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**INTERNATIONAL CONFERENCE**  
**Strengthen Climate Justice Initiatives at the local level with**  
**for sustainable livelihood with a focus on farmers”**  
**On 8<sup>th</sup> to 9<sup>th</sup> November, 2014**  
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**Key papers**

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1. **The Status of Strengthening Climate Justice Initiatives: Livelihood Challenges at Local Level with a Focus on Farmers** - Dr. Kirit N Shelat, Exective Chairman, NCCSD
  2. **Climate Resilient Rainfed Systems** – Dr. Ch. Srinivasa Rao
  3. **The need for Gender sensitive response to the effects of Climate Change – A step towards Climate Justice through Science and Technology Communication-** Kinkini Dasgupta Misra
  4. **Critique of Environment Public Hearing process in India with Special Reference to Rights of the Farmers** - Dr.Madhuri Parikh
  5. **Global Climate Change and Biodiversity** - Prof. Dr. K. Muthuchelian
  6. **Environmental Issues: Environment Protection Act, Challenges of Implementation and Livelihood Security** - JC Dagar<sup>1</sup> and Shakuntla Devi Dagar<sup>2</sup>
  7. **Climate Justice though Regeneration of Common Property Resources (CPRs) for Income and Employment Generation for the : A Case Study-** Dr. R. C. Maheswari
  8. **‘Bio – Rights’ As New Paradigm in Empowering Commons for Environmental Justice** - Dr. R Gopichandran and Dipayan Dey
  9. **Widening Participation for Social Justice: Poverty and Commons Access to Environment** - Dr Dipayan Dey
  10. **Justice Education as Sustainability Instrument for Reducing Interest Conflicts in Development in Global South** - Ms Amrita Chatterjee and Dr Dipayan Dey
  11. **Impact of Climate Change Technologies in India** - Prof. Dr. T. Vidya Kumari
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  17. **Analysis of Seasonality Variations and Copping Strategies among Cocoa Growers : A Case of Kyela and Rungwe Districts** - Magreth Bushesha
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## **Strengthening Climate Justice Initiatives: Livelihood Challenges at the Local Level with a Focus on Farmers**

Dr. Kirit N Shelat, Dr. Gopichandran, Ms. Nisha Shah

### **JUSTICE MEANS:**

- 1) Fairness. 2) Moral rightness. 3) a scheme or system of law in which every person receives his/her/it's due from the system, including all rights, both natural and legal. The attorneys, judges, and legislatures and public administration systems often get caught up more in procedure than in achieving justice for all. Example: the adage "justice delayed is justice denied," applies to the burdensome procedures, lack of sufficient courts, clogging the system with meritless cases, and the use of the courts to settle matters which could be resolved by negotiation or quick administration of decisions. The imbalance by Courts or Decision Makers to privileges obtained by attorneys for the wealthy clients and the negligence towards the legitimate claims of poor farmers is main cause of their grievance of poor's that they are not getting justice at all.

### **IMPACT OF GLOBAL WARMING**

We are familiar with the fact that our earth is heated by sunlight. Most of the sun's energy passes through the atmosphere, to warm the earth's surface, oceans and atmosphere. However, in order to keep the atmosphere's energy budget in balance, the warmed earth also emits heat energy back to space as infra-red radiation. A natural system known as the "greenhouse effect" regulates temperature on Earth. Just as glass in a greenhouse keeps heat in, our atmosphere traps the sun's heat near earth's surface, primarily through heat-trapping properties of certain "greenhouse gases".

Over the past thousands of years, the amount of greenhouse gases in our atmosphere has been relatively stable. A few centuries ago, their concentrations began to increase due to the growing demand for energy caused by industrialization and rising populations, and due to changing land use and human settlement patterns. The greenhouse effect refers to the change in the steady state of temperature by the presence of gases that absorbs and emits infra-red radiation. The greenhouse gases trap heat within the troposphere. The gases are water vapor, carbon dioxide, ozone, methane, nitrous oxide and chlorofluorocarbons.

Nitrogen, oxygen and argon make up 98% of the Earth's atmosphere. But they do not absorb significant amounts of infra-red radiation and thus do not contribute to the greenhouse effect. Carbon dioxide (CO<sub>2</sub>) constitutes about 72% of total GHG and contributes the bulk of radioactive forcing.

Increase of burning of fossil fuel like coal, oil, gas and also wood etc caused by industrial activities and deforestation have increased its concentration in the atmosphere. The concentration of carbon dioxide (CO<sub>2</sub>) in the atmosphere has increased from 285 ppm at

the end of the nineteenth century before the industrial revolution, to about 385 ppm in the new millennium.



**Climate Change is caused by Natural Forces and Human Oriented Activities**

Methane is produced when vegetation is burned, digested or decayed with no oxygen present. Garbage dumps, rice paddies, and grazing cows and other livestock release methane.

- Nitrous oxide is released when chemical fertilizers are used in agriculture.
- Other gas is SF-6.
- Most interesting part of these major emitters is CFC12 ÷ 1 unit = 7000 CO<sub>2</sub>), SF<sub>6</sub> (1 SF = 23900 CO<sub>2</sub>) are largely from industrialized nations.

### **THE IMPACT ON INDIA**

**Unpredictable Climate is a threat to the sustainable development:** Every single day, there is breaking news about natural calamities hitting some region in the world. This unpredictable climate is creating havoc around the world, destroying habitats and disturbing people's livelihood. Some of the recent natural disasters related to this phenomena in India are narrated

below. It must be noted that our country is not new to droughts, cyclones etc., but its frequency and intensity have increased abnormally

in the new millennium. India like other countries in the world has its share of natural disasters.

### **Gujarat Earthquake, 2001**

The Kutch earthquake that shook Gujarat was one of the deadliest earthquakes to strike India. The region continues to simmer and has experienced several mild earthquakes and tremors since 2001.

#### **Trail of Destruction**

- The death toll : 19,727
- Injured: 166,000
- Homeless : 6 lakhs
- Houses destroyed : 3,48,000
- Cattle killed : 20,000
- Estimated losses at : 1.3 billion

**Tsunami December 2004** : affected the Andaman & Nicobar, Pondicherry, Kerala and Andhra Pradesh causing loss of agri-crops, cattle wealth, housing and livelihood.

**Mumbai Floods** : 26th July 2005 – the city was paralyzed and floods in Maharashtra  
07/10/2014

**Surat Floods (2006)** : Estimated loss of Rs.22,000 crore. City's infrastructure affected, high individual losses and crops like sugarcane (Rs. 4,000 crore)

**Heavy rains in 2007 in Rajasthan** : with flooding and consequent breakout of diseases, loss of crops and cattle wealth.

**Bihar: 2008 – Koshi river overflow** with dam in Nepal giving way and large areas of Bihar - UP got affected.

**Droughts 2009:** Delayed monsoon caused drought in some states.

**2010** : Heavy floods in Northern India & un-seasonal showers and snow falling in some parts of India like Gujarat in 2010, the most important is that weather has become totally unpredictable.

**2011 -13:** Floods in Andhra Pradesh so & so far Odisha, land slide in Uttarakhand.

2014-15 : The monsoon has got delayed.

#### **Global Impact:**

The worldwide impact is equally grave.

- In the U.S. alone, nearly 1,000 tornadoes have killed many people and inflicted \$9 billion in damage.

- The 2010 heat wave in Russia killed hundreds of people and led to a 40% fall in the harvest of food grains.

- Floods in Australia and Pakistan killed thousands of people and devastated agricultural lands.
- Re-current droughts in China have eroded millions of acres of farmland.
- Tsunami in Japan – Nuclear plant affected & played havoc to the local habitat
- Recurrent and continuous famines in Ethiopia - Somalia and riots for food by hungry millions.
- Recurrent floods in South East Asia, Philippines, Indonesia, Thailand.
- Almost all nations small or big are affected, one way or another
- This is continuously happening with increasing intensity.

**Such impacts create:**

- Severe famine or heavy floods
- Loss of life
- Loss of agricultural crops and animals

**Effects of Climate Change**



Loss of livelihood

- Increased risk of diseases outbreak and germination of new viruses.

- Damage to infrastructure and communication particularly in rural areas.
  - Setback to social and economic development and emergence of social turmoil with increased rural urban divide.
  - Pushing farmers in rural areas again back below poverty line.
  - Impact in productivity of various crops, thereby creating a challenge to food security.
- Recent research carried out at the Anand Agricultural University - Gujarat provide clue on the deficits that may arise :

**Anand Agricultural University – Research on Impact:**

**Sensitivity of CERES-Peanut (Groundnut) model to ambient temperature under optimal condition (cv. JL-24)**

Change in mean ambient temperature (°C)	Simulated grain yield(kgha-1)	% Change from base(2200 kgha-1) yield
1	2,152	2.1
2	1,888	14.2
3	1,514	31.2

The area under groundnut crop in Gujarat is 19 lac ha. Therefore, due to increase in temperature by 3°C, reduction in groundnut yield could be around 31.2% i. e. 13.2 lac ton per year.

**Anand Agricultural University – Research on Impact: Sensitivity of CERES-Wheat model to ambient temperature under optimal condition (cv. GW-496)**

Change in mean ambient temperature (°C)	Simulated grain yield(kgha-1)	% Change from base(5825 kgha-1) yield
1	4,078	-30
2	3,675	-37
3	3,266	-44

The area under wheat crop in Gujarat is 24 lac ha. Therefore, due to increase in temperature by 3°C, reduction in wheat yield could be around 44% i. e. 12.5 lac ton per year.

**Indian Scenario: Future Projection**

- Change in rainfall pattern by the end of the 21st century

- Increase in temperature by 2 to 4 0C
- Warming will be more pronounced over most of the land areas
- Maximum increase over northern India
- Relatively greater warming in winter and post monsoon seasons
- Frequency of cyclones during post monsoon seasons (2071 to 2100) is projected to much higher than baseline scenario (1961-1990)

#### **OTHER OBSERVED IMPACT ON AGRICULTURE IN INDIA.**

- Drought in 2002 reduced 15 million hectares of the rainy-season crops and resulted in a loss of > 10% in food grain production. Last year/ 2013, delayed monsoon rains caused reduction under rice cultivation.
  - Terminal heat stress is lowering yields of late-sown wheat yields
  - Cold waves during December 2002-January 2003 caused significant impact on crop production in northern India (mustard, mango, guava, papaya, brinjal, tomato and potato).
  - Cold wave during 2006 damaged 50-60 % of young and 20-50 % of old trees of mango.
  - Other fruit crops like guava, aonla, banana, papaya, bael, karonda, chironji, khirni, mahua, tamrind, wood apple and jamun were also affected.
  - High rainfall in 1998 & 2005 ( > 1500 mm) affected kharif and late kharif crop of onion and spoiled rabi nursery leading to price hike.
  - In cashew, untimely heavy rain in March 2008 in west coast reduced the yield and nut quality.
  - Shift in apple cultivation to higher elevations due to non fulfillment of chilling requirement
  - Rise in sea surface temperature (2-2.5oC) in May 1998 led to bleaching in 85% coral reefs.
  - Extension of northern boundary of oil sardine due to rise in sea surface temperature

#### **Heat Waves**

***Andhra Pradesh : 20 lakhs birds died in May & June 2003***



Continuous higher temperatures during critical growth stages of rabi crops reduces the crop yields considerably

Live stock: Heat wave can reduce a milk yield by 10-30% in first lactation and 5-20% in second and third lactation periods in cattle and buffaloes. It also affects the growth, puberty and maturity of crossbreed of cows and buffaloes

**Fish:** Mortality of fishing in shallow water ponds and reduction in fish catch in the water bodies due to movement of fish into the deeper layers.

Rising trends in minimum temperature during *kharif* season have negative impact on rice yields. About 278 districts exhibited a negative impact of rising temperatures and 59 of them showed statistical significance.

Negative impacts are noticed mostly on the eastern parts, Madhya Pradesh and in Indo-Gangetic Plains.

In the current year as of September 2014 the impact of climate change is;

- Parts of north and east India face drought
- Punjab and Haryana farmers are worried over torrential rains. All major kharif crops - paddy, including basmati - cotton and maize are in danger. In neighboring Haryana, cotton



arrivals are on. In Mansa, canals have breached and about 10,000 acres of cotton crop are flooded. "Heavy rain damaged the cotton flower, which resulted in losses

#### **UP : Small farmers stare at big losses**

Monsoon delay has pushed 20 of the 75 districts to the brink of drought. Worst-hit are in Meerut, Kanpur and Varansi, where dry spell has damaged paddy.

#### **Bengal: Pockets of some districts take a hit**

Unusual rain has harmed Bengal. Some parts of Bankura, Purulia and East Midnapore has been affected.

#### **Odisha : Large-scale flooding, minimal loss**

Heavy rain followed by erratic monsoon and floods affected 23 districts.

#### **Kasmir - heavy floods have affected entire region. Source: Economic Times, 7 September, 2014**

- Industry and urban township are mostly implicated in the creating the externality through the release of pollutants and other emissions. They have to be made responsible for the challenges caused and sustained support to overcome challenges in the longer term too.
- These are locally felt challenges of a global phenomenon and can be seen as externalities that the farmers are not responsible for. The stakeholders responsible for creating these challenges cannot be determined as there is no direct cause and effect relationship.
- But it is important to deliver justice to the affected communities in a timely manner. These should include technical, technological and financial inputs & safety-net so that the farmers can tackle climate related challenges immediately and sustain such transitions in the future too or for that matter advisory on Climate Smart Practices.
- The larger questions pertaining to can be popularized. The aspects stated above have to be addressed through the climate justice perspective. The larger questions accordingly are:
  - What are the legal and administrative framework / provisions that the farmers can invoke so that their quality of life becomes the basis for redressal?
  - What can be the mechanism for ensuring responsibility from the industry and Urban Townships infrastructure projects like Ports, Mining that generate these externalities?
  - What are the challenges to the existing rules and regulations and administrative practices which do not meet quick redressal and how they can be modified e.g.

- What existing safety-net provisions and how they can reach out to individual affected families.
- What are existing Government Support Schemes which endeavour to meet these challenges as now they are most often get delayed in delivery at grassroots level
- What are existing Laws/Acts related to quality control etc.
- What inequities are faced by the farmers viz a viz their urban counter part
- What are measures to ensure that farmers receive in timely manner

(a) Warning focused on weather forecast for taking precautionary measures (b) agro-advisory before and after the event has taken place to sustain crops – livestock? Can this be made accountable?

### **CURRENT SYSTEM FOR MEETING THESE CHALLENGES.** The Indian Perspective.

#### **(A) Disaster-Reconstruction policy:**

This is National Policy to provide immediate help to people affected by natural calamities-it includes advance precautionary measures like shifting of population

Government provides assistance to affected at time of natural calamities like floods/cyclone-

- Cash doll payment-for 15 days
- Assistance for Household Kit
- Assistance for Replacing livestock-lost/Died.
- Assistance for Repair /Restore Houses collapsed or washed Away.
- Crop insurance

II Drought

- Employment in the some villages till onset of Monsoon in Community Project
- Health Services.

#### **(B) Employment Guarantee Scheme (Act)-MNREGA(Mahatma Gandhi National Rural Employment Guarantee Act)**

This act provides employment in communities projects to those who have no source of livelihood and in certain cases even one's own farm laborer work is permitted like Farm Pond.

#### **( c ) Crop and cattle Insurance.**

- Government provides
- Subsidy in premium

- Majority crops are including horticulture crops are Covered.

(D) **Minimum Support Price. (MSP) (Govt. of India, Agri .Mini Website)AA**

Government provides a mechanism to purchase agriculture produce-include food grain at a specific price- if the market price is lower. Government sets up purchase depots to buy at MSP. This protects farmers in time of falling price due to bumper crops or Speculative Movement.

(E) **Food Security:**

In September 2013, Government of India has introduced National Food Security Act. The Act provided for food security to both urban and rural poor. Approximately 67% of rural population-81 crore of population is entitled to receive subsidized food grain form Public Distribution System. The rate recommended imbalance are:

1. Rice-Rs 3/-Kg(5 kg per person/month)
2. Wheat –Rs 2/- Kg
3. Coarse Grain Rs 1/- Kg

11 states have introduced this scheme. There are some operational issues-Which are being sorted out.

This is a massive scheme and provides food security covering all rural poor families which include poor farmers.

(F) **Grievance Redressal-**

- The justice system judiciary has created legal Aid Cell- to guide and even provide a lawyer without any fees for those who cannot afford.
- Lok Adalats-These are open courts to settle issues by calling **aggrieved** parties together.

(G) **Public Administration:**

District Level

- Government of Gujarat has setup at District level Committee headed by the Minister (In charge of District), Secretary (In charge of District) and District Collector.
- Every month they meet to here **aggrieve** persons whose problems have not been resolved. This is a public hereing with concerned department. By District Administration from citizen-both rural and urban.
- This administration works in each District effective.

- Those who are not satisfied with the decision or want to take up the matter at Higher Level Department.
- Can directly file complains in CM office through online mechanism .CM takes up video conferences every month to settle /receive such complain.

### **WHY CLIMATE JUSTICE IS NEEDED?**

The changes in weather have now increasing severe impact on habitat. Its aberrations are increasing.

As mentioned earlier farming has become very risky business.

There are safety nets provisions-There are food Security and Employment Guarantee Schemes- but there are people who get left-out .These same poor Families who are left out of development process-and who are more than 20% of rural families. They have been left out because they are not get capable to reap the benefit of Schemes. Hence they need individual help especially at time of their crop-failure or Cattle death or Washing away of crop and soil.

The Exiting provision related to Safety net and other Status-Which deal with input and Marketing are also not favorable to entire Farming Community compared to urban dwellers .there provision have leakages-in certain cases tilted against them.There will be seen from following.

### **CROP INSURANCE**

India has comprehensive system to meet the needs of affected people –including farmers. However those areas where farmers face inequitable treatment vis-a-vis urban dwellers: The brief detailed are briefly as under:

The quick payment claim of crop insurance is main issues.There of difference in treatment between farmers and others. The most important difference is of damage .In case car insurance for Example-Insurance Company does assessment on individual case. It has a system of independent consultant who examines damage and based on his assessment, claim is scrutinized and passed.

In case of crop insurance, the assessment is general and even it is not village --wise .With recent changes in climate ,there is a difference in rainfall pattern between two adjacent village- Sometime even in a same villages, the crop may fail in one farm and in another farm it survives. In case of individual assessment of farmer where crop fails he is entitled to insurance payment- However, in the current general assessment approach, it is overall rainfall pattern or crop yield that determines settlement of claims. India has advanced in a big way in satellite technology. It is possible to identify farm wise detail through satellite images-that is the use of knowledge

Economy. However this is not done As a result the individual farmer suffers. The Question why insurance companies are not using available technology? They can afford to pay Consultant-for car insurance-but not will agree to use satellite data which provide accurate on each ground Situation.

**INJUSTICE TO FARMER-**

Every year there is expansion of urban areas. The government –all over our country introduce new Town planning scheme under Town planning and Urban Development Act. The Act authorities town planning officer to draw out town plan, acquire land for public purpose and re-allocate exiting plots. Every 100 of villages get covered under expansion scheme.

Every village in our country has animal holders those who are farmers and landless persons. The government has provided since land revenue code come in to existence in 1879(*Indian Kanoon*) allocation of “Community Grazing Area” for animals- cattle-Sheep-goat. This land is used as grazing area-and also most of cattle spend time there during the day. In context of overall increase of temperature and in summer –May village panchayat provide how community sheds for protection cattle from “Heat”

But when new Town plan Act comes in to existence the there is no retention of Community grazing Area. It get authorized and distributed for other community purpose like roads, gardens ect.

The end result is that Animal Holders are put to higher cost-They have now buy fodder and create Space for housing them-Which most of them do not have. Hence this cost of Development is paid by poor animal holders.

This is a glaring example of in quits. In query under Right to information Act the Ahmadabad Urban Development Authority has confirmed that no land is reserved (response is “not pertaining to this department”-source Reccd/RTI/AUDA/1138/24<sup>th</sup> Sep .2014 ) for communities or cattle or livestock.

Further to question –What is current provision for Drinking Water and housing policy fot livestock in such new urban center?

Some other areas

<p><b>I. Crop Insurance</b></p>	<p><b>Average settlement period (1 to 2 years) While requirement is</b></p>	<p><b>Car Insurance and Medical Insurance</b></p>	<p><b>Normally Insurance company makes direct payment- Cashless provisions</b></p>
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	immediate for resowing		
<b>II. Inputs Seeds</b>	No action if no germination takes place i.e. Seeds fails germinate any crop or less germination in relation to quantity of seeds	Consumable and non-consumable goods	Immediate exchange / replacement within stipulated period in case product fails to meet standards depicted
<b>III. Sale of Agriculture produces</b>	Gets banned for exports if there is internal (within country) shortage & price rise and farmers lose higher value from its sale if exports	Industrial products	There is no such ban
<b>IV. Tenancy Law</b> If farmers retain- hires a workers	Under certain conditions the workers can become owner – under Tenancy Act Farmers is under constant threat of local Talati who maintain land records.	Urban developer rents out house	But his Tenant can not become owner
<b>V. Sale of Agriculture produce</b>	Compulsory in local Agriculture Produce Market Yard where traders run auction system and	Sale of Industrial Produce	Industries can sell products wherever they want

	<b>make cartel. This under APMC Act.</b>		
<b>VI. International assistance. Carbon Credit</b>	<b>Small farmer cannot fill up a form. Leave apart understand its complexities</b>	<b>This is devised only to help polluters with difficult format which can be filled only by Consultants</b>	
<b>VII. Organisation</b>	<b>There are organisations at national and international level which act as ngos and voice farmer's interest. Some of them are promoted by private group/industries/trade organisation. Some of them mis-represent farmers interest and even take up litigations to prevent adaptation of new technologies</b>	<b>Further some of such organisations do not understand situation at ground level and represent farmers representative in national and international meet. Farmers have actually no voice in what is being represented on their behalf.</b>	

Our emphasis on initiative at local level. The local public Administration –The Taluka level members of Public Governance System. This include the Sub judicial Magistrate, Taluka Magistrate and Mamlatdar, the Taluka Development officer and the police Inspector –apart from commercial and co-op Banks. the Agriculture produce market committee yard (APMC) ,the Input dealers-Seeds, Fertilizer and Agriculture tool and equipments

They have to be made responsive-Sensitized and made aware of their responsibility. This may need capacity building also-

They have to be made accountable- If they do not respond in time for action needed –The corrective action-When grievance is presented .hence there must be “Limitation” imposed on them to take corrective action. Most problem-the injustice arise –as their un-surmountable delay-tossing of papers and persons between village and taluka and District head quarter. Similar the village panchayat who are statutory responsible for development scheme-must also

take initiative for pushing causes-the issues which cause the problem-and over a period of time injustice. For Example Crop failure of a farmers-for claim of insurance –Can not Sarpanch visit farm and make report and report should acceptable for claim settlement.

This also applied to new urban Township. **It should be mandatory Urban Development Authority for them to provide.**

1 Space for cattle maintains community grazing land.

2 provide Community Housing for cattle.

3 Recycle water and make available for irrigation.

4 Recycle Solid waste and convert in to fertilizer and make available to both farmers and new settlers.

5 The Town planning officer and department should be held responsibility of new Town plan does not include this. The Act itself as it now is quite sufficient to take of above.

But it must be mentioned that it is important that farmers are enabled to meet changes in Weather-by scientific means and introduction of “**climate Smart Agriculture**” (CSA) :-

**Climate Smart and Sustainable Agriculture (CSA) is a means to provide this to farmers**

CSA endures to ensure that despite change in climate and its adverse impact on crops/animals, income to farmers should not decrease. It provides opportunities to have multiple sources of income from agriculture and animal husbandry - milch cattle and poultry, fisheries, 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 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.

- Agro – advisory

a) On predicted weather pattern long term, medium term and week to week basis given by Meteorology Department – this prior to kharif and rabi season

b) After unexpected weather that changes have occurred for corrective action to prevent crop loss and livestock management.



- Crop production that contributes to food security by addressing current and projected climate change impacts through adaptation and mitigation and provides an opportunity to win-win situation despite adverse changes.
- It provides institutional arrangement for mass communication and a way to bridge productivity gaps at local level between farmers by reaching out farmers at their door step.

In conclusion, it may be stated that some consider impact on climate change is only related to increase in temperature. But it is much more than that. It also creates tsunami or earthquakes, increased sea-water level or melting ice – so on so forth. In short it brings about unpredictable changes in weather pattern – which are adverse which affect livelihood. These impacts have to be understood in three ways:

- First is the actual increase frequency of natural disasters
- Second is the concurrent impact due to change in weather as low or heavy or no rain or impacts increased temperature are on productivity of crops, animal or fish catch.
- And third is an unforeseen change in weather during seasons.

We need safety net provision to reach out to people at time of Calamity of failure of source income-But much more.

We need to take preventive steps in this area and it can certainly be managed by timely action, convergence of efforts and with involvement of local level leadership of all stakeholders. By leadership, we do not mean only political or elected leaders. It includes all members of Public Governance System – at the village level Sarpanch, Chairman of Co-operative or Self Help Group, village level worker, teacher similarly at taluka & district level. It also includes non-Government Organizations involved in Voluntary assistance, Entrepreneurs and even Judges. if all that act together-There may not be clamor for climate Justice

#### **SOURCE-**

Recnd/RTI/AUDA/1138/24<sup>th</sup> Sep .2014,

Recnd/RTI/ Director Agriculture-Anand/22<sup>nd</sup> Sep 2014

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## Climate Resilient Rainfed Systems

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Knowledge of potential impacts of climate change on agriculture is recently important aspects in scientific community. Many studies showed that climate change lead to agricultural vulnerability, which increases the problems of future food security. Rainfed agriculture covers 58% of net sown area in the country. It is the dominant contributor of staple food production and also ensures livelihood of majority of farmers in India. Climate variability may alter soil flora and fauna, the rate of soil organic matter (SOM) decomposition, nutrient cycling, soil moisture, as well as distribution of pests and diseases. The Intergovernmental Panel for Climate Change (IPCC) reported >25% decrease in food grain production due to climate change in India by 2030. A resilient agricultural system ensures better ecosystem services, such as food, feed, and livelihoods. Climate resilient agriculture, encompassing adaptation and mitigation strategies and the effective use of biodiversity is pre-requisite for sustainable development. Significant decline in production is likely to be caused by shortening of growing period, which will have negative impact on reproduction and grain filling particularly due to terminal heat stress and decreased water availability.

Some of the components towards climate resilience in rainfed systems include rain water management, new cultivars, integrated watershed development, conservation agriculture, and contingency crop planning and integrated farming systems. Management of soil, water and nutrient management strategies are highlighted as an important strategy in building the resilience of natural resources in rainfed areas. Development of climate-resilient crop varieties will be critical to agricultural adaptation. Therefore, there is an urgent need to promote indigenous crop varieties and reverse the loss of agro-biodiversity.

Large parts of India's drylands regularly suffer from water scarcity during summer and mid season droughts, exacerbated by the dropping water tables. Therefore, conservation of water either through increasing SOM or through development of watersheds or harvesting rainwater in the farm ponds is crucial to build resilience in agriculture. Farm ponds conserve the natural resources like soil and nutrients apart from water and acts as flood control measures by reducing peak flows in the watersheds or given area of catchment. Supplemental irrigation with harvested rainwater can play an important role in reducing the risk of crop failures. Conservation agriculture is an important system, it may conserves soil moisture by reduces evaporation and soil erosion, reducing runoff besides moderating soil temperature.

Success of integrated farming system (IFS) lies in proper enterprise mix and optimum utilization of resources. Increasing the tree component in IFS i.e. agroforestry, agri-horti, agri-silvipasture will sequester atmospheric carbon in the plant biomass and in the soil, thereby mitigating climate change. Under NICRA, technology demonstration components of several IFS modules with a combination of small enterprises such as crop, livestock, poultry, piggery, fish and duck

rearing were demonstrated to farmers. Such systems improve their livelihoods and provide resilience to extreme weather events.

### **The need for Gender sensitive response to the effects of Climate Change – A step towards Climate Justice through Science and Technology Communication**

Kinkini Dasgupta Misra, Scientist F, Vigyan Prasar, DST

Climate change and extreme weather affect men and women both, but its adverse effects are likely to be more acute for women, especially economically weak and marginalised rural women. Directly or indirectly village women are largely depends on agriculture and informal sectors for their sovereignty, which are vulnerable to extreme weather.

In almost all economies women's social roles, access to resources and information, and participation leave them disadvantaged. **The impacts of climate change and environmental degradation are different for women and men.** Women from low-income communities, rural and tribal bear a heavier burden from the impacts of climate change because they are more reliant upon natural resources for survival or they inhabit areas with poor infrastructure. **At the same time, women are key players to sustainability solutions.** It is women who are responsible for food production and the collection of water and fuel wood, which makes them particularly aware of changing weather patterns that alter growing seasons, decrease crop yields and lower water levels. This knowledge is essential for adaptation and mitigation strategies.

Women in developing countries are particularly vulnerable to climate change because they are highly dependent on local and natural resources for their livelihood. Women charged with securing water, food and fuel for cooking and heating face the greatest challenges. Women experience unequal access to resources and decision-making processes, with limited mobility in rural areas. It is thus important to identify gender-sensitive strategies that respond to these crises for women.

Climate change is expected to affect many sections of natural and man-made sectors; many of them are of particular relevance to the work and livelihoods of women. Women living in poverty are the most threatened by the dangers that stem from climate change. Rural women are not immune to these climate change threats. In rural communities women are largely dependent on natural resources and agriculture for their livelihoods. Climate change will mean that the supply of natural resources will be threatened. Agriculture may become less viable. Women are playing a significant role in the agriculture production and are facing high risks of loss from droughts, uncertain rainfall, floods and deforestation. These climatic hazards have already led to low production, food shortages and poor livelihoods. Climate change adds to water insecurity and shortage which in turn makes much of women's time for fetching water for domestic uses. Moreover water insecurity increases women's workload in subsistence farming. Given women's key role in agriculture, it is a fundamental for adaptation efforts to provide local climate information and enhance meteorological and climatological knowledge.

A climate justice approach amplifies the voices of those people who have done least to cause climate change, but who are affected most severely by it. It includes the poorest and most marginalized people world-wide who already suffer most from poverty, hunger, ill-health and injustice. Thus climate justice needs to incorporate a strong gender perspective. Gender inequities alone can motivate more women to lead in taking action, but women's leadership must address the entire range of climate issues as well as bringing a gender perspective to each of them.

The paper would attempt to highlight the need for a robust science communication strategy which can facilitate action on climate justice in creating a gender-conscious response to reduce the negative impacts of natural disasters on women, particularly in relation to their critical roles in provision of food, water and energy. Attempt would be made to emphasise the women farmers are the effective agents of change in relation to adaptation, mitigation and disaster reduction strategies through science and technology communication programme. It will be demonstrated that the sensitization programmes are the only source to develop their knowledge, skills, and experiences for shaping adaptation process for better livelihood. The paper would emphasis on the various approaches of creating awareness on the expected consequences and risks of climate change in agriculture; documentation of women's experiences of climate change impacts on agriculture, water, housing, fisheries and related livelihood issues, as well as feeding into the process of developing adaptation policies and strategies for local, state and national government for promoting gender equality. The paper will encompass the initiatives to involve women farmers in developing local-specific issues and reflecting a participatory approach to knowledge management through communication strategies. It would also elaborate how collaboration with the rural women's networks and SHG will help in creating community of practitioners.

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### **Critique of Environment Public Hearing process in India with Special Reference to Rights of the Farmers**

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India has adopted the concept of sustainable development. Many new development projects are given permission in India after Environment Impact Assessment of the projects. But still due to the advent of the projects many people are displaced and rehabilitated. Many farmers lose

their fertile land. It indicates that effective participation of farmers in domestic environmental compliance and enforcement efforts is very essential, as it is one of the effective ways of protecting their human rights, right to environment. The right to participation allows people to be part of the decision making process through consultation and comments, and to have their opinion heard. When members of the public express their views on a proposed project, alternative views, otherwise not represented, are resented. This paves the way for the decision-making agency to be thorough in their analysis and thus brings quality and objectivity in the decisions. The present paper focuses on the critical analysis and evaluation of one of these participatory tool i.e. public hearing as part of environment impact analysis process in India with special reference to farmers. It critically analyses the efficacy of this tool in protecting the rights of the farmers in India. It evaluates the Public Hearing process in India with special reference to the farmers.

### **Global Climate Change and Biodiversity**

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Climate is an integral part of ecosystems and organisms have adapted to their regional climate over time. Climate change is a factor that has the potential to alter ecosystems and the many resources and services they provide to each other and to society. Human societies depend on ecosystems for the natural, cultural, spiritual, recreational and aesthetic resources they provide.

In various regions across the world, some high-altitude and high-latitude ecosystems have already been affected by changes in climate. The Intergovernmental Panel on Climate Change reviewed relevant published studies of biological systems and concluded that 20 percent to 30 percent of species assessed may be at risk of extinction from climate change impacts within this century if global mean temperatures exceed 2-3 °C (3.6-5.4 °F) relative to pre-industrial levels ([IPCC, 2007](#)).

These changes can cause adverse or beneficial effects on species. For example, climate change could benefit certain plant or insect species by increasing their ranges. The resulting impacts on ecosystems and humans, however, could be positive or negative depending on whether these species were invasive (e.g., weeds or mosquitoes) or if they were valuable to humans (e.g., food crops or pollinating insects). The risk of extinction could increase for many species, especially those that are already endangered or at risk due to isolation by geography or human development, low population numbers, or a narrow temperature tolerance range.

Observations of ecosystem impacts are difficult to use in future projections because of the complexities involved in human/nature interactions (e.g., land use change). Nevertheless, the observed changes are compelling examples of how rising temperatures can affect the natural world and raise questions of how vulnerable populations will adapt to direct and indirect effects associated with climate change.

The composition and geographic distribution of ecosystems will change as individual species respond to new conditions created by climate change. At the same time, habitats may degrade and fragment in response to other human pressures. Species that cannot adapt quickly enough may become extinct- an irreversible loss.

Scientists have observed climate- induced changes in at least 420 physical processes and biological species or communities. Changes include migratory birds arriving earlier in the spring and leaving later in the autumn. Observations, experiments, and models demonstrate that a sustained increase of just 1°C in the global average temperature would affect the functioning and composition of forests. The composition of species in existing forests will change, while new combinations of species, and hence new ecosystems, may be established. Other stresses caused by warming will include more pests, pathogens, and fires. Because higher latitudes are expected to warm more than equatorial ones, boreal forests will be more affected than temperate and tropical forests; Alaska's boreal forests are already expanding northward at the rate of 100 kilometers per degree Centigrade.

They are a major reservoir of carbon, containing some 80% of all the carbon stored in land vegetation, and about 40% of the atmosphere during transitions from one forest type to another if mortality releases carbon faster than regeneration and growth absorbs it. Forests also directly affect climate on the local, regional, and continental scales by influencing ground temperature, evapo- transpiration, surface roughness, albedo (or reflectivity), cloud formation, and precipitation.

With few exceptions, deserts are projected to become hotter but not significantly wetter. Higher temperatures could threaten organisms that now exist near their heat- tolerance limits.

Grasslands support approximately 50% of the world's livestock and are also grazed by wildlife. Shifts in temperatures and precipitation may reshape the boundaries between grasslands, shrublands, forests, and other ecosystems. In tropical regions such changes in the evapo- transpiration cycle could strongly affect productivity and the mix of species.

Creating natural migration corridors and assisting particular species to migrate could benefit forest ecosystems. Reforestation and the integrated management of fires, pests and diseases can also contribute. Rangelands could be supported through the active selection of plant species, controls on animal stocking, and new grazing strategies. Wet lands can be restored and even created. Desertified lands may adapt better if drought- tolerant species and better soil conservation practices are encouraged.

## **Environmental Issues: Environment Protection Act, Challenges of Implementation and Livelihood Security**

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The decline in environmental quality has been evidenced by increasing all kinds of pollution, loss of vegetation and biodiversity, excessive concentrations of harmful chemicals and green house gases in the ambient atmosphere causing climate change, growing risks of environmental accidents, and threat to food chain and life support systems. Although there are existing laws dealing directly or indirectly with several environmental matters and even the Environment Protection Act, 1986 received the assent of the President and published in the Gazette of India followed by several rules handling environmental problems from time to time till 2013; the main concern is how to get these legislations implemented in letter and spirit? Moreover, the existing laws/rules generally focus on specific types of pollution related problems or on specific categories of hazardous substances, or wild-life protection. Some major areas of environmental hazards and disposal problems are not covered. Removal of mangroves in coastal areas and forests on hills are ignored facing the consequences of natural disasters. Problem of tackling issues related to disposal of effluents into rivers and estuaries (affecting coastal ecosystems) remain intact. There are inadequate linkages in handling matters of industrial and environmental safety issues. Control mechanisms to guard against slow, insidious build up of hazardous substances, especially new chemicals, in the environment (soil, water and air) are weak. Many areas need to be redefined and the multiplicity of regulatory agencies needs to be rectified for proper implementation of laws and regulations. In many areas problems like accumulation of heavy metals like arsenic, boron, lead, etc and their seepage in drinking ground water is a matter of health concern both of human and animal population. Despite of 67 years of independence, the major challenge remains of implementation of laws for handling the municipal solid and liquid wastes and major rivers which are life lines of millions of people remain polluted. Those who protect the environment through greening (through plantations) are unable to harvest the benefit of carbon credit as we lack easily implementable policies. There are several environmental issues which directly or indirectly affect livelihood security particularly of poor people including farmers with or without land. Some of these issues have been discussed in this paper.

## **Climate Justice through Regeneration of Common Property Resources (CPRs) for Income and Employment Generation for the : A Case Study**

Dr. R. C. Maheshwari

An integrated approach has been made to develop a wasteland falling under classes IIIes and Vles of land capability classification in watershed management plan, for achieving fuel and fodder security in an adopted village Islamnagar under Operational Research Project on Integrated Energy and Nutrient supply System. An Energy Census and resource Assessment



Survey of this village (Maheshwari, et al, 1981) showed that the village was in deficit of fuel wood by 98.8 tons (20.8% shortfall annually) and cattle feed by 812 tons (30% shortfall annually).

The total area of the village consists of 717 ha out of which 61.6 ha is forest land, more than half of the forest land comprise of hilly terrain, completely denuded of its trees, however, the silver lining was the fact that the root stock of trees still existed under the soil. Once the physical protection was ensured and a deep cut was given to the roots below the surface of the soil during the summer before the rains, the rootstock sprouted and regenerated very vigorously. In order to meet the fuel wood and fodder demand of the village, 38 ha of land, as identified on the basis of land use planning, was brought under silvi-pastoral development with early growing tree species and the high yielding varieties of grasses. The soil and water conservation measures taken include contour survey, cut-off trenches along the contour at 5-10 m vertical interval, vegetative waterways, drainage ditches, cattle protection trenches and kachha service road along the boundary of the area, temporary erosion control structures and micro-catchment water harvesting for insitu water conservation. In addition to meeting fuel wood and fodder demand and other intangible benefits, like artisanal raw materials, the silvipastoral development of identified wasteland generated 1,15,421 man-days of work during a five year period. In other words, 60 persons could be employed year round for this work alone. In terms of harnessing solar energy through photosynthetic processes in the form of food, fuel, fiber and fodder amounts to 21 percent annually as against 2-4 percent for field crops. In terms of income generation, the annual auction of natural grasses alone in the fifth year amounted to Rs 6000 per ha. There was perceptible drop in the ambient temperatures in the summer, with increased number of birds and wildlife, including a pair of wolves.

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### **'Bio – Rights' As New Paradigm in Empowering Commons for Environmental Justice**

Dr. R Gopichandran and Dipayan Dey

South Asian Forum for Environment; Research and Planning Division,

'Bio-rights' is based on the principle of Environmental justice that all people have a right to be protected from environmental pollution to live in and enjoy a clean and healthful environment. Bio-rights are financial mechanism to compensate opportunity costs of local stakeholders and assist commons of global south in reconciling poverty alleviation and sustainable use of natural resources. It could contribute to poverty alleviation by direct payments to compensate for poverty related costs and distribution of payments to communities on the basis of nature conservation.

In this review paper, we highlight and assess the significance of the emerging discourse of 'just sustainability' in global south. We briefly examine the influence of the environmental justice movement upon emerging debates, and the role of the many and various 'home grown'

initiatives; of which the concept of commons Bio-rights is significant and we finally examine the linkages which may be made between the environmental justice and sustainability discourses. The paper describes environmental racism and its underlying causes and then presents a case study of environmental racism in the coastal wetlands of west Bengal in India that are used as sewerage dumping grounds and are systematically sited in poorer areas. The paper also describes a movement of environmental awakening in one area to fight environmental racism and to support isolated, rural and peri-urban fishermen communities in their efforts to recover environmental values. Bio-rights policy should not only be reactive to environmental 'bads', but should also be proactive in the distribution and achievement of environmental 'goods' like a better livelihood or a sustainable community growth.

Though the parameters of "environmental justice" may seem virtually unlimited, in response to claims that urban neighborhoods bore a disproportionate share of environmental risks, however, perusal of data showed that neither urban neighborhoods nor areas with concentrations of poor people were disproportionately impacted... The strongest correlation in the study turned up as to the level of political participation: Finally, there is some evidence to suggest that the government is beginning to recognize that environmental justice can play a role in the wider agenda for sustainable development and social exclusion. It is this emerging discourse by NGOs and government based around the linked notions of environmental justice and sustainability.

Environmental justice may be viewed as having two distinct but inter-related dimensions. It is, predominantly at the local and activist level, a vocabulary for political opportunity, mobilization and action. At the same time, at the government level, it is a policy principle, that no public action will disproportionately disadvantage any particular social group. We expand on this below, but it is important to emphasize that a fruitful discussion of environmental justice is crucially dependent upon recognizing this distinction. It is necessary to place the discourse of environmental justice firmly within the framework of sustainability. This paper recognizes the integral connections between justice, reciprocity and equity as a wider question of sustainability and governance.

### **Widening Participation for Social Justice: Poverty and Commons Access to Environment**

Dr Dipayan Dey

Chair: South Asian Forum for Environment

In this international Year of Sanitation, one in five of the world's population, which includes two-thirds as women, live in abject poverty; on the margins of existence, without adequate clean water, sanitation or healthcare, without food and education. This enormous mass basically depends on the natural resources of the environment around them. The loadstone of urbanization though doesn't consider them as stakeholders neither partner the poverty. Social justice is not only denied it is refuted rather. The concept of widening participation in sustainable development has different meanings for different countries, depending on the particular country's overall political and socioeconomic status. As the above quotation indicates, for many of the poorer countries widening participation is not a matter of accessing

right to natural resources at all, even at the most basic level. It is displacing them in the name of rehabilitation and thereby narrowing their livelihood opportunities to facilitate elimination of the poor commons.

As mentioned in the United Nations Millennium Declaration, rural development is stagnating worldwide. For people living in rural areas the (over)exploitation of natural resources is one of the few options remaining to avoid poverty. The over-exploitation of natural resources is seriously compromising long-term development, ensuring that people remain poor, trapped in a so-called poverty trap. '**Bio-rights**' offers a novel approach to addressing this situation, an approach with the potential to effectively increasing income while at the same time stimulating conservation and sustainable exploitation of natural resources. Global stakeholders profit from the long term benefits of the natural resources, while local people gain an increased income.

Nevertheless, it is important to note here some key distinctions that serve to perpetuate the North–South divide on this issue, the most important coming from international donor agencies and their policy-makers. The present paper would peruse the participatory machinery in global south for sustainable development and assess the impact of allowing commons an access to nation's natural resources

### **Justice Education as Sustainability Instrument for Reducing Interest Conflicts in Development in Global South**

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Justice Education happens to be the empowerment panacea for the commons in the global south. Right to participation and socio-economic justice is the only sustainability instrument for reducing interest conflicts in global south. In developing countries, social impact assessment studies continue to be applied as tools for impact minimization and mitigation. Optimally, this approach should aim to ensure social justice and maximize development options and opportunities consistent with internationally agreed principles of sustainability.

Studies carried out in south Asian countries reveal that assessments of environmental opportunity costs and social impacts for establishing special economic zone (SEZ) was critically done but reports were not disseminated to the local stakeholders denying their social justice and development proposals were thus incongruent to sustainability objectives. For any Government, profit alone cannot be the motive as it has an obligation to ensure that such projects do not adversely impact the people. To gauge the likely impact of a project on a State's economy, a Social-Cost Benefit Analysis (SCB Analysis) is often commissioned. Such an approach ensures social reciprocity, allows the assessment of the impact of a project on the national economy, unlike financial analysis which has a narrow perspective of profit accruing. Computation of social profits at the economic hurdle rate is a key step in assessing whether the project is in the national interest and for computing the kind of concessions that can be provided by the governments, such as tax concessions or waivers, or giving it SEZ status.

The present paper showcases a case study named POSCO SEZ project in Orissa of India. The study broadly used the ADB/World Bank methodology on the social cost-benefit with minor adjustments for the local parameters. Econometric models were used to project border prices for the useful life of the project. The project's impact from the State economy perspective in terms of the impact on the State GDP (output multiplier effects) and employment opportunities created within the State (employment multiplier effects) was also assessed.

An important part of the study was the Least Cost Analysis of technology options in the steel-making, the Finex process that Posco project purports to bring and the traditional blast-furnace technology. The Average Incremental Economic Cost was used as the yardstick; this was followed by computing the economic IRR (internal rate of return) to examine whether the project was economically worthwhile from the national economy point of view. The significant feature of the study is the estimation of depletion premium or the opportunity cost for deployable and non-renewable resource iron ore.

Although opening up of the economy and sustainable environmental development at the crossroads of conflicting interests with commons poses uneven challenges, IA tools are seldom brought together in practice to plan, assess and implement SEZ projects, which requires an integrated approach to clarify the trade-offs between economic, equity and environmental criteria.

The paper explains that depletion and deterioration of environmental sources and sinks must be kept within “safe margins” and residual damages be compensated by environmental enhancement. In effect, EIA and SIA should be applied with explicit reference to the precautionary principle through participatory community partnership and with the notion of no net loss of natural capital.

International Conference On “Strengthening Climate Justice Initiatives: Livelihood Challenges at Local Level with a focus on Farmers”

November 8-9, 2014

Institute of Law, Nirma University, Ahmedabad (Gujarat) India

### **Impact of Climate Change Technologies in India**

Prof. Dr. T. Vidya Kumari

New technologies are tools of progress and development. Innovations and technology transfers are the beacon lights that attract the developing countries to provide monopoly rights in exchange for useful products and processes that mitigate problems of public concern including climate change.

It is observed that Patents are akin to fireworks-they need careful handling .The “anti common features” of the Patent system at times deter progress and pose a threat-a challenge to countries starved of new technologies.

This Paper is a review of the positive role of the Patent system in the protection of environment and climate change. The different aspects of the relationship between climate change and new technologies will be discussed.

The base of the Paper includes-

1. The review of the various international instruments on climate change. The starting instrument is the UNFCCC-The UN Framework Convention on Climate change of 1992 followed by the Kyoto Protocol of 1998 which spells out the objectives for its members to reduce greenhouse gas emissions. Subsequently there has been a consistent international dialogue for action against climate change. The limitations of International Instruments and the need for concrete National Policies will be examined in this segment of the Paper.
2. The role of the Patent system follows. The inherent challenges posed by the IP System due to its anti common features has a negative effect on the democratic policies of most developing countries including India.
3. The paper suggests a cooperative approach by the Government to receive the benefits of the Patent system by encouraging technologies that mitigate climate change.

All efforts are required to mould the IP Laws to ensure the rights of the IP holders for their efforts, skill and investments for technologies that address climate change and provide enough room for a synergy between IP holders and the ultimate users of these technologies. The proposals of the Indian Government in this regard will be discussed.

### **Institutional Innovation in Climate Smart Agriculture**

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Indian agriculture is highly dependent upon weather since more than 60% of the cropping area is rain-fed. A recent IFPRI-CCAFS study has forecasted that India could lose 10-40% of its current crop production by the end of century due to global warming. The report estimated that 10% drought will increase the prices of rice by 23%.

A long-term strategy needs to be implemented which would prepare farmers to adapt and respond appropriately to climate change, and effectively overcome the consequences. Climate-Smart Agriculture, which sustainably increases agricultural productivity and ensures achievement of national food security goals, provides a window of opportunity to avert the impacts of climate change. This can be facilitated through Public Private Partnership or by efficient co-operative mechanisms. Co-operatives have been a crucial factor in consolidating the agriculture sector in the country. The co-operatives cover almost all rural parts in India. Co-operatives are playing role in agriculture banking since 1904. Co-operatives are effective instruments to establish any scalable model for agricultural development. The paper proposes a sustainable business model to implement Climate Smart Agriculture by involving Financial

Institutions and Co-operatives. Climate Smart Agriculture requires expensive farm machineries & infrastructure that may not be affordable for small & marginal farmers. So, there is a need of financial ecosystem for co-operatives to construct Custom Hiring Centre from where farmers can afford machineries on rental basis.

Co-operatives can play role of direct intermediary between farmers and consumers. They can procure the produces directly from farm gate and trade directly to retail consumer. Financial Institutions can deliver advisory services for marketing & branding of the products as well as offer credit for construction of warehouses, primary processing, and transport & logistics facilities.

This paper analyses how a sustainable business model can be effectively implemented towards workable Climate Smart Agriculture Practices.

**Keywords:** Climate Change, Agriculture, Cooperatives, Adaptation, Mitigation, Climate Smart Agriculture, Business Sustainability

### Climate Justice: Agriculture Perspectives

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Agriculture appears in the global climate change negotiations principally as a crosscutting issue – relevant to almost all of the main negotiating topics, yet for the most part appearing only incidentally. However, when it comes to ground zero, the cultural practices and traditional knowledge systems that helps in adapting the communities to climate change impacts are enormous and significant; these processes also indirectly help in the mitigation processes. It is all believed that adaptation can only be carried out with sufficient provision of financial resources, as well as transfer and sharing of relevant technologies and practices and building of indigenous capacity to address the broad range of impacts at levels from local to national. It is therefore envisaged that the policies that are derived from the global vision should converge into win-win strategic action plans through local level implementation. While doing so, the indigenous and rural farming practices as well as other ancestral models of agricultural practices that contributes to solving the problem of agriculture and food sovereignty, given the contextual human population, should also be given priorities in the achieving the climate justice at par with the environmental sustainability *per se*.

### Overview of Presentation

by Robert Jordan

Farming in India is a highly complex socio-economic phenomenon. Climate justice is therefore part of a much broader issue of justice for farmers, the rural poor and indigenous peoples in India. This presentation is intended to provide insights into emerging international policies and their implications for farmers in India. It outlines opportunities provided by the new Sustainable Development Goals, the Green Economy, Low Emission Development Strategies and various

initiatives connected with the United Nations Framework Convention on Climate Change and the FAO Committee on World Food Security. But it also questions the suitability of the predominating economic paradigm of market-led trade liberalization that underpins many UN policies for providing India's most vulnerable people – farmers, rural poor and indigenous peoples with justice and a fair deal.

For a nation that has perhaps more farmers than any other country and which is home to a quarter of the world's under-nourished it is absolutely essential that agriculture initiatives primarily engage and empower India's farmers and rural poor. It also looks at the types of agriculture that can deliver gains for Indian farmers and tribal people in terms of resilience, justice, profitability and sustainable development. Finally the presentation looks at the important leadership that NCCSD is providing and makes some suggestions for how it could leverage the networks and expertise it is rapidly assembling for considerable impact at the national and international levels.

### **Is this justice to the saviours of the Climate?**

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Clean Development Mechanism (CDM) more popularly known as “Carbon credits” is no longer a new terminology. It has been introduced since beginning and well accepted in various industrial sectors to gain credits against their future emission reduction potentials. It is mainly done for offsetting the emissions of developed countries by the activities of developing countries. We are at the stage of phase out of Kyoto Protocol and new treaty will be signed when world leaders will meet next year in Paris during Conference of Parties 21 of UNFCCC.

Though it took several years to establish a good process for developing a CDM project which is simpler, acceptable and verifiable, even today it needs special skills to understand its basics to be able to convert them in to a good acceptable proposal. Baseline conditions, Approved methodology, Leakages, Additionality etc. are part of CDM process which is even difficult for technical experts also.

For Agriculture sector it is still to start from the scratch. One important thing is to realize that all other sectors have to put efforts to achieve emission reductions but agriculture is the only sector which by default reduces emissions. Agriculture through their photosynthesis activity is the only known technology in the world by which CO<sub>2</sub> is absorbed and converted to products like glucose. But the sector is driven by the poorest community i.e. farmers. How one can expect a farmer to be able to match with the capabilities required to register their efforts for this global movement called Climate Change. They are anyway and continue to contribute without any support. Like Energy & other industrial process sectors that are having all the capacities including financial resources, have achieved carbon credits beyond imagination. But in the entire process still agriculture sector is far behind.

The process of registering the project / activity which reduces emissions and claim carbon credits is very lengthy and tedious. Thought it has now scope for small players to join together and increase the feasibility of the project / activity but adaptability and dependability is still a big challenge. No government has ever thought for this sector to help them achieve rewards for their contribution towards Climate Change mitigation.

Is this justice to the saviours of our Climate?

**Helping farmers cope with climate variability and change in the regions of  
South Asia and sub-Saharan Africa**

Dr Anthony Whitbread

Director of the Resilient Dryland Systems Program,  
International Crop Research Institute for the Semi-Arid Tropics (ICRISAT)

The International Crop Research Institute for the Semi-Arid Tropics (ICRISAT) is has been in existence since 1972 with its headquarters in Hyderabad and research stations and offices in several sub-Saharan countries giving it a global outreach. Coping with climate, both variability and change, is often the No.1 challenge to farming in the semi-arid tropics. The program that I lead, Resilient Dryland Systems, uses multidisciplinary research (biophysical, social and economic sciences) to understanding the farming systems in the semi-arid regions. Our research for development (R4D) approach is at a range of scales, field-farm-watershed. These R4D approaches are used to identify technologies and intervention strategies and their entry points that that may then be applied at scale to reach millions of farmers.

Our research focus is therefore:

- Enhancement of farm income and risk minimization through better agronomic management (i.e. rotations, crop diversification, soil fertility, enhanced water use efficiency, organic and inorganic nutrient use).
- Generation of farm income through the enhancement of the synergies between crop and livestock enterprises (i.e. forages for livestock creating income from milk and meat, recycling of N from BNF, tree-crop-livestock systems, market linkage).
- Natural resource management through enriching and buffering water and nutrient supplies; protecting soils and moderating microclimates; reducing greenhouse gas emissions.

The approaches and tools we use are:

- Considering how smallholder farm households deal with drought and food insecurity based on the surveys, stakeholder consultations, bioeconomic modelling.



- The use of innovation platforms and value chain approaches that enable intervention strategies to be connected with market opportunities.
- The use of simulation platforms (e.g. crop-APSIM/DSSAT, bioeconomic-statistical and linear programming) to explore strategies for coping with drought and adapting to climate change- (Key Focal Area - Model based analysis)
- Improvement of vulnerability assessment and mapping of resource potential and land use using advanced geospatial techniques.
- Investigation of risk-reducing policies, safety nets, gender equity, early warning systems, and resilience and recovery strategies.

My talk will show data that indicates the climate has indeed changed in the past decades pushing some areas of India into drier agro-climatic classifications. But most of the focus will be on how farmers might better cope with uncertainty by making more informed decisions using information from seasonal climate forecasts, historical analyses of local climate, and a better understanding of soils and crops. I will use examples from the driest continent, Australia, to show that farming can be less risky by combining such sources of information. By working together as scientists, extension workers, policy makers and farmers, farming can become profitable and sustainable in almost any environment.

### **Analysis of Seasonality Variations and Copping Strategies among Cocoa Growers : A Case of Kyela and Rungwe Districts**

Magreth Bushesha

#### **Abstract**

The study investigated how cocoa farmers cope with seasonality variations in Kyela and Rungwe districts in Mbeya Region Tanzania. The study had two specific objectives; to identify main buffer sources of income at times when cocoa produce go down; and to identify challenges that face cocoa growers in the study area. The study adopted a descriptive research design. Simple random sampling was used to select 224 sample population. Data was collected through questionnaire administration, in-depth discussion with key informants, focus group discussion, observation, and documentary review. Thematic data analysis was adopted to analyze qualitative data whereas simple descriptive statistical analysis was adapted to analyze quantitative data. The study identified such crops as maize, beans, groundnuts, paddy, watermelon, banana, oil palm, and cassava to be major buffer crops at times when income from cocoa go down in both districts. Off farm activities including livestock keeping, fishing, selling of forest products, and petty business also add income among farmers. Off-farm activities including food vending, selling of forestry products and petty business also play an important role in income generation among cocoa growers. The study suggests that farmers should be encouraged to invest not only on farming rather in off-farm activities too especially because rainfall for agricultural production is no longer reliable. The government should also assist farmers to regulate prices.

**Key words:** Seasonality, Cocoa, Sustainable Livelihood, Rungwe, Kyela

## **Introduction**

Cocoa is among crops that make an important livelihood options in Kyela and Rungwe districts. However according to Anim-Kwapong and Frimpong (2005) cocoa yields fluctuates with seasons, in some seasons cocoa yields tend to be high whereas in others they tend to be low. A study by Bushesha (2011) indicated that seasonality is an issue of concern among cocoa growers in Kyela district which is one of the study areas; this is particularly because rainfall data in kyela shows inter-seasonal and inter-annual variations. Not only that but also length of dry seasons varies between years. The major concern of this study was on how farmers, who depends mainly on cocoa for their livelihood cop in different seasons.

## **The Problem**

Cocoa is one of the most important sources of income among its growers in Kyela and Rungwe districts (Bushesha 2011). The crop gives yields throughout the year and it can be sold throughout the year hence allowing farmers of having petty cash throughout the year (Bushesha 2011). The crop, however, is sensitive to seasonal variations in terms of yields (Anim-Kwapong and Frimpong 2005; Bushesha 2011). Variations in yields mean variations in income among its growers. This study intended to establish how farmers cope with such variations in cocoa yield. Answering this question has implications on peoples' livelihoods; this is key for sustainable development planning.

## **Research Objectives**

The main objective of this study was to produce a holistic study of the examination of the seasonality coping strategies and their implications on livelihoods of cocoa farmers in Tanzania. Specifically the study intended to:

1. Identify main buffer sources of income at times when cocoa yields go down.
2. Examine implications of buffer sources of income on farmers' livelihood.
3. Identify challenges facing cocoa growers in the study area.

## **Research Questions**

The study strives to answer one main question which is: In which ways cocoa growers buffer themselves from income fluctuations within different seasons? The study will answer the following specific questions: -

1. Which months around the year are characterised by heavy rains and which ones are characterised by drought and how these vary annually?
2. What produce are available within different seasons and how these complement sources of livelihoods?
3. What off-farm activities are perceived important for buffering at times when cocoa yield dwindles?
4. What are the implications of coping strategies on livelihoods?

## **Literature Review on seasonality coping strategies among small holder farmers**

The term seasonality is defined as the variation that occur in different seasons and characterized by a series in which the data experiences regular and predictable changes which

recur every calendar year. Any predictable change or pattern in a time series that recurs or repeats over a one-year period can be said to be seasonal (<http://www.investopedia.com>, 27.09.2012).

According to Devereux (2009) farming process among small holders is dependent of a hypothetical expectations among farmers that rains will timely start, adequately rain and be normally distributed; this hypothetical situation tend to be within the minds of farmers hence the courage of undertaking the different farming activities including field preparations, seed planting, weeding, and tending fields in all ways while looking forward for a bumper harvest. When this hypothetical situation fails to materialize farmers become victims of wasting resources and eventually of hunger and poverty. Communities most vulnerable to seasonality variations are rural that derive their livelihoods predominantly from farming. They cultivate food and other crops for subsistence and income (Devereux 2009).

Swift and Hamilton (2001) describe the concept of coping strategy as “a behavior or action that helps smallholders respond to seasonality by using available resources and create additional income for consumption or investment in order to adapt to environmental changes” (Swift and Hamilton 2001: 73). Where rains happen to rain inadequately or happen to be poorly distributed as a result they cause poor harvest, farmers opt to sell assets such as livestock, bicycles, to cover up the gap of income which could otherwise be generated from cultivated crops (Swift and Hamilton, 2001).

According to Below *et al.* (2010) adaptation practices to seasonality variability can be classified as follows: Farm management and technology; farm financial management; diversification on and beyond the farm; government interventions in rural infrastructure; the rural health care services, and risk reduction for the rural population; knowledge management, networks, and governance. Some known seasonality coping strategies among farmers in different areas include migration and sales of assets. Male members or whole families migrate to nearby towns to search for work in the non-agricultural areas, mostly in the construction sector. In hard times, children are taken out of school and send to work to support the family (Devereux, 2009).

The other known coping strategy for prolonged dry seasons is delayed sowing (Devereux, 2009). This is adaptation per necessity, sowing early without irrigation would lead to crop failure. Further, changing cropping patterns is another noted adaptation strategy for seasonality variability around the world (Toulmin 2009). As the growing seasons get shorter, for example, farmers tend to be constrained to change their cropping patterns (Toulmin 2009). Where no irrigation is available, farmers have stopped growing (ibid). Indigenous knowledge also plays a significant role in early warning and weather forecast, forest and pasture conservation, soil and water conservation and disaster preparedness (Kihupi, 2000; Mhita, 2006).

It is not clear whether these strategies apply to small scale farmers in Tanzania. Using the case of cocoa growers this study is likely to shed light on the applicability of these afore said coping strategies to seasonality variability among small holder farmers in Tanzania. However the research is specifically focusing at explaining how and what do farmers do to supplement income at times where cocoa income dwindles due to seasonality variations.

Around the world seasonality coping strategies have been a major agenda in improving crop production to small holder farmers. With unpredictable changes in seasonality different

countries in the world have adopted different strategies to help small scale farmers cope with seasonality variations. Bruns, (2004) for example reports that Indonesia spent US dollar 10 billion on irrigation to assist small holder farmers to cope with prolonged dry seasons between 1968 and 1993. As of 2004 the Indonesian government had supported 1.5 million hectares of small holder farmers in coping with prolonged drought (Bruns, 2004). IPCC advocates more intensive use of water impoundment; several useful examples are given from Indonesia, Sri Lanka, Niger, and Burkina Faso. Perm culture, water harvesting and infiltration pits, together with the use of drought tolerant crops, have been more recently extended in Zimbabwe, particularly by women in response to recurrent droughts (Stigter *et al.*, 2005).

In Tanzania, use of excavated banded basins for rice farming particularly in the Lake Zone; creation of raised broad basins locally called *Vinyungu* for prolonged drought in Iringa region; and use of water storage structures locally called *Ndiva* in Kilimanjaro are some of coping strategies to seasonality. Growing high water demanding crops in the lower parts of a landscape using rainwater from the surrounding high grounds has been practiced in semi-arid areas of Tanzania (Mbilyni *et al.*, 2005). According NAPA (2005), the existing adaptation and coping strategies for Tanzania for the agriculture sector include alternative farming systems; promotion of indigenous knowledge; change of planting dates in some agro ecological zones; increase of irrigation; drip irrigation for specific regions; growing short-season and drought tolerant crops such as sorghum and millet over maize; shifting crop farming to more appropriate agro ecological zones; changing crop rotation practices; integrated crop and pest management; make better use of climate and weather data, weather forecasts, and other management tools; create awareness on the negative effects of climate change; sustainable water management; and insist on annual and short term crops (NAPA, 2005).

Empirical evidence regarding seasonality coping strategies among cocoa growers in Tanzania is limited. The crop was first planted in Mbeya region in 1952 (URT 1988). From that time cocoa was grown in the then Tanganyika British colonial government farm estates in Kyela and Rungwe districts. In 1960, the government of Tanganyika encouraged small-holder cocoa production, such an encouragement led to expansion of small cocoa farm establishments in parts of Kyela and to a lesser extent in the lowlands of Rungwe district (URT 1988). However there no literature explaining how cocoa farmers have been coping with season variations since then. The agricultural and livestock policy of 1997 for example does not state anything concerning the seasonality coping strategies among small (cocoa) farmers despite the fact that past policies (i.e. 1983Tanzania Agricultural and Livestock Policy) recognized cocoa as an important crop for income generation among small scale holders. The 1983 Agricultural policy acknowledged that cocoa is a good small-scale foreign exchange earner (nearly \$4 million in 1992) surpassing many other non-traditional exports. The policy stated that due to the importance of cocoa in the country, the government would use its extension service to promote the crop and would encourage cooperatives and the private sector to continue with the marketing of the crop (URT 1983). Therefore lack of literature in the study of cocoa cultivation and seasonality coping strategies in Tanzania has left such unanswered questions as: - To what extent are earnings from cocoa contribute to peoples' livelihoods in the study area? How such earnings vary with seasons? What options are there for farmers at times when cocoa produce does not satisfy needs? The study was therefore undertake to answer these questions.

## Methodology

### The Study Area

Kyela (Figure 2) and Rungwe (Figure 3) districts were selected basing on the fact that they are the major cocoa growing districts in the country (URT 1982). Kyela district lies between  $9^{\circ} 25'$  and  $9^{\circ} 40'$  latitudes south of Equator and  $35^{\circ} 41'$  and  $30^{\circ}$  longitudes east of Greenwich meridian. The district borders Makete and Ludewa districts to the east, Ileje district to the west, and Rungwe district to the north. The district also borders Lake Nyasa and the Republic of Malawi to the south. The district has an area of  $1322 \text{ km}^2$  (132,200 ha). The district receives rains of about 2000 - 3000mm per annum. The main rainy season is between November and June, with the heaviest rainfalls usually occurring in April and May (Bushesha 2011). The district has a warm and humid climate, with mean daily temperature of  $23^{\circ}\text{C}$ . The natural vegetation is of tropical savannah forest and grass, with lagoon vegetation on swamps and rivers mouths. Agriculture is the main economic activity in the strict. Production of food and cash crops account for 79.3% of employment and 88% of the district's Gross Domestic Product.

Rungwe District is located between  $8^{\circ}30'$  and  $9^{\circ}30'$  latitudes South and  $33^{\circ}$  and  $34^{\circ}$  longitudes East. The District borders Kyela district to the South, Ileje district to the West, Makete district to the East and Mbeya district to the North. The district is mountainous and it experiences average rainfall ranging from 900mm and 2,700mm. Temperatures are moderate ranging from  $18^{\circ}\text{C}$  -  $25^{\circ}\text{C}$  all year round. Agriculture is the mainstay of Rungwe District economy (Rungwe DADP Draft 2012-13).

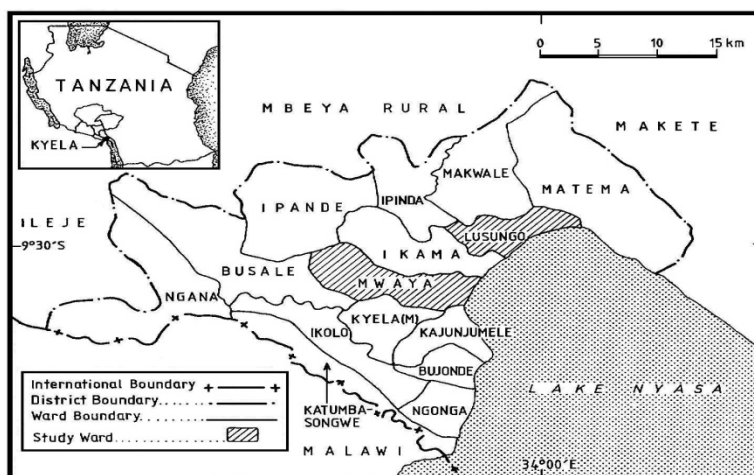


Figure 2: Kyela district

Source: Department of Geography University of Dar-es-salaam (2013)

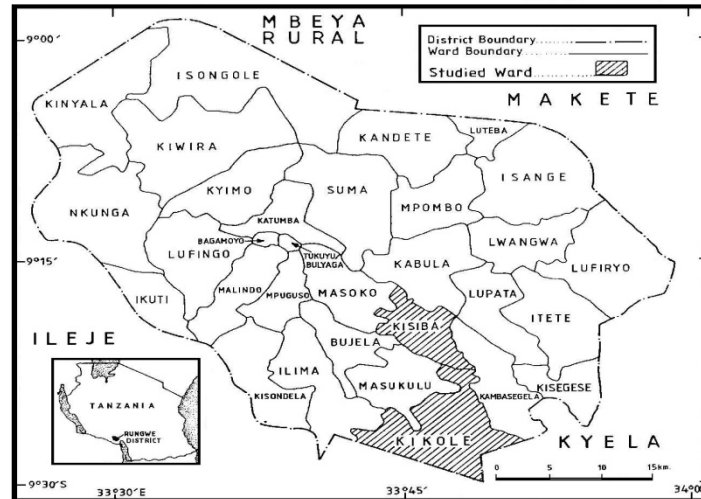


Figure 3: Rungwe District

Source: Department of Geography university of Dar-es-salaam (2013)

### The Research Design

This study applied a descriptive research design. Hence the adoption of such data collection techniques as focus groups and interviews; these approaches allows for probing through asking follow-up questions so as to get the in-depth information for depth description of events (Silverman 2005). A questionnaire was administered to generate descriptive statistical data. The use of more than one set of data sources allowed data triangulation.

### Sample Size and Sampling Procedures

In Kyela district the study was conducted in two wards namely Mwaya and Lusungo. The total number of households in two wards were 3938 and a sample of 114 households was randomly selected. In Rungwe District the study was conducted Kisiba and Kikole wards. The two wards had a total of 2337 households and a sample of 110 households was randomly selected for the study. Key informers for in-depth interviews were selected purposively where by former and current cocoa growers were interviewed.

### Data Collection and analysis

The study employed multiple survey data collection techniques including documentary review which included instrumental records of rainfall and temperature, interviews with key informants, questionnaire administration, and Focus Groups Discussions (FGDs). Qualitative data was thematically analyzed. According to Robson (2002) thematic data analysis is one of the most common approaches to data analysis in qualitative research. As recommended by Ryan and Bernard (2003), repetitions, indigenous typologies, metaphors, similarities and differences, and linguistic connectors, were key issues which were observed when searching for themes. The researcher then described these themes and subthemes, critically interpreted them and finally made recommendations. Simple descriptive statistical analysis was used to analyse quantitative data.

### Findings and Discussion

### Respondents Characteristics

Out of 224 respondents 193 were male and only 31 were females (Figure 4). Further majority of the respondents were aged 36-45 years old, followed by respondents aged 46-55, above 55, 26-35 and 16-25years respectively (Table 1).

Figure 4: Pie chart showing percentage between males and females.

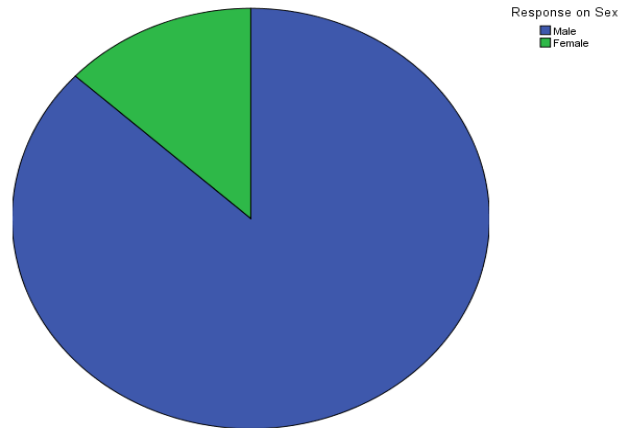


Table1: Age Characteristics of respondents

Age group	No of respondents
16 - 25	13
26 - 35	45
36 - 45	74
46 - 55	48
Above 55	44
Total	224

Source: Field data 2013

### Main buffer sources of income at times when cocoa produce go down

#### Buffer income from crops other than cocoa

In Kyela district cocoa harvests and sells are poor during dry season (figure 5); during this season buffer crops include paddy, cassava, banana, beans, ground nuts, sweet potatoes, and water melon (Table 2). In Rungwe district during wet season where cocoa is not available in abundant (figure 5) buffer crops include beans, banana, corn and cassava (Table 2).

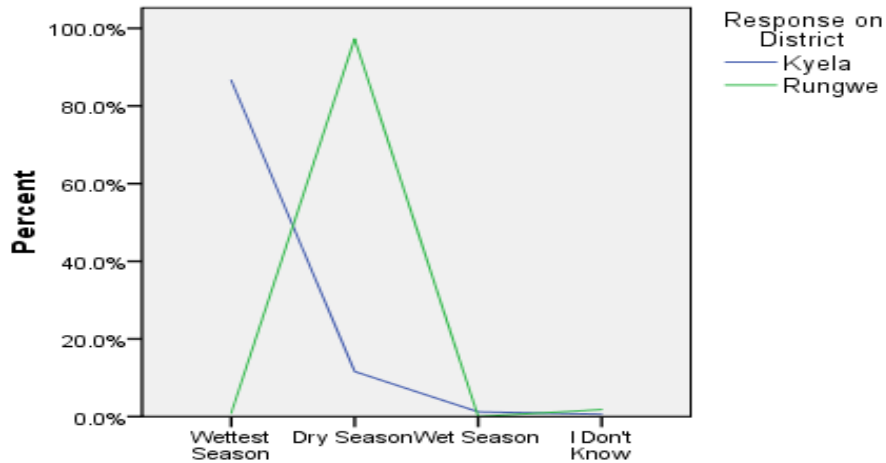


Figure 5: High and low seasons for harvesting and selling cocoa

Table 2: Buffer crops at times when cocoa is not available in abundance (respondents could tick more than one option)

Buffer crops	Kyela n=164		Rungwe n=110	
	Frequency	%	Frequency	%
Banana	81	49.4	68	61.8
beans	32	19.5	26	23.6
cassava	58	35.4	16	14.5
groundnuts	27	16.5	0	00
Sweet potatoes	44	26.8	0	00
Watermelon	8	4.9	0	00

Source: Field data 2013

Crops as groundnuts, watermelon and sweet potatoes are not grown in large quantities as cocoa and paddy in the study areas Table 3 However farmers were of the opinion that these crops make good buffer at times where cocoa harvests go down. A farmer from Kyela made a comment as follows:

“I have few acres ...about three...I grow a mix of crops .... Groundnuts and sweet potatoes...they supplement the income from cocoa especially in August say up to October, without these I would be in trouble”

Table 3: Crops grown in the study area

Crops Grown in the study are	Kyela n=114		Rungwe n=110	
	Frequency	%	Frequency	%
Cocoa	92	80.7	99	90
Paddy	106	92.9	61	55.5
Banana	80	70.1	88	80



Cassava	47	41.2	62	56.4
Round potatoes	00	00	47	42.7
Coffee	00	00	09	8.2
Corn	63	55.3	38	34.5
Beans	86	75.4	42	38.2
Groundnuts	61	53.5	18	16.4
Njugu mawe	28	24.6	11	10
Sweet potatoes	57	50	04	3.6
Palm oil	79	69.3	02	1.8
Watermelon	69	60.5	00	00

Source: Field data 2013

Watermelon is a newly introduced cash crop in Rungwe district; only few farmers grow the crop (Table 3). But according to FGD members in Rungwe, the number of farmers who grow watermelons is increasing day after day.

### Buffer income from Livestock Keeping

Cocoa farmers keep livestock to generate income. Animals kept include pigs, goats and dairy cattle. Farmers also keep birds such as chickens and ducks. Table 4 presents types of livestock kept to subsidize income from cocoa and other crops.

Table 4: Livestock kept for subsidizing income from crops

Livestock kept	Kyela		Rungwe	
	Frequency	%	Frequency	%
Cattle	36	31.6	22	19.3
Goats	12	10.5	08	7
Pigs	17	14.9	15	13
Chicken	49	43	32	28
Ducks	09	7.9	03	2.6

Source: Field data 2013

### Buffer income from fishing

Fishing is another source of buffer income in the study area. In Kyela district fishing is mainly practiced in Lake Nyasa while in Rungwe district farmers have their own fish ponds, very few individuals have fish ponds in Kyela (Table 5).

Table 5: Households with fish ponds

	Kyela		Rungwe	
	No of respondents	%	No of respondents	%
Do you have a fish pond?				
Yes	03	2.6	22	20
No	111	97.4	88	80
Total	114	100	110	100

Source: field data 2013

### **Selling forestry products**

Selling of forestry products makes another source of buffer income for cocoa farmers in the study area; this includes selling charcoal, furniture fire wood, honey and timber (Table 6).

Table 6: Forest products sold for income generation

Products	Kyela		Rungwe	
	Frequency	%	Frequency	%
Charcoal	11	9.7	07	6.4
Furniture	07	6.1	03	2.7
Firewood	11	9.7	08	7.3
Timber	09	7.9	07	6.4
Honey	04	3.5	09	8.2

Source: Field data 2013

Because of cutting trees without replanting, the supply of wood is decreasing, and people have to walk further and further to obtain firewood as one of the farmers from Rungwe commented:

“Nowadays we really walk and walk far far far to get wood. Timber product is not good nowadays because of transport costs wood is found far to the interior of the forest”.

### **Petty Trade**

Selling of brown sugar by street vendors is the major trade between Kyela and Malawians. In Rungwe trading is not as popular as in Kyela. Farmers also engage in other small business activities as food vending such as frying banana, fish, chicken and cassava, retail shops, bars and restaurants. Table 7 presents types of petty business that some farmers engage in as part of subsidizing income from farming activities.

Table 7: Petty business in the study area

Business	Kyela		Rungwe	
	Frequency	%	Frequency	%
Sugar vending	16	14	5	4.6
Food vending	12	10.5	7	6.4
Retail shop	4	3.5	3	2.7
Restaurant	2	1.8	3	2.7
Bar	2	1.8	1	0.9

Source: Field data 2013

Although trade is significantly done in the study areas, there is the need to follow up which products do better in the market and how. That will help to promote such products in order to improve farmers' income status in the study areas.

### **Non Seasons bottlenecks facing cocoa growers in the study area**

#### **Market, lower prices, delayed payments, land shortage, transportation, pests and diseases and Monkeys**

Market is a challenge for cocoa farmers. Farmers were asked to identify their most liable buyers of cocoa; most of them indicated that small vendors famously known as njemke are the most liable buyers of cocoa in both Kyela and Rungwe districts (Table 8).

Table 8: Most reliable cocoa buyers

Buyers	Kyela		Rungwe	
	No of respondents	%	No of Respondents	%
Small vendors	104	91.2	93	84.5
Cooperative unions	3	2.6	5	4.5
Industrial producers	5	4.4	6	5.5
Fellow farmers	2	1.8	6	5.5
Total	114	100	110	100

Source: Field data (2013)

Most farmers identified that the problem with small vendors is that they use exploitative containers to measure cocoa beans. They use plastic containers that have been warmed hence enlarged in size such that they take more than meant amount of cocoa beans (Table 9).

Table 9: Small vendors' means of measuring cocoa

Measurement	Kyela		Rungwe	
	Frequency	%	Frequency	%
Exploitative containers	98	86	88	80
Weighing Machine	16	14	12	11
Sacks	34	30	26	24

Source: Field data 2013

A respondent from Kyela made a comment that indicates the extent to which farmers perceive that middle men exploit them; the comment is in line with findings on table 7.

“....the Njemke are not that much good buyers because they play with our minds...they measure using buckets meant for 10kgs or small tins meant for 3kgs famously known as “*vilita*”. But they deform these containers so that they can take more cocoa but we can do nothing, they are our common buyers of cocoa her...”

Cocoa price is another problem for cocoa growers in the study area. Table 10 shows that over 85% of respondents in Kyela and over 83% of respondents in Rungwe indicated that prices are at a lower side. Likewise over 78.1% and over 76% of respondents in Kyela and Rungwe respectively indicated that there is a delay in payments. The data further shows that buyers pay less than agreed.

Table 10: Bottlenecks in cocoa production

Bottlenecks	Kyela		Rungwe	
	Frequency	%	Frequency	%
Lower price	97	85.1	92	83.6
Delayed payments	89	78.1	84	76.4
Less pays than agreed	58	50.8	57	51.8
Land shortage	65	57	79	71.8
Pests and diseases	45	39.5	46	41.8
Transportation	84	73.6	89	80.9
monkeys	48	42.1	08	7.3

From table 10 it can be noted that farmers were of the opinion that land for cocoa cultivation is limited. Table 11 also shows that sizes of cocoa farms per household range from 0.5ha to 6 ha only. During Focus group discussion in Kyela it was learnt that there is suitable land for cocoa growing but far away from homesteads, farmers avoid such land for security reasons. Table 11 shows that in both Kyela and Rubgwe people aged between 36-45 years own large cocoa farms than the rest of the age groups whereas age group 16 to 25 do own the least.

Table 11: Age groups against cocoa farm sizes in the study area

Age Group	Farm Sizes (acres)			
	0 – 5		6 – 10	
	Kyela	Rungwe	Kyela	Rungwe
16 – 25	12	07	0	6
26 – 35	3	11	2	4
36 – 45	57	38	4	11
46 – 55	21	16	2	7
Above 55	12	4	1	6

Source: Field data (2012)

Table 10 indicates that 73.6% and 80.9% of respondents in Kyela and Rungwe respectively were of the opinion that transportation is a problem to cocoa farmers. Through observation it was noted that, in Kyela, villages with poor road network includes Lusungo, Kikuba, Kikole, Mperangwasi, and Mpakani. In such villages buyers also have not established sales centers hence cocoa farmers have to transport their produce to nearby villages where they can find sales centers. In such villages famers use motorcycles and bicycles as cheap means of transport to access market places. Otherwise farmers walk up to more than 10km to access markets.

## 5.0 Conclusion and recommendations

The study set out to identify main buffer sources of income at times when cocoa produce go down; and to identify challenges facing cocoa growers in the study area. The study has shown that the main buffer sources of income at times where income from cocoa goes down include income from selling crops other than cocoa including paddy, sweet potatoes, ground nuts, beans and watermelon. The study has also identified such off- farm activities as petty business, livestock keeping, fishing and selling of forestry products to be important sources of income buffering farmers when income from cocoa is not sufficient.

This study concludes that there is a number of coping strategies that farmers can adopt and get away with the impact of cocoa yield variations with seasons. Farmers need to be encouraged to grow such crops as cassava, irrigated paddy, water melon, oil palm, and banana as these can make good buffer income at times when yields from cocoa declines. But also off farm activities such as petty business has been found to play an important role in terms of income generations in the study areas. Therefore farmers need to be educated on business

management to increase income through petty business. Livestock keeping, professional careers and talents activities persuaded as well as fishing, all acts as income buffering activities to cocoa producers in Kyela and Rungwe district; all these need to be promoted. Adding value to farm produce may also promote income in the study area. Hence farmers should be encouraged to sell dried cocoa for example as well as to process most farm produce instead of selling them raw.

The study also concludes that there are a number of challenges facing cocoa growers that different stakeholders need to address. One of the challenges is land shortage. Farmers need support especially in terms of increasing productivity per area since land is not enough. Further, farmers need to be assisted to search for reliable markets for these buffer crops. The government should also find ways to regulate cocoa price.

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