

# A Pilot Survey on Carbon Finance as Financial Adoption and Challenges for Agriculture Development

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**Abstract** – India was the third largest CO<sub>2</sub> emitter in the world in 2009, following China and the United States and slightly ahead of Russia. Instead of treating agriculture as a normal sector, the government should emphasize on its uniqueness via research and technology transfer. These two options have been notified by the Ministry of Agriculture and Forestry as a fundamental pillar. Research is essential to better understand, for instance, the rumen and the lower digestive track of ruminants which are the cause of methane emission, but as well, developing instruments to increase farm productivity. It can also resolve the problem of measurement of carbon emissions at farm levels, generating a possibility of integrating agriculture. It requires a lot of communication and a huge degree of cooperation between scientists and farmers.<sup>1</sup> Which helpful not only development of the agriculture sector but also helpful to develop standard of living of agricultural labor.

**Keywords** – Carbon Finance, GHG, CARE, REDD etc.

## I. INTRODUCTION

Modern agriculture, food production and distribution are major contributors of greenhouse gases: Agriculture is directly responsible for 14 per cent of total greenhouse gas emissions, and broader rural land use decisions have an even larger impact. Deforestation currently accounts for an additional 18 per cent of emissions. Carbon finance explores the financial implications of emissions of carbon dioxide and other greenhouse gases carry a worth.

In this context, a historical perspective needs to be considered: Dr. Rattan Lal, Professor of Soil Science at Ohio State University, has calculated that over the last 150 years<sup>2</sup>, 476 billions of tones of carbon has been emitted from farmland soils due to inappropriate farming and grazing practices, compared with ‘only’ 270 Gt emitted from of burning of fossil fuels. A more frequently quoted figure is that 200 to 250 Gt of carbon have been lost from the biosphere as a whole in the last 300 years. Whatever the correct figure, these reductions of ‘living carbon potential’ have resulted from deforestation, biodiversity loss, accelerated soil erosion, loss of soil organic matter, costal water pollution and acidification of the oceans Land use changes can also significantly contribute to climate change. Large scale changes such as deforestation, soil erosion or machine-intensive farming methods may all contribute to increased carbon concentrations in the atmosphere. Soil erosion by water, wind and tillage affects both agriculture and the natural environment. Soil loss, and its associated impacts, is one of the most important

(yet probably the least well-known) of today's environmental problems.

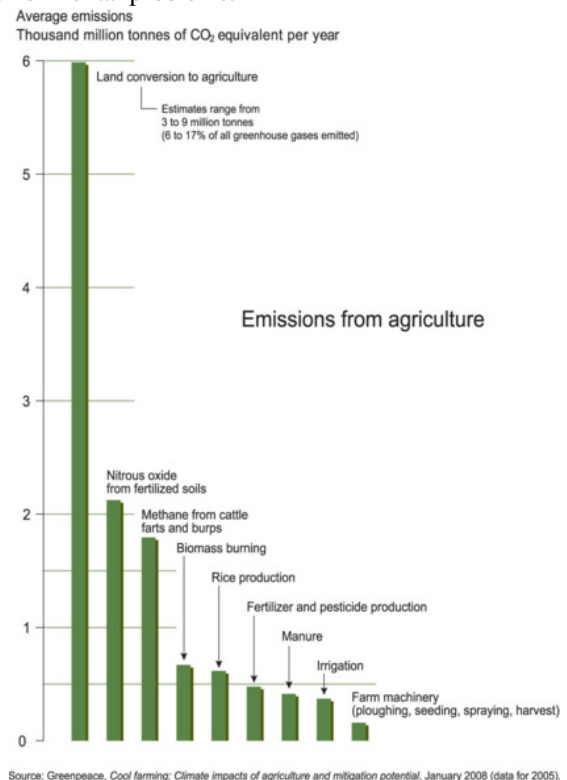


Fig.1. Emissions from agriculture<sup>3</sup>

## II. LITERATURE REVIEW

(Peskett 2007) The emergence of new financing mechanisms associated with the rise of carbon markets brings potential for increased investment in forestry. This paper explores the implications of these mechanisms for community forestry and suggests ways in which such finance may contribute to the pro-poor outcomes of community forestry. The paper also provides an opportunity for those working on the design of carbon financing mechanisms to draw on the experience of community forestry in structuring appropriate benefit systems. The main focus of the discussion is on ‘Reducing Emissions from Deforestation and Forest Degradation’ (REDD).

(Seeberg-Elverfeldt 2009) This study assesses which impact carbon sequestration payments for forest Management systems have on the prevailing land-use systems. Additionally, the level of incentives is

<sup>1</sup> <http://policyprojects.ac.nz/anneliseboluen/how-to-reduce-carbon-emissions-in-agriculture/>

<sup>2</sup> <http://www.worldfuturecouncil.org/2326.html>

<sup>3</sup> [http://www.grida.no/graphicslib/detail/emissions-from-agriculture\\_63ef#](http://www.grida.no/graphicslib/detail/emissions-from-agriculture_63ef#)

determined which motivates farmers to desist from further deforestation and land use intensification activities. Household behaviour and Carbon finance options for smallholders' agroforestry in Indonesia resource allocation is analysed with a comparative static linear programming model. As these models are used as a tool for policy analysis, the output can indicate the adjustments in resource allocation and land use shifts when introducing compensation payments.

(Josh estey) This article shows the carbon finance work for pro poor people. CARE mainly working on three major function i) reduced emissions from deforestation and forest degradation ii) Agriculture forestry and other land use in agricultural landscape iii) Sustainable energy at the household level. CARE's strategy REDD mainly focus on the three perspective development of standards, Demonstration projects, Assessment of social impact

(Havemann 2011) This paper describes obstacles to financing mitigation in smallholder agricultural systems, and provides recommendations to overcome these; it also emphasizes how smallholder agricultural finances overlaps with carbon finance. Analysis and recommendations are based on literature reviews and the author's experience. Descriptions of obstacles to financing both smallholder carbon credit projects and agricultural projects involving smallholders are given. Overlapping barriers are: ability to manage risks, access to inputs, aggregation, best practices and capacity and tenure, property rights and enforcement. The conclusion is that existing agricultural investment barriers are fundamental to the livelihoods of many, and go far beyond carbon finance issues, although significant overlap is acknowledged. By tackling these barriers, it may be possible to unlock some of the potential mitigation from agriculture. Vice versa, 'fit-for-purpose' carbon finance for mitigation could help to overcome some existing barriers faced by smallholders. The paper provides recommendations to a variety of stakeholders on how they could help design fit-for-purpose carbon finance.

**2.1 Purpose of the study:**

As a new branch of Environmental finance Carbon finance is applied to investments in GHG emission reduction projects and the creation of financial instruments that are tradable on the carbon market. The purpose of this research is to identify the key sources of carbon emission in the agriculture in India. Questionnaires are used to conduct data collection and then analyzed using statistical techniques. The findings show that the major activity of agriculture produces Green house gas emissions which helpful to earn the carbon finance through reduction of that all activity by the use of natural sources of energy in agriculture, new technology and standard procedure of Farming.

**2.2 Objective of the study**

The objectives of our study can be classified into:

**1. Primary Objective:**

- To study the Carbon Finance As Financial Adoption And Challenges For Agriculture Development

**2. Secondary Objective:**

- To study all the Green House Gas emission activity of agriculture through their different activity like i) Energy

- Management ii) Soil Management iii) Fertilizer Management iv) Live stock management.

- To know the prospects of clean development mechanism in agriculture.
- To know the awareness and adoption level of Carbon Finance in Agriculture.
- To study the challenges of Carbon Finance in Agriculture.

**2.3 Research Methodology:**

- Data sources: Primary data and secondary data primary data In this survey the primary data was obtained by administering structured questionnaires and the secondary data was collected through various literature reviews and articles.
- Research design: - Descriptive research design.
- Sampling unit: Agriculture Laborer.
- Sample size: 60 samples are to be served.
- Sampling methods: Multistage Stratified Random Sampling Method
- Sampling Area: North Gujarat, Central Gujarat, South Gujarat, Saurashtra and Kutch.
- Respondent: The target respondent includes Agriculture Male Labor in Rural areas.
- Research approach: Survey method is used.
- Research instrument: Close Ended-Questionnaire is used as research instrument.
- Research territory: Gujarat

**III. DATA ANALYSIS**

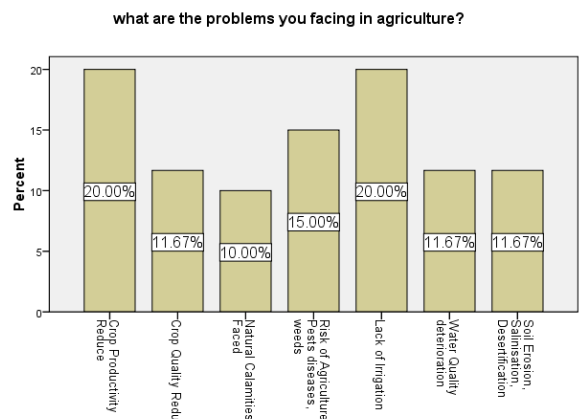


Chart 1: Problem in Agriculture

Do you Know the climate change is the major factor related above all problem?

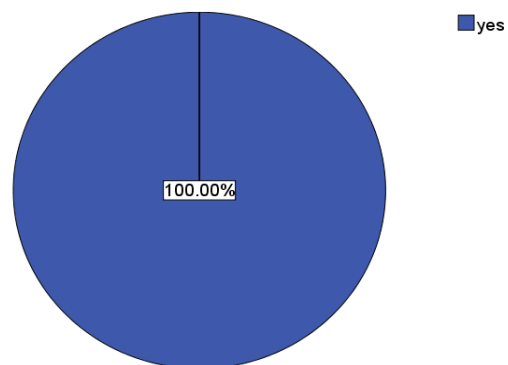


Chart 2: Climate change Problems in Agriculture

Do you Know What are the Agriculture issue play major role for the climate change?

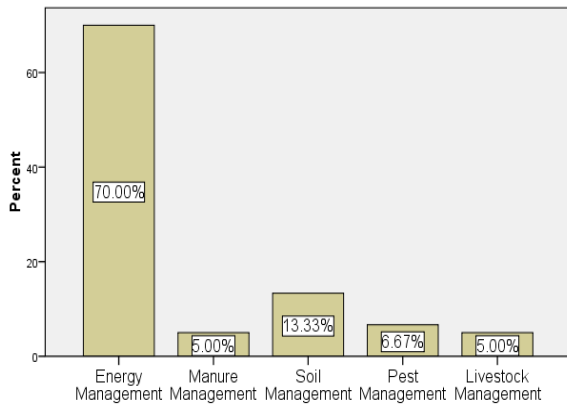


Chart 3: Climate change Issue in Agriculture

The above all graphs shows the major problem faced in agriculture as per respondent crop productivity reduce and also the agriculture pest disease increase due to change climate which is major source on use of new technology and it require a fuel so much which generate green house gas. So in this research find out all the green house gas emission activity of agriculture by energy, Farming method, Using of Soil and Fertilizer and live stock to produce crop.

Most of the farmers use tractor to do the most of activity producing crop in farm. As fuel in tractor consumption is diesel. So mainly to producing Green House gas due to diesel and the land ploughing require more diesel due to hard soil. So the all above show the direct green house gas emission due to the consumption of oil.

How frequently do you assess your soil nutrient levels?

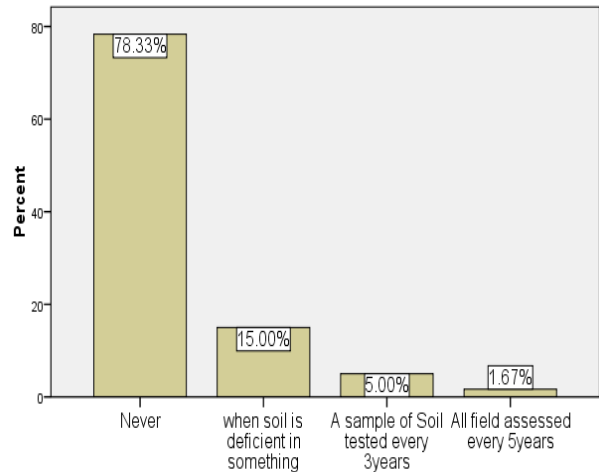


Chart 6: Soil Nutrient Levels

Which fuel you use on farm?

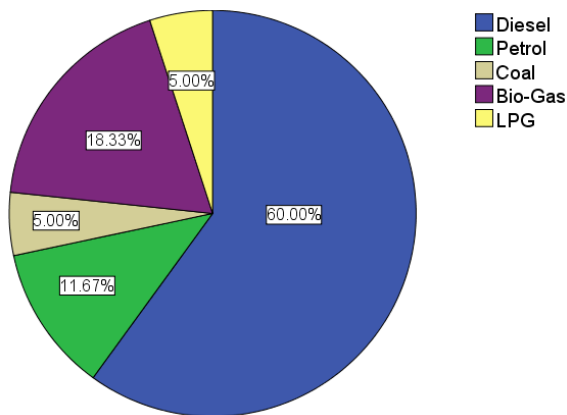


Chart 4: Fuel used on Farm

How do you maintain/build soil fertility?

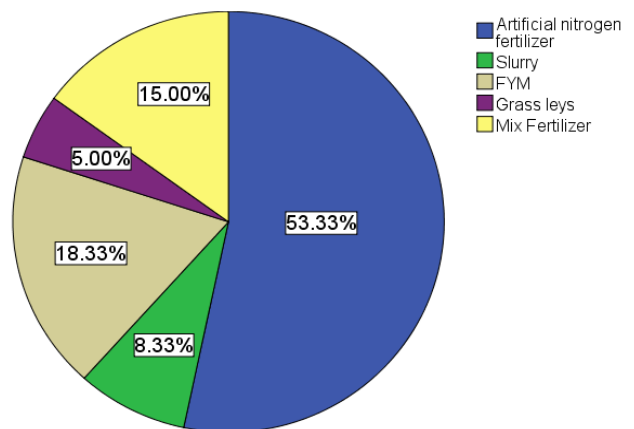


Chart 7: Soil Fertility

In which task energy used in Contracting?

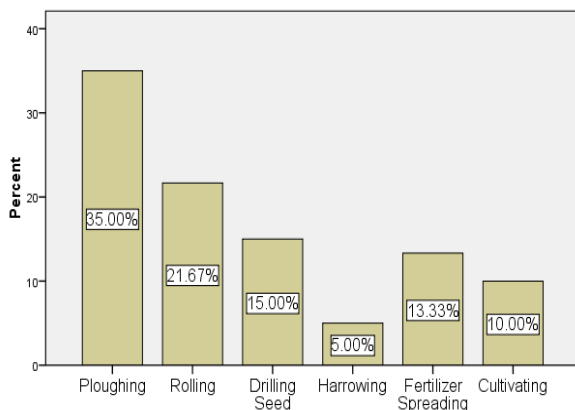


Chart 5: Energy used in Agriculture Activity

In the soil testing the respondents are not taking seriously. No one actually check out the Nitrogen and pH (Power of Hydrogen) quantity in soil. Even day to day the use of In organic fertilizer increase in the farm compare to organic fertilizer so it destroy long period the soil fertility it also the major source of emission in agriculture.

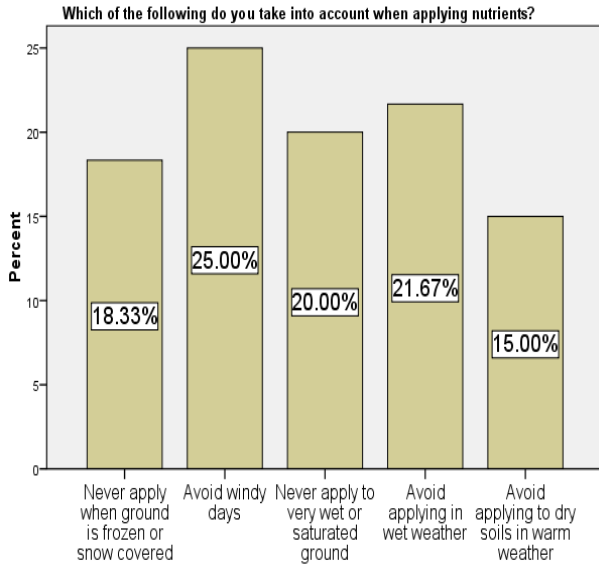


Chart 8: Accountability when applying nutrient

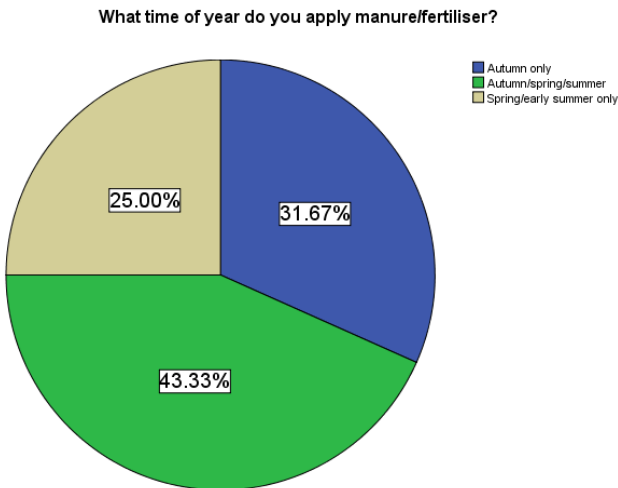


Chart 9: Time of apply Manure/ Fertilizer

Above Manure management graphs show the day to day increasing the artificial fertilizer in the farm which is increasing green house gas emission compare to organic fertilizer even the managing of manure is also increase the green house gas emissions.

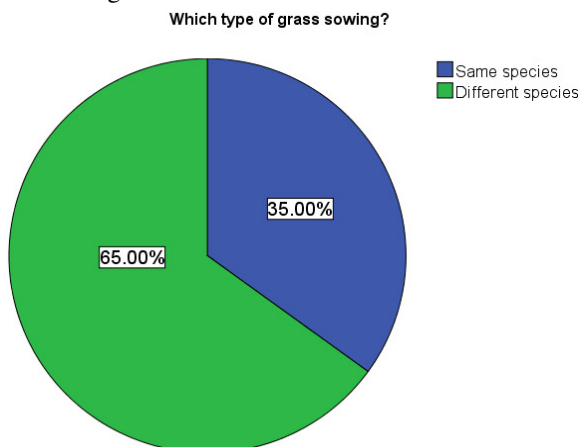


Chart 10: Type of Grass

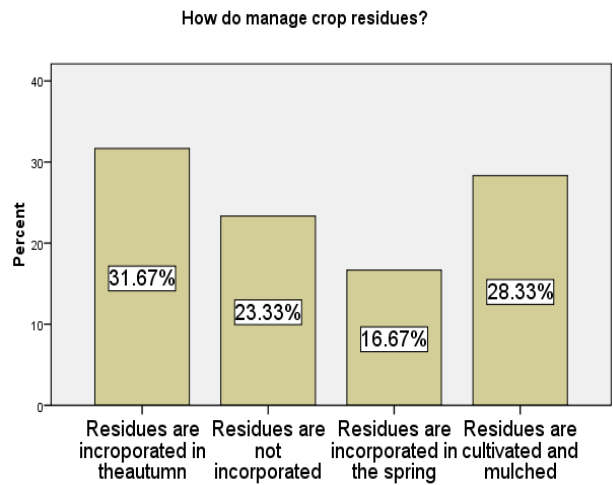


Chart 11: Time of Manage crop residues

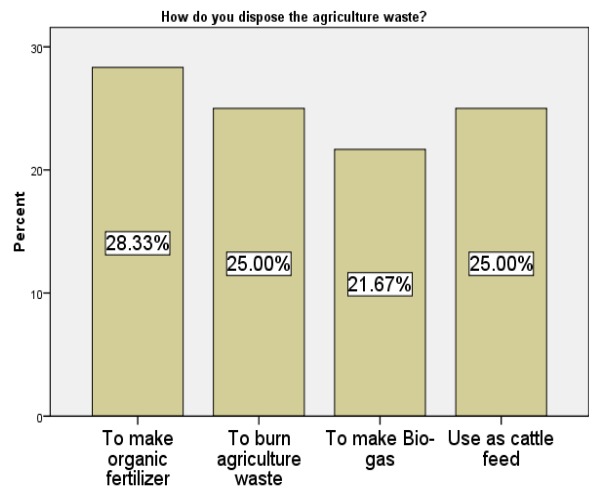


Chart 12: Manage Agriculture Waste

Above Agriculture waste management show if the agriculture waste burn directly it increase green house gas emission directly compare to other option like to make organic fertilizer, To make bio gas and use as cattle feed. So direct Burning agriculture waste is really harmful to the environment

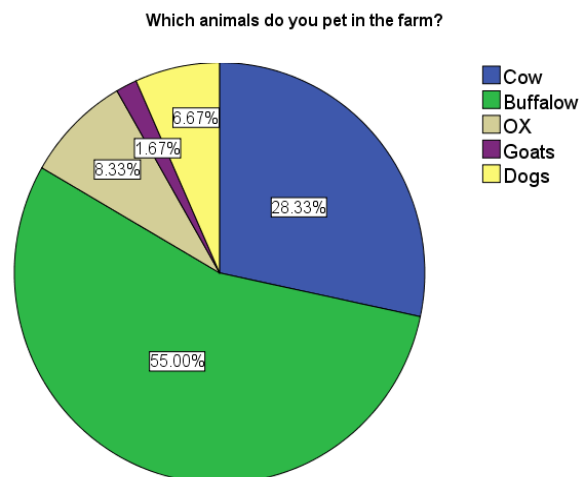


Chart: 13 Live Stock in Farm

Above Live stock graph show increase green house gas emission directly through the live stock so depend on the category of live stock green house gas emission increase. So it is really require maintaining and checking up their health regularly.

Do you maintain health of animal in the farm?

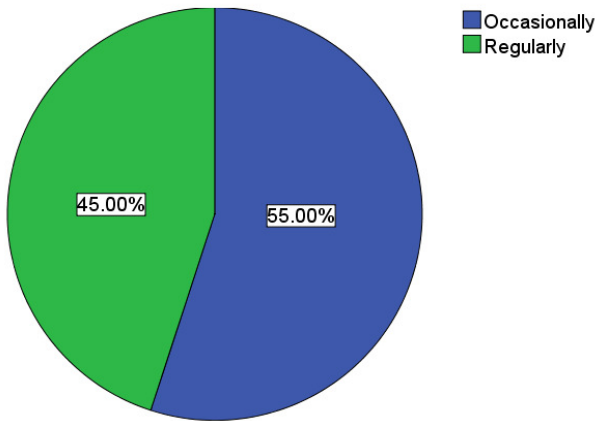


Chart 14: Live Stock Health in Farm

Do you Know about the CDM?

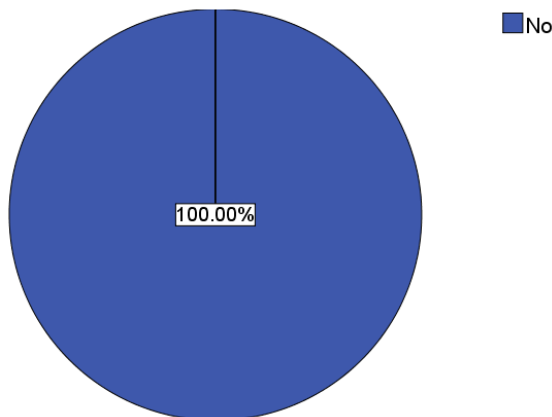


Chart 15: Awareness of Clean Development Mechanism

Do you want to take benefit of Carbon finance to change your perspective of agriculture?

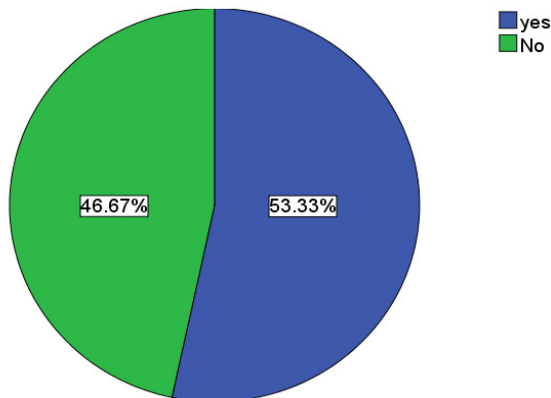


Chart 16: Adoption of Carbon Finance

Respondent do not aware about the clean development mechanism by the Kytoprotocol to save the environment. As per secondary sources the lack of literacy and lack of

advertise about the CDM is major factor. To give the knowledge of respondent some of the farmer is not ready because of the legal system and resistance to change.

### 3.1 Percentage of Prospect of Carbon Finance in Agriculture based on Education

Standard	0-5	5-7	7-10	10-12	12 above	Row Totals
yes	5	7	6	6	8	32
No	6	5	6	5	6	28
Column Totals	11	12	12	11	14	60 (Grand Total)

H0: There is no significance difference between the prospects of carbon finance and education of respondents  
H1: There is significance difference between the prospects of carbon finance and education of respondents

#### Expected: contingency table

	A	B	C	D	E
1	5.87	6.40	6.40	5.87	7.47
2	5.13	5.60	5.60	5.13	6.53

Chi-square = 0.537  
Degrees of freedom = 4  
Probability = 0.970

#### Interpretation

It is conclude that there is no significance difference between the prospects of carbon finance and the education of respondents under study Because If the calculated value of chi-square is greater than the table value then null hypothesis is rejected. Here the calculated value of chi-square 0.537 is less than the tabulated value both at 5% (14.87) and 1% (18.47) level of significance. Hence null hypothesis framed for this study is accepted. Based on above analyses the study it shows that there is no significance difference between the acceptance of carbon finance and education of the respondents.

#### Findings and Suggestions

- 20% respondents are facing the problem crop productivity reduce in the agriculture and same quantity respondents lack of irrigation facility and 15% respondents faces the problem agriculture pests disease, weeds
- All the respondent says that climate change is the major factor related above problem
- The entire agriculture farmer use Diesel as fuel in the tractor which helps to plugging, harrowing, rolling, drilling seed and fertilizer spreading. Some of the respondent use biogas, petrol and coal as other resources of fuel for other activities
- 78% respondents do not assess soil nutrient level and 15% assess soil nutrient while soil is deficient.
- No one respondent assess the nitrozen and pH (power of Hydrogen) of soil in the farm. So as per the soil assessment and nitrozen and pH level data they are not conscious about green house gas emission.

- 53% agriculture farmer use inorganic fertilizer to maintain the nutrient level of soil and only 20% maintain through the farm yard manure and 15% maintain through the mix fertilizer means combination organic and inorganic fertilizer.
- Use of the new technology for farming and changing the old traditional method of farming increase the use of energy for different activity in the agriculture. Mainly the ploughing is consume a lot energy because of the soil is really hard in this region.
- Use of the In organic fertilizer also destroy the soil fertility in long term aspects and it also major source of carbon emission.

#### IV. CONCLUSION

This paper studies the climate change finance (carbon Finance) helpful to develop the developing nation like India due to lack of resources. India as growing economy of the nation most of the money spends by the government on infrastructure and service sector last one decade while majority portion depend on the agriculture but last few years agriculture output reduced. So the carbon Finance become the alternative sources of finance due to high green house gas emissions by the agriculture activities of the Gujarat.

#### REFERENCES

- [1] Foster K, Neufeldt H. "Climate Finance for Agriculture and Livelihoods ICRAF policy brief." *Research Programme on Climate change and Food Security*. Nairobi, Kenya: World Agroforestry centre, 2013. 1-6.
- [2] Havemann, Tanja. "Financial Mitigation in small holder agricultural system issue and opportunities." *CGAIR Research Programme on Climate Change, Agriculture and Food security (CCAFS)*, 2011: 1-27.
- [3] Josh estey, Ami vitale. "CARE make carbon finance work for poor and marginalised people." *CARE website*. 2013. www.careclimatechange.org (accessed April 20, 2013).
- [4] peskett, Cecilia Luttrell and Leo. "The implications of carbon financing for pro-poor community forestry." *Forestry Briefing series*, 2007: 1-5.
- [5] Seeberg-Elverfeldt, Chrisitna. "Carbon finance option for small holders agroforestry in Indonesia." *International Journal of the commons*, 2009: 113-130.

#### Webography:

- [1] <http://www.slideshare.net/SIANIAgri/kenya-smallholder-agriculture-carbon-finance-project>
- [2] [http://www.ashden.org/files/pdfs/reports/Carbon\\_finance\\_guide.pdf](http://www.ashden.org/files/pdfs/reports/Carbon_finance_guide.pdf)
- [3] <https://wbcarbonfinance.org/Router.cfm?Page=BioCF&FID=9708&ItemID=9708&ft=LULUCF>
- [4] <http://www.geres.eu/en/resources/tools-and-calculators/item/308-screening-tool-for-calculating-the-potential-carbon-finance-projects>
- [5] <http://carbonfinanceforcookstoves.org/implementation/feasibility-assessment/>
- [6] <http://carbonfinanceforcookstoves.org/carbon-finance/the-basics/>
- [7] [http://www.aes.bioflux.com.ro/docs/AES\\_4.1.2.pdf](http://www.aes.bioflux.com.ro/docs/AES_4.1.2.pdf)
- [8] <http://connection.ebscohost.com/c/articles/78366441/carbon-stock-assessment-three-selected-agroforestry-systems-bukidnon-philippines>
- [9] [http://www.pcaarrd.dost.gov.ph/home/momentum/afin/index.php?option=com\\_content&view=article&id=431:carbon-stock-assessment-of-multistorey-agroforestry-systems-using-various-field-sampling-techniques&catid=87&Itemid=2](http://www.pcaarrd.dost.gov.ph/home/momentum/afin/index.php?option=com_content&view=article&id=431:carbon-stock-assessment-of-multistorey-agroforestry-systems-using-various-field-sampling-techniques&catid=87&Itemid=2)

#### ANNEXURE

##### *A Study on Carbon Finance as Financial Adoption and Challenges for Agriculture Development*

The researcher is a Ph.D. research scholar of Department of Management, University of HNGU, Patan. During this research the researcher is inspired to study the carbon emission activity of agriculture sector in Gujarat.

**Name of Participant:** \_\_\_\_\_

**Address:** \_\_\_\_\_ **Village:** \_\_\_\_\_

**District:** \_\_\_\_\_

**Age:** Below 20 \_\_\_\_, 20-40 \_\_\_\_, 40-60 \_\_\_\_, 60 to above \_\_\_\_

**Education:** \_\_\_\_\_ **Mobile No** \_\_\_\_\_

**Cultivated Land** \_\_ **Uncultivated Land** \_\_\_\_\_

*Energy:* This section calculates the CO2 emissions from the farm's annual fuel and energy use.

Q-1 what are the problems you facing in agriculture?

- Crop Productivity Reduce  Crop Quality Reduce   
 Natural Calamities Faced  Risk of Agriculture Pests diseases, weeds   
 Lack of Irrigation  Water Quality deterioration   
 Soil Erosion, Salinisation, Desertification   
 Deterioration of Condition of Livestock

Q-2 Do you agree the climate change is the major factor related above all problem?

Yes  No

Q-3 Do you Know what are the Agriculture issue play major role for the climate change?

- Energy Management  Fertilizer Management   
 Farming Management  Soil Management   
 Pest Management  Livestock Management   
 Agriculture waste management

Q-4 which and How much quantity fuel you use on Farm?

Diesel \_\_\_  Petrol \_\_\_  LPG \_\_\_  Coal \_\_\_   
 Heating oil \_\_\_  Natural Gas \_\_\_

Q-5 In which task energy used in contracting?

- Ploughing  Sub soiling  Rolling   
 Harrowing  Drilling seed   
 Cultivating  Fertilizing spreading

*Nutrients and manure* - This section looks at nutrient and manure management and scores practices depending on their impact on nitrous oxide, methane and carbon dioxide emissions

Q-6 How frequently do you assess your soil nutrient levels?

- Never  only when I am concerned that the soil is deficient in something   
 A sample of soil tested every 3 years   
 All field assessed every year for N and every 3-5 years for P&K   
 All field assessed every other year for N and every 5+ years for P&K

Q-7 How do you maintain/build soil fertility? Artificial nitrogen fertilizer   
 Slurry  FYM  Green manures   
 Grass leys  Compost

Q-8 How do you prepare the seedbed for sowing?

- Not applicable  Cultivate deeper than 4 inches   
 Cultivate top 4 inches only  Cultivate top inches only

Q-9 Do you know your 'farmgate' nitrogen balance (kg/ha)?

- No  Less than 0   
 0-50  50-70

- 70-90  90-110   
 110-130+ kg/ha   
 Q-10 How do you ensure correct pH conditions for crop growth and reduced nitrous oxide emissions?  
 I don't monitor ph  I monitor ph if I think there is problem  I monitor soil ph every 3-5 years   
 I monitor soil ph every 3-5 years and manure ph prior to application   
 Q-11 How do you maintain/build soil fertility?  
 Artificial nitrogen fertilizer  Slurry   
 FYM  Green manures  Grass leys   
 Compost   
 Q-12 What time of year do you apply fertilizer?  
 Autumn  Spring  Summer  All three   
 Q-13 Which of the following do you take into account when applying nutrients?  
 Never apply when ground is frozen or snow covered   
 Avoid windy days  Never apply to very wet or saturated ground   
 Avoid applying in wet weather  Avoid applying to dry soils in warm weather   
 Apply on cool, dry days  Incorporate manure within 48 hours or as soon as practical   
 Q-14 What time of year do you apply manure?  
 Not applicable  Autumn only   
 Autumn/spring/summer  Spring/early summer only   
 Q-15 How do you store FYM on the farm?  
 In an 'A' shaped stack  Biogas Plant   
 Q-16 How do you apply slurry to grassland?  
 Not applicable  Broadcast spreader   
 Band spreader  Trailing shoe  Shallow injector   
 Deep injector   
 Q-17 What type of crop do you seed?  
 Grain **Less 1 2 3 4 5 More** Pulse **Less 1 2 3 4 5 More**  
 Fruits **Less 1 2 3 4 5 More** Flowers **Less 1 2 3 4 5 More**  
 Grass **Less 1 2 3 4 5 More**  
 Q-18 How species rich are the grassland leys generally grown on your farm?  
 No grassland  Single species ley  Limited mix species   
 Diverse species   
 Q-19 How does manage crop residues?  
 Residues are incorporated in the autumn  Residues are not incorporated   
 Residues are incorporated in the spring  Residues are cultivated and mulched   
 Q-20 How do you disposal of agriculture waste?  
 To make Organic fertilizer **Less 1 2 3 4 5 More** To burn **Less 1 2 3 4 5 More**  
 To make bio-gas **Less 1 2 3 4 5 More** Use as Cattle feed **Less 1 2 3 4 5 More**  
 Q-21 Which alternative you can use to save the crop?  
 In organic Pesticides **Less 1 2 3 4 5 More** Farm yard manure **Less 1 2 3 4 5 More**  
 Mix Pesticides **Less 1 2 3 4 5 More**  
**Live Stock** This section helpful to reduce the emission output from the livestock  
 Q-22 which and how many animals you pet in your farm?  
 Cow \_\_\_\_\_ Buffalo \_\_\_\_\_ Ox \_\_\_\_\_ Sheep \_\_\_\_\_ goats \_\_\_\_\_  
 Dogs \_\_\_\_\_  
 Q-23 Do you maintain health and welfare of live stock (eg. Buffalo, cow etc.)?  
 Sometimes  Rarely  Occasionally  Regularly

- Q-24 Do you know about clean development mechanism?  
 Yes  No   
 Q-25 Do you want to use carbon finance as financial adoption for agriculture development and to protect environment?  
 Yes  No

### AUTHOR'S PROFILE



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is associate professor in the S.K. School of Business Management and he is Convener, Quality Council of India - Gujarat Chapter, India. He entitled Regional Director, Academy of Hospital Administration - Gujarat Chapter, India Empanelled Resource Person, SEBI, India Member, Advisory Board, MHM, HNGU Chairman, Board of Studies, MHM, HNGU Member, Board of Studies, BBA, HNGU Member, Board of Studies, MBA, HNGU. He possesses MBA and PHD degree in Management. He has published the research paper in many national and international journal.



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