



## Research Paper

### Clean Development Mechanism in Indian Agriculture Sector: Benefits, Current Status, and Challenges

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**Abstract:** Considering Indian scenario, agriculture is one of the biggest contributors to nation's gross domestic product and can easily take advantage of the Clean Development Mechanism (CDM) under the Kyoto Protocol to earn carbon credits and generate an additional revenue source. But however, the progress in agricultural projects under CDM are quite less as of now. This paper focus on the role of CDM in developing the eco-friendly projects in agriculture sector and also clearly explains the benefits of the registering such projects under CDM by considering the few case studies. Also the current status of such projects in India is studied. Barriers that led to decline of project development in agriculture are also discussed. In the end few suggestion were framed to promote the CDM in agriculture sector.

**Abbreviations:** Gross Domestic Product (GDP), Green House Gases (GHGs), Clean development mechanism (CDM), United

Nations Framework Convention on Climate Change (UNFCCC)

**Keywords:** Agriculture, Clean development mechanism, Emission Reduction, Agriculture in India.

#### INTRODUCTION

It is known fact that the agricultural sector is one of the major contributors in the Indian economic growth in terms of GDP. It is one of the sector having highest priority in India (Sasmal, 2016). Hence, such sector is to be well organised and managed with state of art facilities in achieving energy and environmentally efficiency in its activities. At present, the agriculture makes up around 10-12% of total global anthropogenic emissions of GHGs (Suzuki, 2014). This needs to be reduced by adopting to GHGs emission mitigation methods. However, the mitigation methods are financially not viable and hence an alternative support is needed to progress. CDM under the Kyoto Protocol

seems to be an option for promoting energy and environmentally efficient methods in agriculture sector. CDM offers financial incentives for managing the agricultural practices in sustainable manner (Nallapaneni, 2015). But still the practice of CDM in agriculture sector is very slow. The objective of this paper is to examine the number of projects under CDM in India, and also to study various possible benefits, current status, and challenges.

**Clean Development Mechanism:** In 1995, the conference of parties i.e., COP-1 to the UNFCCC agreed for the commitment of stabilizing GHG emission concentration in atmosphere, with this effort Kyoto Protocol was engrossed in 1997 and came into existence by having an approval from 175 parties on 16th February 2005 UNFCCC. Kyoto Protocol with a motto caring for climate introduced three flexible mechanisms to help both the developed and developing nations irrespective of regional differences for achieving their emission reduction targets in cost effective manner as per the emission reduction targets set for first commitment period i.e., 2008-2012 as 5.2% reduction in emissions on 1990 levels. The three mechanisms are clean development mechanism, joint implementation and emission trading, as India is a developing country we use CDM for reducing GHG emission and emission trading mechanism for selling or purchasing the certified emission reduction (CERs)

credits in tCO<sub>2</sub>e in order to get back capital cost invested for energy recovery projects. The main motto of CDM is to promote environmental friendly generation technologies i.e., emission reduction projects in developing countries for socio-economic benefits (Shakila, et. al., 2009). We have different methodologies shown in Table 1 (UNFCCC, 2013) the suggested CDM projects should use one of the approved baseline and monitoring methodologies as per the nature of project. These approved baseline and monitoring methodologies used for validation, approval and registration of environmental friendly projects under CDM.

CDM balances various complex situations that arises during the project execution.

1. Accounts and helps in achieving the finance additional emission reductions.
2. Cost effectiveness of the project activity.
3. Distributed operational decisions.
4. Consistency in Input/feedback loops.
5. Minimization of process time.
6. Possibility of integrating technology with environmental for achieving environmental integrity.
7. Provide assistance to achieving sustainable development and its goals especially in Non-Annex-I countries.
8. Suggestions and support in simplification process. Transparency.

**Table I. CDM methodologies for agriculture sector**

| Type                             | Sub type         | CDM methodologies  |   |
|----------------------------------|------------------|--|---|
| GHG avoidance or GHG destruction | Livestock        | AMS-III.BK (reduced CH <sub>4</sub> by strategic feed supplementation for large ruminants)     |   |
|                                  | Rice cultivation | AMS-III.AU (reduced CH <sub>4</sub> by adjusted water management practice in rice cultivation) |   |
|                                  | Waste Management |  | AMS-III.F and ACM0022 (Avoidance of CH <sub>4</sub> through composting)                   |
|                                  |                  |  | ACM0010, AM0073, AMS-III.D, AMS-III.R (destruction of CH <sub>4</sub> from animal manure) |

|                   |            |  |
|-------------------|------------|--|
|                   | Mulching   | AMS-III.BE (reduced N <sub>2</sub> O and CH <sub>4</sub> by mulching)                  |
|                   | Fertilizer | AMS-III.A (reduced CO <sub>2</sub> case)<br>AMS-III.BF (reduced N <sub>2</sub> O case) |
| Energy efficiency |            | AMS-II.F (energy efficiency and fuel switching)<br>AMS-II.P (energy efficient pumpin)  |

**Table II. Approved CDM projects under CDM as of November 2015[12]**

| Project ID   | PP Name   | Project Title   | Sector                      | State       |
|--------------|---|---|-----------------------------|-------------|
| 1541/09/2012 | Core CarbonX Solutions Private Limited          | <a href="#">Methane avoidance in rice cultivation</a>   | <a href="#">Agriculture</a> | Multi State |
| 1771-09      | M/s CNG Agrocare Private Limited.               | <a href="#">"GHG emission reductions through methane avoidance in North Bengal" in the Madhupur village of Uttar Dinaipur District in North Bengal by M/s CNG Agrocare Private Limited.</a>   | <a href="#">Agriculture</a> | West Bengal |
| 1774-09      | M/s (i) Narayana Farm Produce Private Ltd and ( | <a href="#">"Methane recovery from Manure Management System (MMS) at dairy farm of Naravana Farm Produce Pvt. Ltd., Nagpur, India" at 57/1 Sukali, Gharapura, Tahsil - Hinqna, District – Nagpur in state of Maharashtra by M/s (i) Narayana Farm Produce Private Ltd and (</a> | <a href="#">Agriculture</a> | Maharashtra |

**Scope for Agriculture in CDM:** Scope for the agriculture sector projects have the great potential in attaining CDM project status that could help in achieving the financial and environmental stability. As per the IPCC fourth assessment report, it was suggested that, agricultural activities which are striving or progressing towards greenhouse gas emission mitigation are to be considered for CDM. The various possible project options are improved agronomic practices, nutrient use, crops with more yields with reduced environment impacts, tillage, residue management, and grazing land management. Apart from this, few other options like restoration of organic soils that are drained for crop production and restoration of degraded lands can also have the potentials. Few other option where the mitigation of emissions is possible are improved water and rice management, set-asides, land use change, and agro-forestry (UNFCCC. 2013; Maharjan and Joshi,

2012). The various CDM methodologies applicable for agriculture sector are shown in Table. I.

**Benefits of CDM in Agriculture:** With the practice or adoption of GHG emission reduction CDM methodologies in agriculture sector would lead to the benefits which includes the increase in crop productivity, improvisation in food security, technology transfer options (interdisciplinary technology integration with agro sector), reductions in pollutions, and financial incentives in terms of carbon credits (CERs) (Suzuki, 2014).

**Current Status of CDM in Agriculture:** As of November 2015, only three projects were approved in the category of agriculture sector under CDM. These projects list is shown in Table. II. Among these three projects one project is multi state project and other two projects are individual states West Bengal and Maharashtra. In the recent data,

National CDM authority shows no projects under the agriculture sector category.

**Challenges in CDM in Agriculture:** In general, there are few challenges for CDM as well as specific to agriculture sector.

Few general challenges in CDM includes:

1. Avoiding incentives of buyer and seller to overstate emission reduction possibility.
2. Centralized vs. distributed structure.
3. Cost effectiveness
4. Choosing the right approach in CDM credit evaluation (top down or bottom up)
5. Ensuring public scrutiny, and transparency.
6. Ensuring the integrity in the environmental aspects.
7. Keeping process times reasonable

The challenges in CDM specific to agriculture are as follows:

1. Soil carbon losses with the enhanced erosions and decomposition.
2. Uncertainty of net effect.
3. Influence of local weather conditions on N<sub>2</sub>O emissions.
4. Requires rigorous monitoring systems to account all the parameters or activities.
5. Costs involved in the agro projects is quite high and needs the technology integration.
6. Frequencies in emission reduction possibilities.
7. As per the CDM criteria, the emission reduction credits should be real, measurable and validated with appropriate verification methods, but in agriculture not all process can be done undergone the complete process in the first commitment period.

**Suggestions:** Few suggestions were made keeping the view on present and future progress in the CDM projects under agricultural sector. The projects undertaken might be any scale.

1. Bring awareness of various technologies that can be used in agricultural sector.
2. One should understand the quantity of emissions released while doing agriculture in various possible ways.
3. Bring awareness on the carbon credit markets and financial gains.
4. Ask the farmers to have test reports of their land fertility especially in the nitrogen content.
5. Various schemes under CDM, and a brief awareness on the methodologies used for agriculture.
6. Adoption of reuse, reduce, recycle concepts in the agriculture.
7. Volunteering various programs on the best practices of agriculture.

**Conclusion:** This paper gives the brief study on the Clean Development Mechanism methodologies used for energy and environmental efficient practices in agriculture sector. The scope for CDM, benefits, current status, challenges are also discussed. From the extensive discussions, few suggestions were made to improve or to promote the contribution of CDM in agriculture sector.

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