



**PROGRAMME DESIGN DOCUMENT FORM FOR
SMALL-SCALE CDM PROGRAMMES OF ACTIVITIES (F-CDM-SSC-PoA-DD)
Version 02.0**

PROGRAMME OF ACTIVITIES DESIGN DOCUMENT (PoA-DD)

PART I. Programme of activities (PoA)

SECTION A. General description of PoA

A.1. Title of the PoA

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Energy Efficiency through Micro irrigation system - India

Version: 06

Date: 10/08/2013

A.2. Purpose and general description of the PoA

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Mahindra and Mahindra- Farm Equipment Division¹ is the top-selling tractor company in the world. In 2011, it acquired² 'EPC Industrie Limited'³ – one of the pioneering companies in India in the micro-irrigation space. It operates through a wide network of dealers and sells micro irrigation systems, sprinkler irrigation systems and industrial pipes.

Purpose of PoA:-

The proposed PoA aims at encouraging energy efficiency through installation of efficient irrigation system such as drip and sprinkler irrigation replacing the conventional flood method of irrigation resulting in:

1. Uniform Distribution of water over the field according to crop need,
2. Storage of maximum fraction of water in the root zone for plant use,
3. No adverse effect on crop growth.
4. Soil transport or loss is negligible, and
5. Reduction in the consumption of electricity for pumping and delivering the water directly into the root zone of the plant,⁴
6. Savings of water (30-50%), labour (50%), fertilizers (30-40%) and increase in yield (12-76%)⁵

The programme will minimize usage of excess electricity for irrigating the agricultural fields which will lead to reduction of GHG emission into the atmosphere.

The predominant practice followed in Indian agriculture is the conventional flood method of irrigation. A conventional irrigation method includes Surface irrigation methods like broad strip methods, check basin irrigation, furrow irrigation etc. which is known as flood irrigation method⁶. In this method, water from

¹ <http://www.mahindra.com/What-We-Do/Farm-Equipment/Companies/Mahindra-and-Mahindra-Farm-Equipment-Division>

² <http://www.mahindra.com/News/Press-Releases/1297258522>

³ <http://www.epcmahindra.com/Home.aspx>

⁴ Efficiency of irrigation a case of drip irrigation. Department of economic analysis and research. NABARD , Mumbai 2005 Chapter 4 - Water and energy saving

⁵ <http://www.icar.org.in/en/natural-resource-management.htm>

⁶ <http://en.wikipedia.org/wiki/Irrigation#Surface>



an irrigation channel is allowed to reach a part or whole of the field and spread by the gravitational flow incidental to the slope of the land. The important requirements to obtain high efficiency in surface method are (1) properly constructed water distribution systems to provide adequate flow of water to the fields; and (2) proper grading and levelling of land to achieve uniform distribution of water. All these practices require more labour, man power and mechanical power for farms.

Under conventional irrigation method in India, water pumps are used to irrigate the agricultural fields. It is estimated that between 60 to 65⁷ percent of water is lost in these systems due to run-off, evaporation, deep percolation and conveyance.

Hence, the baseline scenario identified is the electricity consumption for pumping irrigation water under conventional flood method of irrigation and the emission is determined based on the electricity (in kWh/ha) consumed by the equipment installed per hectare per tonne of produce.

The surface irrigation methods are being followed in India since ages on small scales as well as on large scale for agriculture production. Surface irrigation methods are economic but are more cumbersome and time consuming as well as it require more time and water to irrigate piece of land. For surface irrigation methods high electricity is required comparatively for pumping water out of wells, rivers, canal, ponds and to make land flooded with water. As compared to this conventional system, micro irrigation methods is more convenient, less time consuming, less laborious and requires low pressure operative electrified pumps to irrigate the land. The micro irrigation method contributes in electricity conservation, water conservation and conservation of natural resources as well in aggregates.

Policy/measure or stated goal of the PoA

The goal of the PoA is to reduce the GHG emissions due to the excess use of electricity in irrigation systems in India by introducing Micro irrigation system (MIS) such as Drip and Sprinkler irrigation system.

The introduction of MIS will be facilitated by the CME. The CME will promote the installation of Micro irrigation system to the farmers in India and adopting efficient means of irrigation. CME has also assured by means of a letter (on 09/03/2013) to the NCDMA that the revenue earned out of CERs would be used for

- 1) Training programs for awareness creation on micro irrigation systems
- 2) Assistance in raising loan/ financial aids for purchase of new irrigation systems
- 3) O&M services to beneficiaries of the CPA
- 4) Installation of monitoring systems required for the CDM monitoring plan
- 5) Expenditure on CDM consulting and validation/ verification services in realising CER revenue
- 6) Any other work realised after consultation with the beneficiaries

Hence, it can be seen that the CME is not getting any revenue for itself but CDM revenue is required to boost the implementation of this PoA.

Pre – project Scenario:

Prior to implementation of programme of activities, the baseline is identified as electricity consumption for pumping irrigation water under conventional flood method of irrigation and the emission is determined based on the electricity (kWh) consumed by the equipment installed per hectare (ha).

⁷ Potential for drip and sprinkler irrigation in India. A. Narayanamoorthy, pg. 3. Paper is available online at link below http://nrlp.iwmi.org/PDOcs/DReports/Phase_01/12.%20Water%20Savings%20Technologies%20-%20Narayanamoorthy.pdf

*Programme Activity:*

The CME will promote the programme for installation of efficient irrigation system by the farmers to reduce consumption of electricity resulting in lower GHG emissions.

The CME will allow other investors such as technology manufacturers/ irrigation companies/ agricultural entities etc. to promote the implementation of efficient irrigation system in the fields where conventional flood method of irrigation is followed. The CPA implementer will operate along with their dealers/ manufacturing company to implement the micro irrigation system and provide training on operation/ maintenance, awareness on the benefits of micro irrigation system compared to the conventional irrigation method. The cost of developing this PoA and maintaining various activities as described above is borne by CME. There will not be any contribution received from the farmers, CPA implementers etc.

The investment in the CPAs and CER revenue will be shared mutually between CME, CPA implementer, new investor/ technology supplier joining CPAs and end user farmers (in terms of discount in purchasing of equipments, O&M services etc.).

General Operating and Implementing Framework of PoA:

Mahindra & Mahindra Ltd., Farm Equipment Sector (herein referred to as M&M FES) will be the Coordinating/ Managing entity (hereafter referred to as CME) of the small scale Programme of Activities (SSC-PoA) and will support the CPA implementers in implementing the CDM Programme Activity (CPAs) in India.

This PoA will include ‘Micro irrigation systems (MIS)’.

The MIS comprises of following two types of technologies.

1) Drip irrigation

Drip irrigation system is an irrigation method which minimizes the use of water and fertilizer by allowing water to drip slowly to the roots of the plants either onto the soil surface or directly onto the root zone, through a network of valves, pipes, tubing, and emitters.

2) Sprinkler irrigation

In sprinkler irrigation, water is delivered through a pressurized pipe network to sprinklers nozzles or jets which spray the water into the air.

Each CPA under this PoA will comprise of micro irrigation systems such as drip or sprinkler irrigation system as described in section A.6. The implementation of the micro irrigation system will be facilitated by the CPA implementer in the fields where the conventional method of irrigation is being practiced. The farmers will be given training and awareness on the benefits of micro irrigation system in terms of water saving, electricity reduction and increase in yields. The data collected during the entire life time of PoA will be recorded in database and maintained by CME (till two years after the end of crediting period or last issuance whichever is later).

Investments:-

- Investment by CPA implementer may cover full cost of the efficient micro irrigation system by selling it at market price. The CME and CPA implementer will use carbon revenue for the extra campaigns, trainings and O&M services to spread the use of MIS and installation of monitoring equipments as discussed above.

Distribution and awareness raising (extra campaigns):-

- Framework for distribution of the micro irrigation system along with accessories through on-ground networks (like dealers and service engineers) and CME will provide a guidance document to CPA implementers that will aid successful implementation of CPA. It will describe awareness, capacity building programs, operation & maintenance and troubleshooting of the CPA region. Depending on the social expectations and sensitivities from state to state the guidance document will also provide information with regards infrastructure requirements such as distributor, retailer, mechanics, platform for installing primary and secondary filters, fertigation and venturi system, creating enclosure for pump set (if required).
- The CME will provide guidance document for stakeholder engagement for positive influence on the user behaviour to encourage usage of the improved irrigation technology.

Monitoring and operations:

CME will provide framework for monitoring the usage and operation of the micro irrigation system, operation and maintenance of the accessories, replacements of the same etc.

Documentation:

- Documentation of the PoA, CPAs will be undertaken as required by the “Simplified modalities and procedures for small scale CDM project activities” prescribed by UNFCCC.
- The investors into the project activity and joining this PoA may use all available domestic subsidies and discounts, funds for such measures including funds available for community development, social investments and socially responsible investments which are not mandatory to CPA implementer as well as to CME. The project activity may deploy all technologies, measures, and devices of efficient irrigation system that will save the water and electricity at maximum possible limits. All efficient micro irrigation systems that will be deployed in the programme will save 40-70%⁸ of water as well as electricity consumption up to certain extents.

CME will take up following activities for the implementation of PoA

Step 1: Collect information of Project Activities.

Step 2: Scrutinize information regarding eligibility as CDM Program Activity as per Section B.2 and B.5.

Step 3: Listing eligible CPAs.

Step 4: Addition of new CPAs via DOE/s

Step 5: Report on Monitoring Instruments & System to be installed as per the Section B.7.2

Step 6: Undertaking periodic verification by engaging DOE

CME will promote the Micro irrigation system to the farmers and engage other CPAs into the programme.

Contribution to sustainable development

The contribution of SSC-CPA to sustainable development in the country is substantiated based on the following indicators stipulated by Government of India for sustainable development in the approval guidelines for CDM projects⁹.

⁸ <http://www.netafimindia.com/pdf/Micro-Irrigation%20-%20for%20electricity%20saving%20in%20Gujarat%20-%20A%20potentiality%20statement.pdf>

⁹ http://www.cdmindia.nic.in/host_approval_criteria.htm

**Social well being**

- Reduces the extra efforts put by farmers in traditional irrigation methods who use to spend a lot of time in making bunds and furrows for drawing water in his fields. Improved irrigation method will save farmer's time during flood irrigation method and hence he can spend more time for other different agricultural activities like weed control, pest control.
- This method also prevents the cumbersome farm practices like levelling of land, which is an essential part of flood irrigation method.

Economic well being

- The improved irrigation technology results in reduction in water and electricity consumption
- Reduced man power cost
- Increase in yield leading to rise in the economy of the farmers.

Environmental well being

The project should reduce the impact on resource sustainability and resource degradation, and improve bio-diversity friendliness, reduces impact on human health; reduce levels of pollution in general.

- The improved irrigation technology results in reduction in water and electricity consumption
- There will be no soil erosion and saves land as no bunds etc are required.
- There will be less water discharge out of ground water and hence water table will not go to deeper level.
- Installation of micro irrigation system will reduce the over use of water and electricity and subsequently conserve the natural resources.

Technological well being

The PoA will lead to implementation of environmentally safe and sound technologies that are comparable to best practices in order to assist in up gradation of the technological base and increased access to the same

- The propagation of this technology would bring in optimum utilisation of natural resources 'water and energy and hence conservation of natural resources.
- The technology is easy for installation and has flexibility in operations. Hence farmers can easily install the micro irrigation systems on their farms. But some training needs be given to the farmers before implementing this project on ground.

Confirmation that the proposed PoA is a voluntary action by the coordinating/ managing entity.

There is no mandatory requirement in India to enforce the deployment of micro irrigation system (MIS) for the purpose of crop/farm irrigation. Poor extension and training facilities to farmers is another major reason that use of MIS did not spread in India¹⁰.

The proposed programme aims to benefit farmers across India through access to improved irrigation technologies thus contributing to economic, social and environmental benefits through such an activity. The programme will provide the impetus to potential investors to channel investments that create on ground impacts that are real and measurable and where the carbon risks can be mitigated. Hence the

¹⁰ The share of area under MIS from the total cultivated area is less than 1% in India in 2012. Evidence is shared with the DOE.

CME aims to bring in investors into such kind of project to have a positive impact on the agriculture of India.

This confirms that the CME is not mandated to implement any such programme and the initiative is taken up voluntarily¹¹.

Hence the proposed PoA is a voluntary action by the coordinating/managing entity.

A.3. CMEs and participants of PoA

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The coordinating or managing entity of the SSC-PoA will be Mahindra & Mahindra Ltd. Farm Equipment sector (referred to as CME hereafter on in this document).

A.4. Party(ies)

Name of Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (host)	Mahindra & Mahindra Ltd. Farm Equipment sector (private entity)	No

A.5. Physical/ Geographical boundary of the PoA

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The political boundary of India is chosen as the country/ geographical boundary of the SSC-PoA. The SSC-CPAs that will be included under the SSC-PoA will be within the defined geographical region and follow applicable national and / or sectoral policies and regulations. Latitude and longitude of India is 20°N and 77° E¹².



¹¹ An undertaking of this effect is given to the DOE

¹² http://www.mapsofindia.com/lat_long/

A.6. Technologies/measures

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Baseline scenario:-

The predominant practice followed in Indian agriculture is the conventional flood method of irrigation. A conventional irrigation method includes Surface irrigation methods like broad strip methods, check basin irrigation, furrow irrigation etc. which is collectively as flood irrigation method¹³. In these methods, water from an irrigation channel is allowed to reach a part or whole of the field and spread by the gravitational flow incidental to the slope of the land. The important requirements to obtain high efficiency in surface method are (1) properly constructed water distribution systems to provide adequate flow of water to the fields; and (2) proper grading and levelling of land to achieve uniform distribution of water. All these practices require more man power and mechanical power for small scale farms.

Under conventional irrigation method in India, water pumps are used to flood irrigate the agricultural fields. It is estimated that between 35 to 40¹⁴ percent of water is lost in these systems due to run-off, evaporation, deep percolation and conveyance.

Hence the baseline scenario identified is the electricity consumption for pumping irrigation water under conventional flood method of irrigation and the baseline emissions is determined based on the electricity consumed by the equipment installed per hectare per tonne.

Project Scenario:

Micro irrigation technology refers to low pressure irrigation systems that spray, mist, sprinkle or drip. The water discharge patterns differ because emission devices are designed for specific applications due to agronomic or horticultural requirements. Micro irrigation components include pipes, tubes, water emitting devices, flow control equipment, installation tools, fittings and accessories¹⁵.

Micro irrigation system technology encompasses (1) drip irrigation and (2) sprinkler irrigation. The basic principle behind these systems is more crops per drop.

1) Drip Irrigation¹⁶:

Drip irrigation refers to application of water in small quantity at the rate of mostly less than 12 lph as drops to the zone of the plants through a network of plastic pipes fitted with emitters. Drip irrigation in its present form has become compatible with plastics that are durable and easily moulded into a variety and complexity of shapes required for pipe and emitters. Drip irrigation system is mainly of two types,

- 1) Surface drip irrigation system and
- 2) Sub surface drip irrigation system.

In surface drip irrigation system the laterals are laid down in the soil surface and are not covered with the soil. In subsurface drip irrigation systems, the laterals and drippers are buried into the soil surface itself and irrigation is given to the plants below the surface of soil. The sub surface drip irrigation system is more efficient as compared to surface drip irrigation system, since it directly delivers water into the root zone of the plant and reduces the evaporation losses from direct exposure to sun's radiation. The

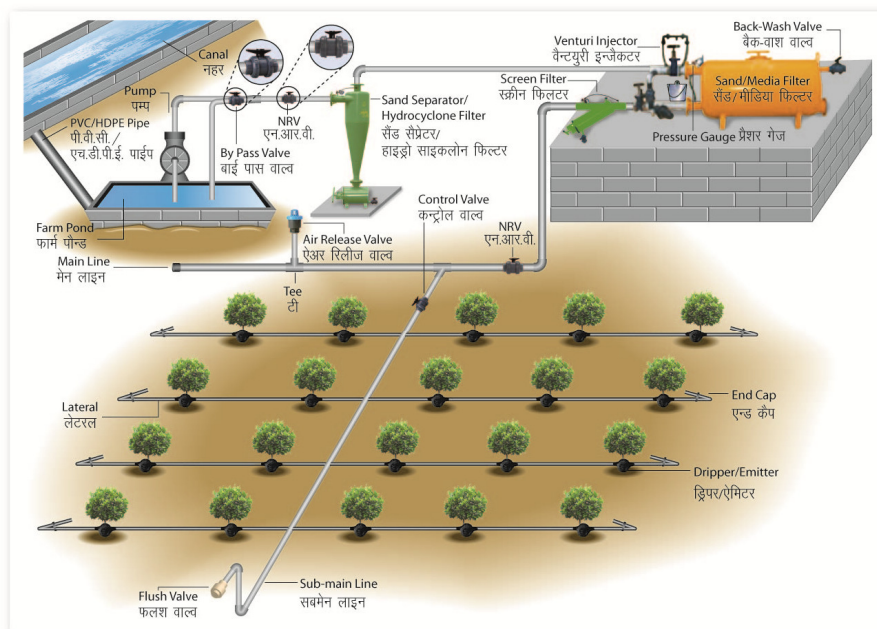
¹³ <http://en.wikipedia.org/wiki/Irrigation#Surface>

¹⁴ Potential for drip and sprinkler irrigation in India. A. Narayanamoorthy. Paper is available online at link below
http://nrlp.iwmi.org/PDdocs/DReports/Phase_01/12.%20Water%20Savings%20Technologies%20-%20Narayanamoorthy.pdf

¹⁵ <http://www.ag.ndsu.edu/pubs/ageng/irrigate/ae1243w.htm>

¹⁶ http://agritech.tnau.ac.in/agricultural_engineering/drip_irrigation.pdf

subsurface irrigation systems are more predominantly followed in sugar cane production. The drip irrigation systems are pressure regulated and hence usage of efficient high pressure pump set is highly essential to create required pressure in the laterals and at the tip of the dripper. The drippers are also of various types like inline dripper and online dripper. In the inline drippers system, the drippers are placed in the laterals and on the other hand in the online dripper system, drippers are placed on the laterals.



Layout of Drip Irrigation System (ड्रिप सिंचाई पद्धति का रेखाचित्र)

- Component of sprinkler irrigation system:
- Pump or pressurized water source
- Water filter(s) or filtration systems: sand separator such as Hydro-Cyclone, screen filters, media filters, disc filters
- Fertigation systems (Venturi injector) and chemigation equipment (optional)
- Backwash controller (Backflow prevention device)
- Pressure Control Valve (pressure regulator)
- Main line (larger diameter pipe and pipe fittings)
- Hand-operated, electronic, or hydraulic control valves and safety valves
- Smaller diameter polytube (often referred to as "laterals")
- Poly fittings and accessories (to make connections)
- Emitting devices at plants (emitter or dripper, micro spray head, inline dripper or inline drip tube)

Crops Suitable for Drip Irrigation System	
FRUIT CROPS	Almond, Apple, Arecanut, Indian Gooseberry, Ber (Zizyphus), Banana, Cashew, Custard Apple, Cherry, Durian, Fig, Guava, Grape, Litchi, Lemon, Sweet Lime, Mango, Orange, Olive, Papaya, Pomegranate, Pear, Peach, Pistachio, Pineapple, Sapota, Strawberry, Star Fruit, Jack Fruit, Tamarind, Water Melon, Musk Melon.
VEGETABLE CROPS	Brinjal, Cucumber, Lettuce, Pepper, Potato, Pea, Tomato.
FIELD & OTHER CROPS	Corn, Cotton, Sugarcane, Tobacco, Betel vine, Mulberry



OIL SEEDS	Groundnut, Sunflower, Jojoba, Castor
FORAGE CROPS	Lucerne, Pastures, Turfs, Fodder
PLANTATION CROPS	Cardamom, Coffee, Tea, Rubber, Spices, Oil Palm, Coconut
ORNAMENTALS	Floricultural Plants; Rose, Gerbera, Carnation, Gladioli, Poinsettias, Chrysanthemum

2) Sprinkler Irrigation¹⁷:

In the sprinkler method of irrigation, water is sprayed into the air and allowed to fall on the ground surface somewhat resembling rainfall. The spray is developed by the flow of water under pressure through small orifices or nozzles. The pressure is usually obtained by pumping. With careful selection of nozzle sizes, operating pressure and sprinkler spacing the amount of irrigation water required to refill the crop root zone can be applied nearly uniform at the rate to suit the infiltration rate of soil.

Sprinkler systems are classified into the following two major types on the basis of the arrangement for spraying irrigation water.

- a) Rotating head or revolving sprinkler system.
- b) Perforated pipe system.

a) Rotating head or revolving sprinkler system:

Small size nozzles are placed on riser pipes fixed at uniform intervals along the length of the lateral pipe and the lateral pipes are usually laid on the ground surface. They may also be mounted on posts above the crop height and rotated through 90°, to irrigate a rectangular strip. In rotating type sprinklers, the most common device to rotate the sprinkler heads is with a small hammer activated by the thrust of water striking against a vane connected to it.

Sprinkler irrigation systems are further classified into;

- Micro sprinkler irrigation system
- Overhead sprinkler

a.1) Micro sprinkler irrigation system:

Micro sprinklers are basically used for floriculture, and floriculture production. The area under irrigation in micro sprinkler is more as compared to drip irrigation system. It is basically followed in more distantly spaced crops. The micro sprinklers are connected to lateral via small diameter pipes termed as risers. The risers bring water through the laterals and then water flows to the micro sprinkler from where the water is emitted on the ground. Pre-packaged sprinklers come with heads for 360°, 180°, 90° and strip spray.

a.2) Overhead sprinklers:

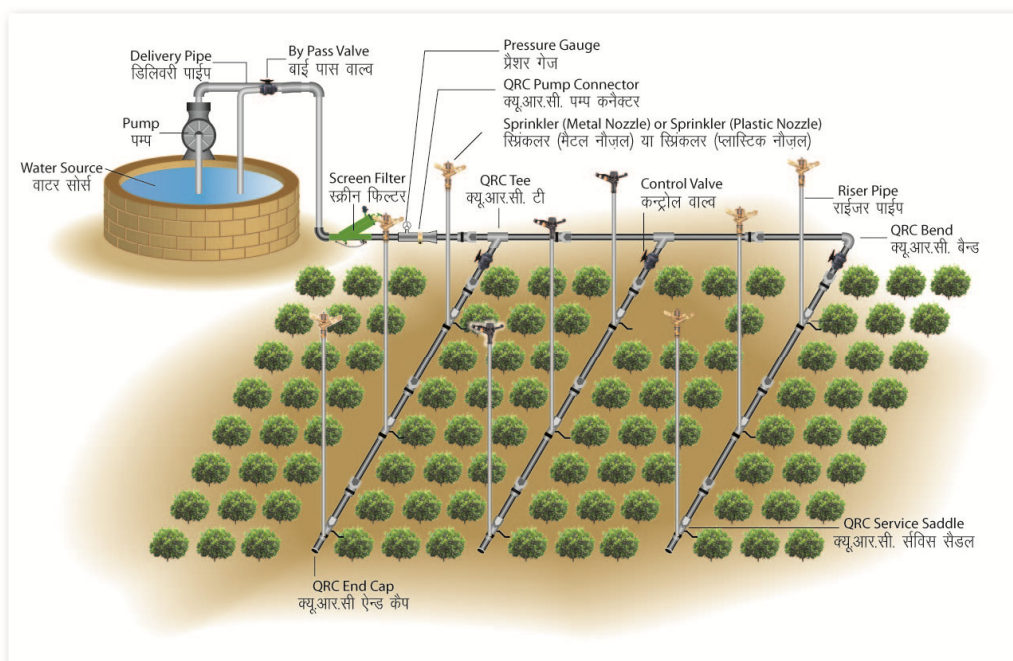
Overhead sprinklers are predominantly used in agronomic crops like wheat, rice, sorghum etc. The overhead sprinklers are used for irrigating fields like rain water. The Sprinkler Irrigation is a method of applying irrigation water which is similar to rainfall. Water is distributed through a system of pipes usually by pumping. It is then sprayed into the air and irrigated entire soil surface through spray heads so that it breaks up into small water drops which fall to the ground. Sprinklers provide efficient coverage for small to large areas and are suitable for use on all types of properties. It is also adaptable to nearly all irrigable soils since sprinklers are available in a wide range of discharge capacity. Sprinkler system is an

¹⁷ http://agritech.tnau.ac.in/agricultural_engineering/spring_irrigation.pdf

unique irrigation system. It is designed to ensure maximum water saving, combining high quality, affordability and ease of installation.¹⁸

b) Perforated pipe system:

This method consists of drilled holes or nozzles along their length through which water is sprayed under pressure. This system is usually designed for relatively low pressure (1 kg/cm²). The application rate ranges from 1.25 to 5 liter per hour for various pressure and spacing.



Layout of Sprinkler Irrigation System (छिड़काव सिंचाई प्रणाली का रेखाचित्र)

Component of sprinkler irrigation system

- A pump unit
- Tubings- main/ submains and laterals
- Couplers
- Sprinkler head
- Other accessories such as valves, bends, plugs and risers.

The CPAs under this PoA could either use one of the above mentioned system or the combination of system i.e. both drip and sprinkler irrigation where multi-cropping is done depending on feasibility and availability. The advanced version of these technologies could also be used if it meets the eligibility criteria mentioned in PoA-DD section B.2. The choice of drip or sprinkler is decided by the type of crop. So, each CPA will have sub-projects one for land parcels using sprinklers and another for that using drip MIS. Similar sub-project can be made if new technology under MIS meets requirements of the eligibility criteria mentioned in PoA-DD section B.2.

The technology mentioned above will be procured within the boundaries of host country. It is not transferred from outside the boundary of the host country.

¹⁸ <http://www.indiamart.com/vasundharaenterprises/irrigation-systems.html>

**Environmentally safe and sound technology:**

A Micro-irrigation System means an environmentally safe system for the conveyance and distribution of water, chemicals and fertilizer to agricultural fields for crop production¹⁹. The implementation of this technology does not have any adverse impact on the environment (like direct air/ liquid discharge) and saves electricity, it is considered as environmentally safe and sound.

A.7. Public funding of PoA

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The PoA will not receive any public funding from Parties included in Annex I²⁰.

SECTION B. Demonstration of additionality and development of eligibility criteria**B.1. Demonstration of additionality for PoA**

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A SSC-CPA can demonstrate the additionality using “Guidelines for demonstrating additionality of micro scale project activities”, version 04.0, EB 68, Annex 26.

Energy efficiency project activities²¹ that aim to achieve energy savings at a scale of no more than 20 gigawatt hours (GWh) per year are additional if any of the conditions below is satisfied:

- a) The geographic location of the project activity is in the LDC/SIDS or special underdeveloped zone of the host country identified by the government in accordance with the paragraph 2(a) (i) above mentioned guideline.
- b) The project activity is an energy efficiency activity with both conditions (i) and (ii) below satisfied:
 - (i) Each of the independent subsystems/measures in the project activity achieves an estimated annual energy savings equal to or smaller than 600 megawatt hours;
 - (ii) End users of the subsystems or measures are households/communities/SMEs.

As per paragraph 04, Annex 26 of the EB 60 meeting report “full additionality assessment is not required in the context of component project activities (CPA), rather the confirmation of additionality for CPAs should be conducted by means of the eligibility criteria”. Hence PP chooses to demonstrate additionality at PoA level. The eligibility criteria of inclusion of CPAs would be defined in Section B.2 of the PoA. The same will be demonstrated at the CPA level.

The individual CPAs will be eligible under para ‘b’ of the conditions referred above and a brief description along with required calculations is presented in the SSC-CPA-DD (Section D.5).

Hence the proposed activity would not be implemented in the absence of the PoA.

¹⁹

http://www.ncagr.gov/SWC/costshareprograms/AgWRAP/documents/AgWRAP_micro_irrigation_system_aug2012.pdf

²⁰ Undertaking from CME of this effect is given to the DOE

²¹ All technologies/measures included in approved Type II small-scale CDM methodologies are eligible to be considered. Further, the Board at its fifty-seventh meeting clarified that all CDM project activities that meet the criteria specified in the guidelines are eligible to apply the guidelines irrespective of the scale of the approved CDM methodology applied to the project.

**B.2. Eligibility criteria for inclusion of a CPA in the PoA**

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As per the “Standard for the demonstration of additionality, development of eligibility criteria and application of multiple methodologies for Programme of Activities” Version 03.0, Annex 05 of EB 74 following criteria must be met by each CPA to be included under PoA.

	Requirement	Eligibility criteria
A	The geographical boundary of the CPA including any time-induced boundary consistent with the geographical boundary set in the PoA	Each CPA will be located within the geographical boundary of India.
B	Conditions that avoid double counting of emission reductions like unique identifications of product and end-user locations (e.g. programme logo)	<p>The micro-irrigation system to be installed in each CPA will be given (in the database maintained by CME)</p> <ul style="list-style-type: none"> • Acronym/title of the programme • Unique identification number (CPA No. XX – District XX – Taluka XX – sub-project No. XX) • Farm holder Name • Location of CPA with geo coordinates • Type of MIS (drip and/or sprinkler) • Capacity of pumps <p>Further, an undertaking will be taken from the CPA implementer to confirm that any MIS system is not part of any other CDM project activity or PoA.</p>
C	The specifications of technology/ measure including the level and type of service, performance specifications including compliance with testing/certifications.	<p>a. The micro irrigation technology to be installed under the proposed SSC- PoA will follow the following or latest available/ applicable IS standards</p> <p><input type="checkbox"/> <i>Drip irrigation:</i> e.g. Laterals – IS 12786: 1989²² Emitter – IS 13487: 1992²³ Inline – IS 13488: 2008²⁴ Filter – IS 12785: 1994²⁵</p> <p><input type="checkbox"/> <i>Sprinkler irrigation:</i> e.g. IS 14151 (Part 2): 2008²⁶ IS 14792 : 2000²⁷ IS 12232 (Part 2) : 1995²⁸</p>

²² <https://law.resource.org/pub/in/bis/is.12786.1989.pdf>

²³ <https://law.resource.org/pub/in/bis/is.13487.1992.pdf>

²⁴ <https://law.resource.org/pub/in/bis/is.13488.2008.pdf>

²⁵ <https://law.resource.org/pub/in/bis/is.12785.1994.pdf>

²⁶ <https://law.resource.org/pub/in/bis/is.14151.2.2008.html>

²⁷ <https://law.resource.org/pub/in/bis/is.14792.2000.html>



		If any new technology is invented, relevant IS standards will be used.
D	Conditions to check the start date of the CPA through documentary evidence.	<p>CPA has a project start date on or after start date of the PoA with documentary evidences.</p> <p><input type="checkbox"/> Sale/ purchase bill / invoice of MIS by farmer/ CPA implementer</p> <p><input type="checkbox"/> Any other commitment to implement project (in case sale/ purchase bill/ invoice is not available).</p>
E	Conditions that ensure compliance with applicability and other requirements of single or multiple methodology/ies applied by CPAs	<p>The CPA is using AMS II.F methodology and each CPA will satisfy the following applicability criteria described in approved methodology AMS II.F <i>Energy efficiency and fuel switching measures for agricultural facilities and activities, version 10, EB 66</i></p> <ul style="list-style-type: none"> • This category comprises any energy efficiency and/or fuel switching measure implemented in agricultural activities of or facilities or processes. This category covers project activities that encourage energy efficiency or involves fuel switching. Examples of energy-efficient practices include efficiency measures for specific agricultural processes (e.g. efficient irrigation such as micro irrigation less irrigation etc.), and measures leading to a reduced requirement of farm power per unit area of land, reflected in less and smaller tractors, longer lifetime of tractors and less farm equipment. Further energy efficient measures would be reducing fuel use in agriculture, such as reduced machinery use e.g. the elimination of tillage operations, reduction of irrigation, use of lighter machinery etc. • The measures may be a replacement on existing equipment or equipment being installed in a new facility. The aggregate energy savings of a single project may not exceed the equivalent of 20 GWh per year²⁹.
F	The conditions that ensure that CPAs meet the requirements pertaining to the demonstration of additionality.	This PoA demonstrates additionality at the PoA level. Thus, each CPA will not be required to demonstrate the additionality as per the

²⁸ <https://law.resource.org/pub/in/bis/is.12232.2.1995.html>

²⁹ As per the Guidelines on demonstrating additionality of micro scale project activities, the energy savings of Micro irrigation system in each CPA will be less than or equal to 20 GWh.



		requirements of Guidelines on demonstrating additionality of micro scale project activities (Version 04.0), Annex 26, EB 68.
G	The PoA-specific requirements stipulated by the CMEs including any conditions related to undertaking local stakeholder consultations and environmental impact analysis.	<p>Each CPA will undertake local stakeholder consultations following:</p> <ul style="list-style-type: none"> • Identification of local stakeholders identified by CME and CPA implementer • Invitation to local stakeholder consultation or meets • Demonstrating the CPA project activity • Inviting comments from stakeholders • Minutes of the meetings <p>The project activity does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India, 2006³⁰. Hence, it is not required for this programme.</p>
H	Where applicable, target group (e.g. domestic/commercial/industrial, rural/urban, grid-connected/off-grid) and distribution mechanisms (e.g. direct installation)	For each CPA the target beneficiaries will be the farmers currently practising flood method of irrigation consuming more electricity for pumping of water for irrigation compared to micro irrigation method. The CPA implementer will identify the target beneficiaries by the data collection from Government records, dealers contact list, area managers data sheets etc.
I	Where applicable, the conditions related to sampling requirements for a PoA in accordance with the approved guidelines/standard from the Board pertaining to sampling and surveys.	Each CPA will conduct sampling and surveying as appropriate or applicable based on requirements of “Standard for sampling and surveys for CDM project activities and programme of activities”, version 04.0, Annex 06, EB 74 and “Guidelines for sampling and surveys for CDM project activities and programme of activities”, version 02, Annex 5, EB 69.
J	Where applicable, the conditions that ensure that CPA in aggregate meets the small-scale or micro-scale threshold criteria and remain within those thresholds throughout the crediting period of the CPA.	<p>Each CPA will meet the following small-scale threshold criteria as per EB 61, Annex 21, “General Guidelines to SSC CDM methodologies”, version 17.</p> <p>Each CPA will deploy the Micro irrigation system with energy savings not exceeding the equivalent of 60 GWh per year throughout the crediting period.</p> <p>However as per the Guidelines on demonstrating additionality of micro scale project activities, the energy savings of Micro irrigation system in each CPA will be less than or equal to 20 GWh.</p>

³⁰ <http://www.envfor.nic.in/legis/eia/so1533.pdf>



K	Where applicable, the requirements for the debundling check, in case CPAs belong to small-scale (SSC) or microscale project categories (please refer to the latest approved version of the ‘Guidelines on assessment of debundling for SSC project activities’)	<p>Confirmation by CME, to ensure that the CPA is in accordance with the latest version “Guidelines on assessment of de-bundling for SSC project activities”, Annex 13, EB 54</p> <p>If each of the independent subsystems/measures (e.g., biogas digester, solar home system) included in the CPA of a PoA is no larger than 1% of the small-scale thresholds defined by the methodology applied, then that CPA of PoA is exempted from performing de-bundling check i.e., considering as not being a de-bundled component of a large scale activity. The aggregate energy savings of a single project may not exceed the equivalent of 60 GWh per year as per the Type II projects for Small Scale activity. $1\% \text{ of the small scale thresholds} = 60 \text{ GWh} \times 1\% = 0.6 \text{ GWh} = 600 \text{ MWh} = 600,000 \text{ kWh}$ There by these CDM project activities are exempted from performing a de-bundling check, i.e., considered as being not a de-bundled component of a large scale activity.</p>
L	Conditions to provide an affirmation that funding from Annex I parties if any, does not result in a diversion of official development assistance.	<p>The CME and the CPA implementer shall confirm that in case of public funding there shall not be diversion of Official Development Assistance by following:</p> <p><input type="checkbox"/> Undertaking by CPA Implementer to CME</p> <p><input type="checkbox"/> Certificate by CPA implementer’s chartered accountant during verification.</p>

B.3. Application of methodologies

>>

The PoA involves application of micro irrigation system in agriculture. Thus applicable methodology is

Title of the applied baseline methodology: “Energy efficiency and fuel switching measures for agricultural facilities and activities”

Sectoral Scope 03: Energy demand

Project Type: II - Energy Efficiency Improvement Projects

Reference: AMS-II.F, Version 10.0, EB 66

<http://cdm.unfccc.int/methodologies/DB/JBIGP7UXNB82DGLWTKENW64LZ5D8HD>

This methodology also refers to the latest approved versions of the following tools:

<https://cdm.unfccc.int/methodologies/SSCmethodologies/approved>

- “Tool to calculate the emission factor for an electricity system” (Version 03.0.0, EB 70, Annex 22)
- “Guidelines for demonstrating additionality of microscale project activities” (Version. 04.0, EB 68, Annex 26)

Applicability criteria	Justification
------------------------	---------------



<p>This category comprises any energy efficiency and/or fuel switching measures implemented in the agricultural activities of facilities or processes. This category covers project activity that encourages energy efficiency and involves fuel switching. Examples of energy-efficient practices include efficiency measures for specific agricultural processes (e.g. efficient irrigation such as drip irrigation less irrigation, etc.), and measures leading to a reduced requirement of farm power per unit area of land, reflected in less and smaller tractors, longer lifetime of tractors and less farm equipment. Further energy efficient measures would be reducing fuel use in agriculture, such as reduced machinery use through, e.g. the elimination of tillage operations, reduction of irrigation, use of lighter machinery, etc.</p>	<p>The measures to be implemented in each CPA will comprise of efficient irrigation system such as drip, sprinkler etc. used for irrigating the crops.</p>
<p>The aggregate energy savings of a single project may not exceed the equivalent of 60 GWh per year. The energy savings of each individual CPA will not exceed the equivalent of 20 GWh per year³¹.</p>	<p>The energy saving of each CPA will not exceed 20 GWh per year. The energy saving of first CPA submitted with this PoA is 3.77 GWh (< 20 GWh).</p>

The possible list of technologies as per methodology AMS II.F which will comply with national or international standards that can be included in PoA are:

PoA constitutes technology of Micro-irrigation system under which drip irrigation and sprinkler irrigation is included. As described in PoA section B.2 each CPA either includes drip irrigation, sprinkler irrigation or both drip and sprinkler but on different lands of project activity.

- Drip irrigation system
- Sprinkler irrigation system

As per para 29 of EB 65, Annex 3 the PoA will allow for applications of combination or single technologies which will be in accordance with the methodology AMS II F. The PoA and all CPAs joining this PoA will follow the applicability conditions as required by the methodology AMS II. F. The CPAs included in the PoA will satisfy the inclusion criteria as mentioned in section B.2 of PoA DD.

Cross Effects:

As per annex 3, EB 65, para 28 for the application of multiple small scale technologies “Combinations of technologies/measures and/or methodologies for a PoA are eligible where it is demonstrated that there are no cross effects between the technologies/measures applied”. Where such cross effects do exist, the CME shall propose methods to account for such cross effects using the “Procedures for requests to the executive board for deviation from an approved methodology” so as to ensure that the calculation of emission reductions is accurate. The choice of drip/ sprinkler even on a single farm will measure the electricity consumption and hence this will not impact the emission reduction calculation. Since the technology used is Micro-irrigation system (MIS) and eligible under single methodology, the technology/methodologies mentioned in the PoA do not have cross effects.

³¹ As per the Guidelines on demonstrating additionality of micro scale project activities, the energy savings of Micro irrigation system in each CPA will be less than or equal to 20 GWh.



Sampling for monitoring plan:

Sampling will be undertaken as a part of sampling plan that is in line with the requirements of AMS II.F: Energy efficiency and fuel switching measures for agricultural facilities and activities, version 10 and Standard for sampling and surveys for CDM project activities and programme of activities, Version 04.0, Annex 06, EB 74 and Guidelines for sampling and surveys for CDM project activities and programme of activities, version 02, Annex 5, EB 69.

SECTION C. Management system

>>

CME will have overall operational and management responsibility for the implementation and monitoring of the proposed PoA and therefore is acting as the PoA managing Entity.

For the addition of new CPAs, following management structure is set up. Each CPA will decide this management structure in Section D.7 OR Appendix 5 of the CPA-DD.

- 1) CPA Implementer – Coordinating with farmers, MIS dealers
- 2) CME - Evaluation of applicability criteria of addition of CPAs in consultation with Consultant
– Coordination between CPA implementers and Consultants, DOEs

CME will be responsible for the following operational and management activities related to each SSC-PoA under the PoA as listed below.

- Technical development of PoA concept and related documents
- Managing PoA CDM registration
- Working with various potential CPA implementers and including them in the PoA, supporting them to recover part / full finance through carbon credits, and provide guidance to facilitate their role as CPA implementer.
- Performing technical review of inclusion of CPAs
- Following procedures to avoid double counting
- Maintaining records and documentation control process for each CPA.
- Verification activities

A record keeping system for each CPA under the PoA,

The standardized formats shall be applied, used and maintained by the SSC-CPA implementer. The SSC-CPA team would maintain appropriate records documenting the following variables *inter-alia*:

- The geographical location of each CPA
- The name, address and records of target beneficiary participating in the CPA along with acceptance letters
- The record of the accessories distributed to target beneficiary participating in CPA
- The record of equipments and address of target beneficiaries where the accessories are replaced during the monitoring period
- Annual monitoring data - the names, address and data of each target beneficiary involved in the monitoring survey on sample basis.

Documentation System

The SSC-CPA shall establish procedures for:

1. Defining document requirement
2. Control of documents and records *inter-alia* their approval, updating, review and distribution



Procedure to check for De-bundling

Debundling check will be performed as per section II Guidelines for determining the occurrence of debundling under a programme of activities (PoA)

“Guidance on Assessment of Debundling for SSC project activities,” version 03.1, Annex 13 EB 54.

Para 8:-

‘For the purposes of registration of a Programme of Activities (PoA), a proposed small-scale CPA of a PoA shall be deemed to be a de-bundled component of a large scale activity if there is already an activity, which satisfies both conditions (a) and (b) below:

- (a) Has the same activity implementer as the proposed small scale CPA or has a coordinating or managing entity, which also manages a large scale PoA of the same technology/measure, and;*
- (b) The boundary is within 1 km of the boundary of the proposed small-scale CPA, at the closest point.’*

Para 9:-

‘If a proposed small-scale CPA of a PoA is deemed to be a debundled component in accordance with paragraph 2 above, but the total size of such a CPA combined with a registered small-scale CPA of a PoA or a registered CDM project activity does not exceed the limits for small-scale CDM and small-scale A/R project activities as set out in Annex II of the decision 4/CMP.18 and 5/CMP.1 respectively, the CPA of a PoA can qualify to use simplified modalities and procedures for small-scale CDM and small-scale A/R CDM project activities’

Para 10:-

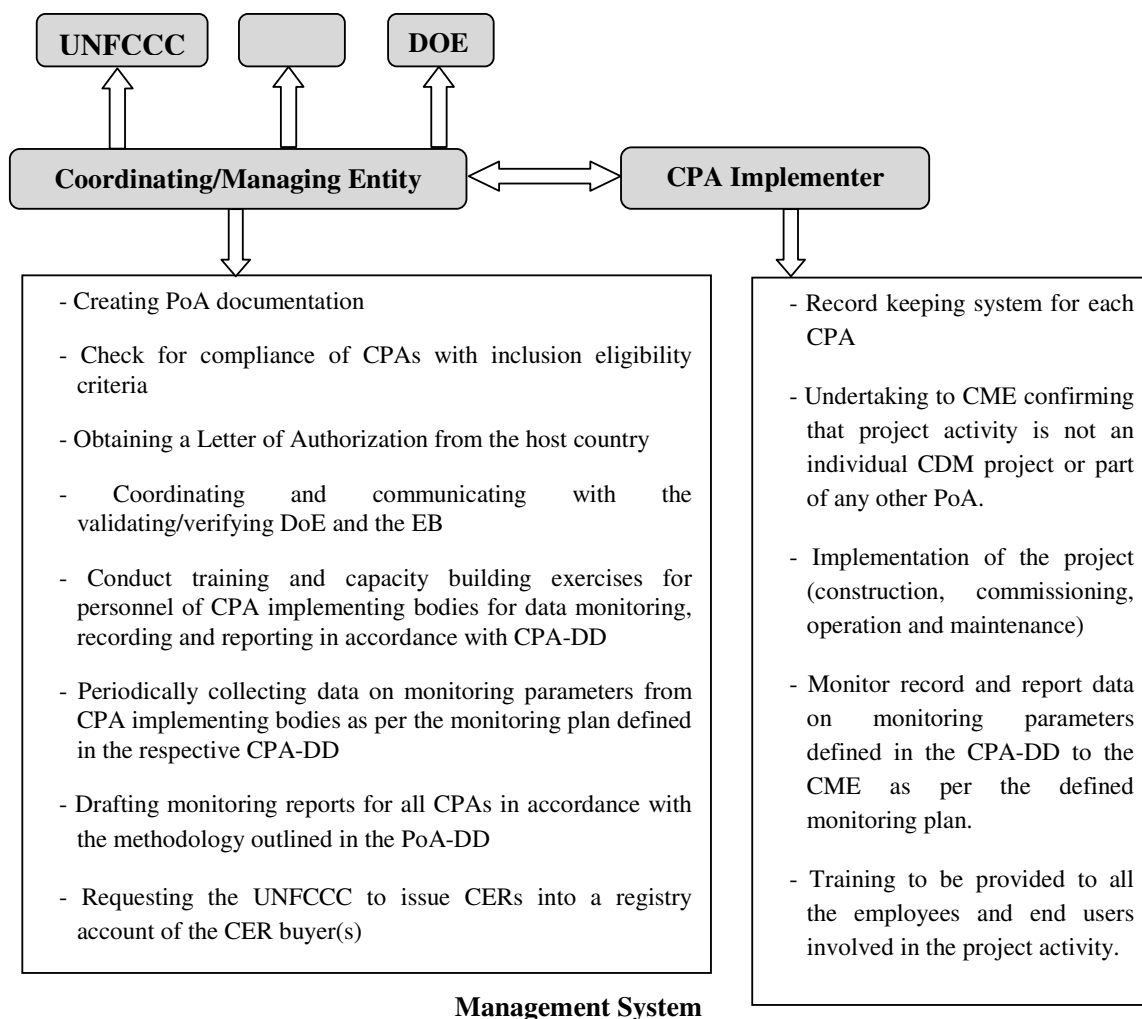
‘If each of the independent subsystems/measures (e.g. biogas digester, solar home system) included in the CPA of a PoA is no greater than 1% of the small scale thresholds defined³² by the methodology applied, then that CPA of PoA is exempted from performing de-bundling check i.e. considered as being not a de-bundled component of a large scale activity’

Each CPA will perform debundling check will occur as per the criteria mentioned above.

The provisions to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA:

CME is a managing entity of the PoA and is therefore responsible for operating the PoA. The operating CPAs are fully aware and have voluntarily agreed to participate in the PoA owned by CME, thus their activity is subscribed to the PoA. The CME will enter a contract with the CPA implementer that confirms the CPA implementer’s involvement in the PoA.

³² This is based on the clarification from “Guidelines on assessment of debundling for SSC project activities, v03 (EB 54, Annex 13, par. 10) for determining the occurrence of debundling under a Programme of Activities (PoA)”, if each of the independent subsystem/measures included in the CPA of a PoA is no larger than 1% of the small scale threshold defined by the methodology applied, then that CPA of PoA is exempted from performing de-bundling check, i.e. considered as being not a de-bundled component of a large scale activity.



The micro irrigation system installed at each CPA will have a unique identification in the records with CME based on the following '(CPA No. XX – District XX – Taluka XX – sub-project No. XX)'

The technology type, location of the project and its coordinates will be provided in each SSC-CPA DD which will also avoid double counting.

As per para 17 (b) of EB 65, Annex 3, Records of arrangement for training and capacity development for personnel:

The CME is responsible for training any contractors for CPA used during distribution, education and monitoring activities. The CME will ensure training of all on-site staff with respect to the monitoring plan of the project activity. Records of the training will be maintained for verification records. Training records and procedures will be provided to the DOE at the time of verification.

As per para 145, EB 70, Annex 02 'Clean Development Mechanism Project Standard, Version 02':

The CME will designate appropriately trained technical staff to review the inclusion of CPAs. All CPAs are managed by the CME. The procedures for technical review of inclusion of CPAs will be in accordance with the section B.2 above. CME will maintain a checklist as per the section B.2 which will



be reviewed by the technical staff appointed by CME and the decision for inclusion of CPA under PoA will be taken as per the information mentioned in the checklist.

As per para 17 (d) of EB 65, Annex 3, Procedure to avoid double Counting:

At the time of implementer(s) empanelment, SSC-CPA implementer credentials are verified and SSC-CPA owner will undertake that this project activity is not included in any CDM project activity or any other programme of activities. The Managing Entity will also monitor available data bases (UNFCCC) to check that the project activity is not being structured to generate offsets more than once simultaneously.

As per para 17 (e) of EB 65, Annex 3, Records and documentation control process for each CPA under this PoA:

A record keeping system for each CPA under this PoA, the monitoring plan for this project is closely derived from the methodology AMS II.F. A database for the entire PoA will be maintained by CME.

A project database will be maintained the distribution, subsequent replacements, as well as detailed data on the representative sample surveyed for monitoring purpose.

The database will be accessible to the CME and all the CPA implementers and the verification DOE. The database will include at minimum the following:

- Unique CPA identification number
- Installation date
- Contact details
- Date of installation of MIS
- Monitored parameters
- Sampling results

As per para 17 (f) of EB 65, Annex 3, Measures for continuous improvement of PoA management system:

CME shall continually improve the effectiveness of the PoA management system through the effective involvement of personnel, improvement of guidance framework for success of CPA, providing training to the personnel involved, analysis of data, corrective and preventive actions and management review and if the methodology and standard are updated, the PoA management system should be improved too.

SECTION D. Duration of PoA

D.1. Start date of PoA

>>

19/10/2012

The proposed PoA was webhosted for validation start on 19/10/2012 i.e. the date on which the PoA-DD is first published for global stakeholder consultation. This is in line with the 'Glossary: CDM terms', Version 07.0, EB 70, Annex 07.

D.2. Length of the PoA

>>

28 years 00 months

SECTION E. Environmental impacts

E.1. Level at which environmental analysis is undertaken

>>



The project activity does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India, 2006³³. Hence, EIA is not required to be conducted at either PoA or CPA level by the CPA Implementer.

E.2. Analysis of the environmental impacts

>>

The project activity does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India, 2006³⁴. Hence, EIA is not required to be conducted at either PoA or CPA level by the CPA Implementer.

SECTION F. Local stakeholder comments

F.1. Solicitation of comments from local stakeholders

>>

Local stakeholder consultation is done at SSC-CPA level

Since the local stakeholder concerns will vary for every CPA included in PoA and specific to the socio-economic and environmental conditions of the location, it is appropriate to undertake local stakeholder consultation at CPA level.

The time, date and location for the same will be pre-determined and identified stakeholders will be contacted.

The local stakeholders will be invited through:

- Personal invitation via email, telephone or post (if necessary)
- Open invitation notices pasted on public places
- Other means

Stakeholders foreseen at this stage include:

1. Employees of the CME/ CPA implementer and staff members to be involved in the Project
2. Local officials of the Department of Environment and Natural Resources
3. Local officials from Agricultural department
4. Local government officials
5. Non-Government Organizations as well as social organization working in the area
6. Local Residents, Resident Associations, impacted beneficiaries or neighbours.
7. Members of the academic institutions

Stakeholder Consultation Meet

The Stakeholder Meetings will have the following agenda:

- Discussion of the Project Background and its impact on the local community
- Question and Answer Segment to solicit feedback from the attendees and for the Project Proponent to answer information queries
- Circulation of attendance forms

The information gathered will be appropriately recorded for documentation purposes and will be made available to DOE.

³³ <http://www.envfor.nic.in/legis/eia/so1533.pdf>

³⁴ <http://www.envfor.nic.in/legis/eia/so1533.pdf>

**F.2. Summary of comments received**

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Comments will be invited from various stakeholders and will be addressed. A summary of comments including the name of a person who has commented as well as the responses given to that particular comments will be prepared and mentioned for each CPA.

F.3. Report on consideration of comments received

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Local stakeholder consultation will be held at CPA level. Comments received during the consultation will be addressed and reported in each CPA DD.

SECTION G. Approval and authorization

>>

The Host Country Approval is available for the PoA (Ref. No. 4/1/2013-CCC dt. 23/04/2013).

PART II. Generic component project activity (CPA)**SECTION A. General description of a generic CPA****A.1. Purpose and general description of generic CPAs**

>>

The CDM programme activity “Energy Efficiency through Micro irrigation system – India” involves CPA XXX - Installation of XX irrigation system in XXX of XXXX” which includes the installation of efficient irrigation system in XX ha of land in XX in XX district. Mahindra & Mahindra Ltd. Farm Equipment Sector (hereafter referred to as M&M FES) is the coordinating/managing entity of the PoA. XXX is the CPA Implementer for this CPA.

The current practice of irrigation in the region is conventional flood method of irrigation where the water is let into the plot or field so that water can flow freely and cover the entire surface of land.

The CPA will follow the policy/measure or stated goal of the PoA

The goal of the PoA is to reduce the GHG emissions due to the excess use of electricity in irrigation systems by introducing Micro irrigation system (MIS) such as Drip and Sprinkler irrigation system.

The introduction of MIS will be facilitated by the CME. The CME will promote the installation of Micro irrigation system to the farmers in India and adopting efficient means of irrigation. CME would devise financial mechanisms such as available incentives and carbon finance to make the micro irrigation systems accessible to the farmers.

Contribution to Sustainable development:

The contribution of SSC-CPA to sustainable development in the country is substantiated based on the following indicators stipulated by Government of India for sustainable development in the approval guidelines for CDM projects³⁵.

Social well being

³⁵ http://www.cdmindia.nic.in/host_approval_criteria.htm

- Reduces the extra efforts put by farmers in traditional irrigation methods who use to spend a lot of time in making bunds and furrows for drawing water in his fields. Improved irrigation method will save farmer's time during flood irrigation method and hence he can spend more time for other different agricultural activities like weed control, pest control.
- This method also prevents the cumbersome farm practices like levelling of land, which is an essential part of flood irrigation method.

Economic well being

- The improved irrigation technology results in reduction in water and electricity consumption
- Reduced man power cost
- Increase in yield leading to rise in the economy of the farmers.

Environmental well being

The project should reduce the impact on resource sustainability and resource degradation, and improve bio-diversity friendliness, reduces impact on human health; reduce levels of pollution in general.

- The improved irrigation technology results in reduction in water and electricity consumption
- There will be no soil erosion and saves land as no bunds etc are required.
- There will be less water discharge out of ground water and hence water table will not go to deeper level.
- Installation of micro irrigation system will reduce the over use of water and electricity and subsequently conserve the natural resources.

Technological well being

The PoA will lead to implementation of environmentally safe and sound technologies that are comparable to best practices in order to assist in up gradation of the technological base and increased access to the same

- The propagation of this technology would bring in optimum utilisation of natural resources 'water and energy and hence conservation of natural resources.

The technology is easy for installation and has flexibility in operations. Hence farmers can easily install the micro irrigation systems on their farms. But some training needs be given to the farmers before implementing this project on ground.

SECTION B. Application of a baseline and monitoring methodology

B.1. Reference of the approved baseline and monitoring methodology(ies) selected

>>

Title of the applied baseline methodology: "Energy efficiency and fuel switching measures for agricultural facilities and activities"

Sectoral Scope 03: Energy demand

Project Type: Energy Efficiency Improvement Projects

Reference: AMS-IL.F, Version 10.0, EB 66

<http://cdm.unfccc.int/methodologies/DB/JBIGP7UXNB82DGLWTKENW64LZ5D8HD>

This methodology also refers to the latest approved versions of the following tools:

<https://cdm.unfccc.int/methodologies/SSCmethodologies/approved>

- "Tool to calculate the emission factor for an electricity system" (Version. 02.0.0, EB 70, Annex 22)



- “Guidelines for demonstrating additionality of microscale project activities” (Version. 04.0, EB 68, Annex 26)

B.2. Application of methodology(ies)

>>

The proposed PoA is applicable as per the applicability criteria mentioned in the small scale CDM methodology *AMS.II.F. Energy efficiency and fuel switching measures for agricultural facilities and activities, version 10, EB 66*.

The proposed small scale CDM project activity is of Type II: Energy efficiency improvement project activities that reduce energy consumption, on the supply and/or demand side, with a maximum output of 20 GWh per year (or an appropriate equivalent) in any year of the crediting period. The justification for the same is given below.

Applicability criteria	Justification
This category comprises any energy efficiency and/or fuel switching measures implemented in the agricultural activities of facilities or processes. This category covers project activity that encourages energy efficiency and involves fuel switching. Examples of energy-efficient practices include efficiency measures for specific agricultural processes (e.g. efficient irrigation such as drip irrigation less irrigation, etc.), and measures leading to a reduced requirement of farm power per unit area of land, reflected in less and smaller tractors, longer lifetime of tractors and less farm equipment. Further energy efficient measures would be reducing fuel use in agriculture, such as reduced machinery use through, e.g. the elimination of tillage operations, reduction of irrigation, use of lighter machinery, etc.	The measures to be implemented in each CPA will comprise of efficient irrigation system such as XXX.
The aggregate energy savings of a single project may not exceed the equivalent of 60 GWh per year.	The energy savings of this CPA is XXX GWh and will not exceed 20 GWh per year ³⁶ .

In line with the ‘Clean Development Mechanism Project Standard, Version 02.0 (EB70, Annex 02, para 81), the CPAs are classified as ‘Type II: Energy efficiency improvement project activities that reduce energy consumption, on the demand side’ and each CPA will have to demonstrate that the total annual energy savings do not exceed 20 GWh in any year during verification.

The possible list of technologies as per methodology AMS II.F which will comply with national or international standards that can be included in PoA are:

- Drip irrigation system
- Sprinkler irrigation system

The PoA and all CPAs joining this PoA will follow the applicability conditions as required by the methodology AMS II.F. Each CPA under this PoA will deploy the combination of technologies as mentioned in section A.6 of PoA DD. The CPAs included in the PoA will satisfy the inclusion criteria as

³⁶ As per the Guidelines on demonstrating additionality of micro scale project activities, the energy savings of Micro irrigation system in each CPA will be less than or equal to 20 GWh.



mentioned in section B.2 of PoA DD and implementation will be in accordance with the framework provided by PoA.

Cross Effects:

As per annex 3, EB 65, para 28 for the application of multiple small scale technologies “Combinations of technologies/ measures and/or methodologies for a PoA are eligible where it is demonstrated that there are no cross effects between the technologies/measures applied. Where such cross effects do exist, the CME shall propose methods to account for such cross effects using the “Procedures for requests to the executive board for deviation from an approved methodology” so as to ensure that the calculation of emission reductions is accurate. The technology/methodologies mentioned in the PoA do not have cross effects. However it will be checked at CPA level.

As per annex 3, EB 65, para 30 The CME may optionally use the Procedure for the submission and consideration of request for clarification on the application of approved small scale methodologies (see EB 34 report, annex 6)³⁷ to seek clarifications on cross effects in the proposed combinations.

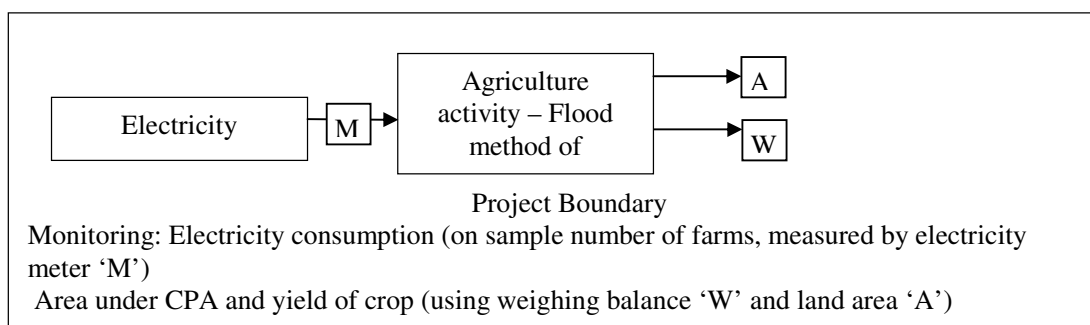
Sampling will be undertaken as a part of sampling plan that is in line with the requirements of AMS II.F: Energy efficiency and fuel switching measures for agricultural facilities and activities, version 10 EB 66 and Standard for sampling and surveys for CDM project activities and programme of activities, Version 04.0, Annex 06, EB 74 and Guidelines for sampling and surveys for CDM project activities and programme of activities, version 02, Annex 5, EB 69.

B.3. Sources and GHGs

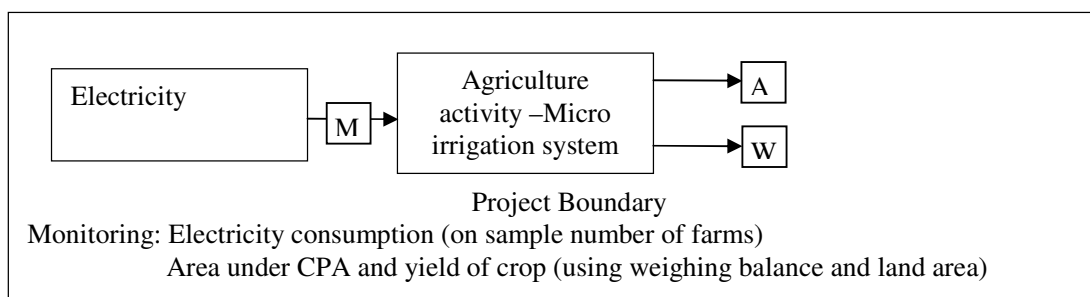
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Source	Gas	Included?	Justification/Explanation
Baseline use of less efficient agriculture facilities, processes and equipment.	CO ₂	Yes	Major source of emissions
	CH ₄	No	Minor source of emissions. Exclusion is conservative assumption.
	N ₂ O	No	Minor source of emissions. Exclusion is conservative assumption.
Project activity use of efficient irrigation implemented in the agricultural activities	CO ₂	Yes	Major source of emissions
	CH ₄	No	Minor source of emissions. Excluded for simplicity.
	N ₂ O	No	Minor source of emissions. Excluded for simplicity.

³⁷ http://cdm.unfccc.int/Reference/Procedures/methSSC_proc01_v01.pdf



Baseline



Project Activity

B.4. Description of baseline scenario

>>

The methodology (AMS IL.F./Version 10.0, para 4) describes energy baseline consists of energy use of

- The existing activity that is reduced in the case of retrofit measures; or
- The facility that would otherwise be installed in the case of new facility

As the project activity is not a retrofit measure but involves installation of a new irrigation system, the baseline applicable will be the electricity displaced by MIS that otherwise would have been consumed by FMI.

The predominant practice followed in Indian agriculture is the conventional flood method of irrigation.

A conventional irrigation method includes Surface irrigation methods like broad strip methods, check basin irrigation, furrow irrigation etc. which is in combined termed as flood irrigation method³⁸. In these methods, water from an irrigation channel is allowed to reach a part or whole of the field and spread by the gravitational flow incidental to the slope of the land. The important requirements to obtain high efficiency in surface method are (1) properly constructed water distribution systems to provide adequate flow of water to the fields; and (2) proper grading and levelling of land to achieve uniform distribution of water. All these practices require more labour, man power and mechanical power for small scale farms. Under conventional irrigation method in India, water pumps are used to flood irrigate the agricultural fields.

³⁸ <http://en.wikipedia.org/wiki/Irrigation#Surface>



Hence the baseline scenario identified is the electricity consumption for pumping irrigation water under conventional flood method of irrigation and the emission is determined based on the electricity (kWh/ha) consumed by the equipment installed per hectare per tonne of produce.

The host country government through various measures is taking efforts to improve the agricultural practices³⁹. Thus, any situation where ‘future emissions by sources may rise above current levels’ is unlikely. Thus, the Guidelines on the consideration of suppressed demand in CDM methodologies (Version 02.0, EB 68, Annex 2) is not applied here. Further, there are no policies that give relative advantage to emission intensive technologies in the irrigation sector⁴⁰. Thus, the consideration of E+/E- policies was not used here.

Determination of baseline

The host country government through various measures is taking efforts to improve the agricultural practices⁴¹. Thus, any situation where ‘future emissions by sources may rise above current levels’ is unlikely. Thus, the Guidelines on the consideration of suppressed demand in CDM methodologies (Version 02.0, EB 68, Annex 2) is not applied here.

Baseline determination has been conducted based on XXXXXXXX survey report as per para 10 of the SSC methodology AMS II.F, version 10. The project activity is being implemented in XXXX village, XXXX taluka, XXXXX state. The objective of the study is to conduct a field survey and do the analysis of electricity consumption in irrigating crops through XXX and flood method of irrigation (FMI). The regions selected for baseline survey are as follow:

District	Taluka	Village	Model and rated capacity of Pump/ connected motor	Name of crop cultivated
XXXX	XXXX	XXXX	XXXX	XXXX
XXXX	XXXX	XXXX	XXXX	XXXX
Add the columns and rows as required				

Cropping Pattern: Rabbi/ Kharif/ XXXX and Crop types: Banana/Cotton/ Onion/ XXXX
(Insert table if necessary)

Soil Type: XXXX
(Insert table if necessary)

Electricity consumption per unit irrigated area (kWh/Ha) for the crop duration using XXXX over FMI

Crop	Electricity Consumption per unit Irrigated Area (kWh/Ha) for Complete Crop Duration ⁴²	
	in baseline	in FMI
XXXX (e.g. Banana)	XXXX (e.g. Rabbi)	XXXX
XXXX	XXXX	XXXX
XXXX	XXXX	XXXX

³⁹ Evidence shared with the DOE

⁴⁰ As evident from the removal of subsidies on diesel (http://articles.timesofindia.indiatimes.com/2013-01-18/india/36414647_1_diesel-price-subsidized-cylinder-litre)

⁴¹ Please refer Section ‘Agriculture Demand Side Management (Ag DSM)’ on web link http://powermin.nic.in/acts_notification/energy_conservation_act/introduction.htm

⁴² Baseline survey (to be conducted in each new CPA as field conditions vary – based on region, climate, crops)



Saving in electricity consumption using XXXX over FMI as per the baseline survey report.

Crop	Energy consumption using MIS	Saving in Electricity Consumption per unit irrigated area (kWh/Ha) for the crop the duration using MIS (DMI/ SMI/ XXXX) over FMI
XXXX	XXXX	XXXX
XXXX	XXXX	XXXX

The electricity consumption for pumping irrigation water under FMI is determined, based on the electricity (kWh/ha) consumed by the equipment installed per hectare per tonne of produce, using the following equation:

For Flood Irrigation:

$$EC_{i,FMI,y} \Big|_{i=1}^n = \sum_{j=1}^n EC_{j,FMI,y} / A_{j,FMI}$$

Where,

- $EC_{i,FMI,y}$ = Specific energy consumption per unit area (in ha) of XXXX crop in the baseline area in FMI (kWh/ha/y)
- $EC_{i,FMI,y}$ = Total energy consumption by water pumping system in FMI (kWh/y)
- $A_{i,FMI}$ = Area and yield of XXXX crop in FMI (hectares)
- i = Sub-region of area (taluka) under FMI, varies from 1 to n
- j = Farms selected in the sub-region as per 'Standard for sampling and surveys for CDM project activities and programme of activities'.
- n = Total number of farms in the sub-region

☐ For Drip Irrigation:

The electricity consumption for pumping water under DMI is determined, based on the electricity (kWh/ha) consumed by the equipment installed per hectare, using the following equation:

$$EC_{i,DMI,y} \Big|_{i=1}^n = \sum_{j=1}^n EC_{j,DMI,y} / A_{j,DMI}$$

Where,

- $EC_{i,DMI,y}$ = Specific energy consumption per unit area (in ha) of XXXX crop in the project area with DMI in the year y (kWh/ha/y)
- $EC_{i,DMI,y}$ = Total energy consumption by the DMI irrigation (kWh/y)
- $A_{i,DMI}$ = Area of XXXX crop irrigated by DMI (hectares)
- i = Sub-region of area under DMI, varies from 1 to n
- j = Farms selected in the sub-region as per 'Standard for sampling and surveys for CDM project activities and programme of activities'
- n = Total number of farms in the sub-region

In multiple crop scenario the formula will be repeated as per the number of crops

☐ For Sprinkler Irrigation:

$$EC_{i,SMI,y} \Big|_{i=1}^n = \sum_{j=1}^n EC_{j,SMI,y} / A_{j,SMI}$$

$EC_{i,SML,y}$	=	Specific energy consumption per unit area (in ha) of XXXX crop in the project area with DMI in the year y (kWh/ha/y)
$EC_{i,SML,y}$	=	Total energy consumption by the DMI irrigation (kWh/y)
$A_{i,SML}$	=	Area of XXXX crop irrigated by DMI (hectares)
i	=	Sub-region of area under DMI, varies from 1 to n
j	=	Farms selected in the sub-region as per 'Standard for sampling and surveys for CDM project activities and programme of activities'.
n	=	Total number of farms in the sub-region

In multiple crop scenario, the formula will be repeated as per the different types of crops.

The actual electricity (kWh/ha) consumption shall be monitored ex-post and the value thus arrived will be reckoned to arrive at emission reductions.

The specific energy consumption of FMI and XXXX (project technology MIS) are multiplied with area to arrive total energy consumption using FMI and XXXX (project technology MIS) and the same are multiplied with grid emission factor to calculate baseline emission.

B.5. Demonstration of eligibility for a generic CPA

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S.N	Eligibility Criteria	Justification
A	Each CPA will be located within the geographical boundary of India.	Each CPA will be located at XXXX district and is within the geographical boundary of India.
B	Conditions that avoid double counting of emission reductions like unique identifications of product and end-user locations (e.g. programme logo)	<p>The micro-irrigation system to be installed in each CPA will be given (in the database maintained by CME)</p> <ul style="list-style-type: none"> ● Acronym/title of the programme ● Unique identification number (CPA No. XX – District XX – Taluka XX – sub-project No. XX) ● Farm holder Name ● Location of CPA with geo coordinates ● Type of MIS (drip and/or sprinkler) ● Capacity of pumps <p>Further, an undertaking will be taken from the CPA implementer to confirm that any MIS system is not part of any other CDM project activity or PoA.</p>
C	The specifications of technology/measure including the level and type of service, performance specifications including compliance with testing/certifications.	<p>b. The micro irrigation technology to be installed under the proposed SSC- PoA will follow the following or latest available/ applicable IS standards</p> <p><input type="checkbox"/> Drip irrigation: e.g. Laterals – IS 12786: 1989⁴³ Emitter – IS 13487: 1992⁴⁴ Inline – IS 13488: 2008⁴⁵</p>

⁴³ <https://law.resource.org/pub/in/bis/is.12786.1989.pdf>

⁴⁴ <https://law.resource.org/pub/in/bis/is.13487.1992.pdf>



		<p>Filter – IS 12785: 1994⁴⁶</p> <p><input type="checkbox"/> <i>Sprinkler irrigation:</i> e.g. IS 14151 (Part 2): 2008⁴⁷ IS 14792 : 2000⁴⁸ IS 12232 (Part 2) : 1995⁴⁹ If any new technology is invented, relevant IS standards will be used.</p>
D	Conditions to check the start date of the CPA through documentary evidence.	<p>CPA has a project start date on or after start date of the PoA with documentary evidences.</p> <p><input type="checkbox"/> Sale/ purchase bill / invoice of MIS by farmer/ CPA implementer</p> <p><input type="checkbox"/> Any other commitment to implement project (in case there is no sale/ purchase bill/ invoice available).</p>
E	Conditions that ensure compliance with applicability and other requirements of single or multiple methodology/ies applied by CPAs	<p>The CPA is using AMS II.F methodology and each CPA will satisfy the following applicability criteria described in approved methodology AMS II.F <i>Energy efficiency and fuel switching measures for agricultural facilities and activities version 10, EB 66</i></p> <ul style="list-style-type: none"> • This category comprises any energy efficiency measure implemented in agricultural activities of or facilities or processes. This category covers project activities that encourage energy efficiency. Examples of energy-efficient practices include efficiency measures for specific agricultural processes (e.g. efficient irrigation such as micro irrigation less irrigation, etc.), and measures leading to a reduced requirement of farm power per unit area of land, reflected in less and smaller tractors, longer lifetime of tractors and less farm equipment. <p>The measures may be a replacement on existing equipment or equipment being installed in a new facility. The aggregate energy savings of a single project will not exceed the equivalent of 20 GWh per year⁵⁰.</p>
F	The conditions that ensure that CPAs meet the requirements pertaining to the demonstration of additionality.	This PoA demonstrates additionality at the PoA level. Thus, each CPA will not be required to demonstrate the additionality as per the requirements of Guidelines on demonstrating additionality of micro scale project activities (Version 04.0), Annex 26, EB 68.
G	The PoA-specific requirements stipulated by the CMEs	Each CPA will undertake local stakeholder consultations following :

⁴⁵ <https://law.resource.org/pub/in/bis/is.13488.2008.pdf>

⁴⁶ <https://law.resource.org/pub/in/bis/is.12785.1994.pdf>

⁴⁷ <https://law.resource.org/pub/in/bis/is.14151.2.2008.html>

⁴⁸ <https://law.resource.org/pub/in/bis/is.14792.2000.html>

⁴⁹ <https://law.resource.org/pub/in/bis/is.12232.2.1995.html>

⁵⁰ As per the Guidelines on demonstrating additionality of micro scale project activities, the energy savings of Micro irrigation system in each CPA will be less than or equal to 20 GWh.



	including any conditions related to undertaking local stakeholder consultations and environmental impact analysis.	<ul style="list-style-type: none"> • Identification of local stakeholders identified by CME and CPA implementer • Invitation to local stakeholder consultation or meets • Demonstrating the CPA project activity • Inviting comments from stakeholders • Minutes of the meetings <p>The project activity does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment and Forest, Government of India, 2006⁵¹. Hence, it is not required for this programme.</p>
H	Conditions to provide an affirmation that funding from Annex I parties if any, does not result in a diversion of official development assistance.	<p>The CME and the CPA implementer shall confirm that in case of public funding there shall not be diversion of Official Development Assistance by following:</p> <p><input type="checkbox"/> Undertaking by CPA Implementer to CME</p> <p><input type="checkbox"/> Certificate by CPA implementer's chartered accountant during verification.</p>
I	Where applicable, target group (e.g. domestic/commercial/industrial, rural/urban, grid-connected/off-grid) and distribution mechanisms (e.g. direct installation)	For each CPA the target beneficiaries will be the farmers currently practising flood method of irrigation consuming more electricity for pumping of water for irrigation compared to micro irrigation method. The CPA implementer will identify the target beneficiaries identified by the data collection from Government records, dealers contact list, area managers data sheets etc.
J	Where applicable, the conditions related to sampling requirements for a PoA in accordance with the approved guidelines/standard from the Board pertaining to sampling and surveys.	Each CPA will conduct sampling and surveying as appropriate or applicable based on requirements of "Standard for sampling and surveys for CDM project activities and programme of activities", version 04.0, Annex 06, EB 74 and "Guidelines for sampling and surveys for CDM project activities and programme of activities", version 02, Annex 5, EB 69.
K	Where applicable, the conditions that ensure that CPA in aggregate meets the small-scale or micro-scale threshold criteria and remain within those thresholds throughout the crediting period of the CPA.	<p>Each CPA will meet the following small-scale threshold criteria as per EB 61, Annex 21, "General Guidelines to SSC CDM methodologies", version 17.</p> <p>The CPA deploys the Micro irrigation system with energy savings XXX GWh and it does not exceed the equivalent of 60 GWh per year throughout the crediting period.</p> <p>However as per the Guidelines on demonstrating additionality of micro scale project activities, the energy savings of Micro irrigation system in each CPA will be less than or equal to 20 GWh.</p>

B.6. Estimation of emission reductions of a generic CPA

B.6.1. Explanation of methodological choices

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The methodology selected for the proposed SSC PoA is "AMS.II.F Energy efficiency and fuel switching measures for agricultural facilities and activities", version 10 EB 66

As per para 4 of AMS II.F the energy baseline consists of the energy use of:

⁵¹ <http://www.envfor.nic.in/legis/eia/so1533.pdf>



- (a) The existing activity that is reduced in the case of retrofit measures; or
- (b) The facility that would otherwise be installed in the case of a new facility.

As per para 5 of AMS II. F, if the energy displaced is a fossil fuel, the energy baseline is the existing fuel consumption or the amount of fuel that would be used by the practice that would have been implemented otherwise, i.e. total fuel consumption in the project area per year for field operations and average fuel consumption per unit area (ha), crop yield and year.

As per para 7 of AMS II. F, each energy form in the baseline/project is multiplied by an emission coefficient (in kg CO₂e/kWh) in order to derive the baseline and project emissions. For the electricity displaced, the emission coefficient is calculated in accordance with provisions under category I.D. For fossil fuels, the IPCC default values for emission coefficients may be used.

Baseline Emission (BE_y):

As discussed in the para above, AMS I.D (version 17) is used to calculate the emission coefficient of grid.

The baseline emissions are calculated as the product of total fuel/ electricity consumption of all the pumps of the sample area selected for conventional method of irrigation and emission factor of respective grid. In this PoA, as only electricity based pumps are considered, the fuel consumption is not applicable and thus only electricity consumption is monitored and used for baseline emission calculation.

$$BE_y = EC_b * A_b * EF$$

EC_b – Electricity consumed in the baseline, kWh/ha

A_b – Area under baseline region⁵², hectares

EF – Emission factor of grid, tCO₂/MWh

Calculation of Grid Emission Factor

As the project activity displaces grid electricity, the baseline for the project activity is the amount of electricity displaced or removed from the grid, which shall be calculated as net energy avoided from the grid multiplied by an emission factor of the grid as per CEA database version 7.

As per paragraph 12 of AMS I.D. v17 the emission factor can be calculated as following:

- a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the ‘Tool to calculate the emission factor for an electricity system’.

Or

- b) The weighted average emissions (in kg CO₂e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used. Calculations must be based on data from an official source (where available) and made publicly available.

Here, following step wise calculation is done

⁵² The specific energy consumption is irrespective of crop type as it is normalised during calculation above. The conservativeness of this will be ensured using good sampling practice – good representation of each project sub-area under the CPAs

Step 1: Identify the relevant electricity systems

For determining the electricity emission factors, identify the relevant a project electricity system. The host country DNA has considered delineation of the national grid⁵³ the project is connected to

☐ NEWNE grid

☐ southern grid

Thus the relevant electricity system is **INSERT name of grid**.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.

Option II: Both grid power plants and off-grid power plants are included in the calculation.

As per the CEA report referred above, Captive power stations and Small decentralised generation sets are not accounted for in the database. Thus, PP chooses Option I - Only grid power plants are included in the calculation.

Step 3: Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods, which are described under Step 4:

(a) Simple OM; or

(b) Simple adjusted OM; or

(c) Dispatch data analysis OM; or

(d) Average OM.

Further, the simple OM method (Option a) can only be used if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

As per the CEA report referred above, in India, hydro and nuclear stations qualify as low-cost / must run sources.

Share of Must-Run (Hydro/Nuclear) (% of Net Generation)					
	2006-07	2007-08	2008-09	2009-10	2010-11
NEWNE	18.5%	19.0%	17.4%	15.9%	17.6%
Southern	28.3%	27.1%	22.8%	20.6%	21.0%

As can be seen above, the share of must run sources is always less than 50% in **INSERT name of grid**. Thus, option (a) Simple OM is chosen here.

Here, PP chooses ex-ante emission factor calculation and hence this emission factor will be calculated at validation stage and will be fixed for the chosen fixed crediting period.

Step 4: Calculate the operating margin emission factor according to the selected method

In the step above, PP has chosen simple OM. The simple OM emission factor is calculated as the generation-weighted average CO₂ emissions per unit net electricity generation (tCO₂/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

⁵³ Central Electricity Authority, CO₂ baseline database for the Indian Power Sector, latest Version 07 of the report is used. http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

As per CEA report referred (pg. 14-15), individual power plant data is used and thus the following option is chosen.

Option A: Based on the net electricity generation and a CO₂ emission factor of each power unit

The recent three years generation weighted average OM is as below.

INSERT name of grid

Year		2008-09	2009-10	2010-11	Average
OM (tCO ₂ /MWh)	NEWNE Grid	1.01	0.98	0.97	0.98
OM (tCO ₂ /MWh)	South Grid	0.97	0.94	0.94	0.95

Step 5: Calculate the build margin (BM) emission factor

In terms of vintage of data, project participant has chosen Option 1 – ex-ante emission factor. As per the CEA report, the BM of INSERT name of grid for the year INSERT year is INSERT value tCO₂/MWh.

NENWNE grid = 0.86 tCO₂/MWh

South grid = 0.73 tCO₂/MWh

Step 6: Calculate the combined margin emissions factor

The Option (a) Weighted average CM is chosen and calculated as below

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM}$$

Where:

- $EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (tCO₂/MWh)
- $EF_{grid,OM,y}$ = Operating margin CO₂ emission factor in year y (tCO₂/MWh)
- W_{OM} = Weighting of operating margin emissions factor (%)
- W_{BM} = Weighting of build margin emissions factor (%)

As per the Tool, for other (than solar and wind) projects, the weighted factors are $W_{OM}=0.5$ and $W_{BM} = 0.5$.

For INSERT name of grid

Thus,

$$EF_{grid,CM,y} = 0.5 \times \text{INSERT OM value} + 0.5 \times \text{INSERT BM value}$$
$$= \text{INSERT value tCO}_2/\text{MWh}$$

NENWNE grid = 0.92 tCO₂/MWh

South grid = 0.84 tCO₂/MWh

The pumps using fossil fuels will not be included in the PoA.

Project Emission (PE_y):

The project emissions are calculated as the product of total electricity consumption of all the pumps of the sample area selected for micro irrigation method and emission factor of respective grid.



$$PEy = EC_p * A_p * EF$$

EC_p – Electricity consumed in the project, kWh/ha

A_p – Area under project region, hectares

EF – Emission factor of grid, tCO₂/MWh

Leakage, LEy:

Since there is no change in pump, there is no transfer of equipment from outside the boundary⁵⁴ to the project activity and hence leakage is considered to be zero. The para 12 of the SSC meth is related to ‘fuel extraction, processing, liquefaction, transportation, regasification and distribution of fossil fuels outside of the project boundary’. The PoA will use only water pumps that use electricity. It is already clarified that this PoA will not use pumps that operate on fossil fuels. Thus, leakage as per para 12 is not applicable here.

Hence,

$$LEy = 0$$

Emission Reduction (ERy)

$$ERy = BEy - PEy - LEy$$

B.6.2. Data and parameters that are to be reported ex-ante

Data / Parameter	EC _b
Unit	kWh/ha
Description	Electricity consumption for the pumping of water for irrigation in the baseline
Source of data	Baseline survey report
Value(s) applied	XXX (Name of Crop/s) = XXX
Choice of data or Measurement methods and procedures	sample survey basis - this is as per AMS II.F, version 10, para 10
Purpose of data	The data is used to estimate the baseline emissions
Additional comment	For each new area where climatic conditions/ water availability and more of irrigation varies, a new baseline survey will be undertaken

⁵⁴ In this CPA, only new equipments from the original equipment manufacturers (OEM) can be used and hence leakage is ruled out.



Data / Parameter	EF_{OM,y}
Unit	tCO ₂ /MWh
Description	Operating margin CO ₂ emission factor of grid, in which the project activity displaced the electricity during the year y
Source of data	CEA CO ₂ Baseline Database for the Indian Power Sector, version 07
Value(s) applied	<input type="checkbox"/> For NEWNE grid = 0.98 <input type="checkbox"/> For Southern grid = 0.95
Choice of data or Measurement methods and procedures	The CEA is the prime authority of Indian power sector for determining the guidelines and norms and the authority publishes all data relevant to the Indian power sector. The CO ₂ data base for Indian power sector published by CEA is made available publicly and established in accordance with the guidelines of UNFCCC. Hence, the application of data published by CEA is transparent and conservative.
Purpose of data	The data used to estimate baseline and project emissions
Additional comment	-

Data / Parameter	EF_{BM,y}
Unit	tCO ₂ /MWh
Description	Build margin CO ₂ emission factor of grid, in which the project activity displaced the electricity during the year y
Source of data	CEA CO ₂ Baseline Database for the Indian Power Sector, version 07
Value(s) applied	<input type="checkbox"/> For NEWNE grid = 0.86 <input type="checkbox"/> For Southern grid = 0.73
Choice of data or Measurement methods and procedures	The CEA is the prime authority of Indian power sector for determining the guidelines and norms and the authority publishes all data relevant to the Indian power sector. The CO ₂ data base for Indian power sector published by CEA is made available publicly and established in accordance with the guidelines of UNFCCC. Hence, the application of data published by CEA is transparent and conservative.
Purpose of data	The data used to estimate baseline and project emissions
Additional comment	-



Data / Parameter	EF_y
Unit	tCO ₂ /MWh
Description	is the CO ₂ emission factor of grid, in which the project activity displaced the electricity during the year y
Source of data	CEA CO ₂ Baseline Database for the Indian Power Sector
Value(s) applied	<input type="checkbox"/> For NEWNE grid = 0.92 <input type="checkbox"/> For Southern grid = 0.84
Choice of data or Measurement methods and procedures	The CEA is the prime authority of Indian power sector for determining the guidelines and norms and the authority publishes all data relevant to the Indian power sector. The CO ₂ data base for Indian power sector published by CEA is made available publicly and established in accordance with the guidelines of UNFCCC. Hence, the application of data published by CEA is transparent and conservative.
Purpose of data	The data used to estimate baseline and project emissions
Additional comment	The emission factor is fixed for the crediting period without need to monitor and update during verification

Data / Parameter	A_b
Unit	Hectares
Description	Total baseline area selected in the CPA
Source of data	The record maintained by the CPA implementer
Value(s) applied	XXX (Name of Crop/s) = XXX
Choice of data or Measurement methods and procedures	The area under cultivation using conventional flood method of irrigation.
Purpose of data	The data used to estimate the baseline emissions
Additional comment	-

B.6.3. Ex-ante calculations of emission reductions

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The formulae used below are not crop specific, hence these are applicable to all crops under the PoA.

Baseline Emission (BE_y):

The baseline emissions are calculated as the product of total fuel/ electricity consumption of all the pumps of the sample area selected for conventional method of irrigation and emission factor of respective grid.

$$BE_y = EC_b * A_b * EF$$

☐ For a single crop:

Specific energy consumption per unit area (in ha) of XXXX crop in the baseline area with FMI is given by using the formula:

$$EC_{i,FM,y} \Big|_{i=1}^n = \sum_{j=1}^n EC_{j,FMI,y} / A_{j,FMI}$$



$$\text{Specific Energy Consumption (EC}_{i,\text{FMI},y}) = \text{XXXX kWh /ha/y}$$

Total electricity Consumption in the Baseline scenario for crop XXXX is arrived at by applying the following formula:

$$\begin{aligned} \text{EC}_{by} &= \text{EC}_{i,\text{FMI},y} * A_b \\ &= \text{XXXX} * \text{XXXX} \end{aligned}$$

Hence for a XXXX:

$$\text{BE}_y = \text{XXX} (\text{EC}_{by}) * \text{XXXX} (\text{EF}) / 1000$$

$$\begin{aligned} \text{EF} &= \square \text{ For NEWNE grid} = 0.9215 \\ &\square \text{ For Southern grid} = 0.8426 \end{aligned}$$

$$\text{Total Baseline Emission} = \text{XXX tCO}_2$$

In multiple crop scenario the formula will be repeated as per the number of crops.

Project Emission (PE_y):

The project emissions are calculated as the product of total electricity consumption of all the pumps of the sample area selected for micro irrigation method and emission factor of respective grid.

$$\square \text{ For a single crop: } \text{EC}_p * A_p * E$$

Specific energy consumption per unit area (in ha) of XXXX crop in the baseline area with XXMI is given by using the formula:

$$\square \text{ For Drip Irrigation}$$

$$\text{EC}_{i,\text{DMI},y} \Big|_{i=1}^n = \sum_{j=1}^n \text{EC}_{j,\text{DMI},y} / A_{j,\text{DMI}}$$

$$\square \text{ For Sprinkler Irrigation}$$

$$\text{EC}_{i,\text{SMI},y} \Big|_{i=1}^{10} = \sum_{j=1}^n \text{EC}_{j,\text{SMI},y} / A_{j,\text{SMI}}$$

$$\begin{aligned} \text{Specific Energy Consumption EC}_{i,\text{XMI},y}) &= \text{XXXX} \\ &= \text{XXXX kWh /ha/y} \end{aligned}$$

Total electricity Consumption in the Project scenario for crop XXXX is arrived at by applying the following formula:

X = D for DMI and

X = S for SMI

$$\begin{aligned} \text{EC}_{by} &= \text{EC}_{i,\text{XMI},y} * A_p \\ &= \text{XXXX} * \text{XXXX} \end{aligned}$$



Hence for a XXXX crop: $PE_y = XXX (EC_{py}) * XXX (EF) / 1000$

Total Project Emission = XXX tCO₂

In multiple crop scenario the formula will be repeated as per the number of crops.

EF = ☐ For NEWNE grid = 0.9215
☐ For Southern grid = 0.8426

$PE_{y(Total)} = PE_{y(crop A)} + PE_{y(crop B)} + + PE_{y(crop N)}$

Total project emission = XXX tCO₂

If both the irrigation systems are used in the CPA then project emission will be determined as follows:

$PE_{y(Total)} = PE_{y(Total \text{ of DMI})} + PE_{y(Total \text{ of SMI})} + PE_{y(MIS)}$

Leakage, (LE_y):

Since there is no transfer of equipment from outside leakage is considered to be zero. Hence,
 $Ly = 0$

The para 12 of the SSC meth states ‘fuel extraction, processing, liquefaction, transportation, regasification and distribution of fossil fuels outside of the project boundary’. The PoA will use only water pumps that use electricity. Thus, leakage as per para 12 is not applicable here.

Emission Reduction (ER_y)

$ER_y = BE_y - PE_y - LE_y$

$ER_y = XXX (BE_y) - XXX (PE_y) - XXX (LE_y)$

Total Emission Reduction = XXX tCO₂e

B.7. Application of the monitoring methodology and description of the monitoring plan

B.7.1. Data and parameters to be monitored by each generic CPA



Data / Parameter	EC _{by}
Unit	kWh/ha
Description	Total electricity consumption of all pumps in the baseline region
Source of data	On site measurements (from baseline survey report)
Value(s) applied	XXX (Name of crop/s) – XXXX (Value).
Measurement methods and procedures	Energy meters will be installed for the appropriate number of pumps as per sample size calculated Type of meter: Energy meter Accuracy: 1.0 class ⁵⁵ Responsible entity for measurement: Representative of CPA implementer Calibration: Onsite zero check and reset and third party calibration if required ⁵⁶ , once in three years ⁵⁷
Monitoring frequency	Continuous monitoring with monthly recording
QA/QC procedures	The Meters used for recording the electricity consumption will be calibrated once in three years.
Purpose of data	The data is used to estimate the baseline emissions.
Additional comment	The data will be archived electronically for 2 years after the end of the crediting period or the last issuance of CERs, whichever is later.

⁵⁵ In line with 'IEC 61036' OR equivalent IS 13779:1999 compliance (specification of a meter following this is shared with the DOE)

⁵⁶ as will be determined by trained electrician (e.g. ITI or equivalent)

⁵⁷ The calibration frequency is once in three years. This is lower than once in five years specified by Ministry of Power specification (http://powermin.nic.in/whats_new/pdf/Metering_Regulations.pdf). As per 'Clean development mechanism project standard' (Ver. 02, EB 70, Ann 02, para 56f), the calibration should be carried out in accordance with the local/ national standards or the manufacturer specification. As here CME has used National guidance, this is in line with the referred CDM guidance.



Data / Parameter	Ap
Unit	Hectares
Description	Total crop wise area selected for CPA
Source of data	The record maintained by the CPA implementer: Summation of farm land data from official documents (any of the following) of programme signatory farmers/ beneficiaries <input type="checkbox"/> 7/12 extract <input type="checkbox"/> Form 8A certified by talati / certified by government officials <input type="checkbox"/> XXX (Any other authentic document)
Value(s) applied	XXX (Name of crop/s) – XXXX (Value)
Measurement methods and procedures	Summation of farm land data from official documents (any of the above) of programme signatory farmers/ beneficiaries
Monitoring frequency	Annually
QA/QC procedures	The agreements to be part of the CPA by individual farmers signed with the CPA Implementer
Purpose of data	The data used to estimate the project emissions.
Additional comments	The data will be archived electronically for 2 years after the end of the crediting period or the last issuance of CERs, whichever is later.

Data / Parameter	EC _{py}
Unit	kWh/ha
Description	Total electricity consumption of all pumps in the project region.
Source of data	On-site measurements from sampled energy meters on farms
Value(s) applied	XXX (Name of crop/s) – XXXX (Value)
Measurement methods and procedures	The energy meter will be installed to sample group and electricity consumed by each meter in the project area. Meter: Energy meter Accuracy class ⁵⁸ : 1.0 Responsible entity for measurement: Representative of CPA implementer Calibration: Onsite zero check and reset and third party calibration if required once in three years
Monitoring frequency	Continuous monitoring with monthly recording
QA/QC procedures	The Meters used for recording the electricity consumption will be calibrated once in three years ⁵⁹ . The responsible entity for the calibration will be CPA implementer.
Purpose of data	The data used to estimate the baseline emissions.
Additional comments	The data will be archived electronically for 2 years after the end of the crediting period or the last issuance of CERs, whichever is later.

⁵⁸ MSEDCL – Technical Specifications for Agricultural Metering, Para 4.0
(<http://www.mahadiscom.com/compliance/LT%20AGR%20MTR%20SPECIFICATIONS.pdf>)

⁵⁹ This is lower than once in five years specified by Ministry of Power specification
(http://powermin.nic.in/whats_new/pdf/Metering_Regulations.pdf)



Data / Parameter	Y_{py}
Unit	Tons
Description	Total crop yield achieved in the project area
Source of data	As per sampling procedure, EB 69, Annex 4 for weight: measurements provided by crop purchaser/ traders at the time of crop purchase. for land area: land documents and records of crop distribution in land
Value(s) applied	XXX
Measurement methods and procedures	The total yield will be weighed by the calibrated weigh meters and the quantity will be cross checked with sale records/receipt provided by the purchaser for making the payment. The parameter will be monitored for the sample number of farmers. The accuracy of weighing systems = Minimum 0.1% of full scale Calibration weighing scale: Once in two years ⁶⁰
Monitoring frequency	The monitoring of yield from the crops will be done annually.
QA/QC procedures	The weigh meters used for recording the weight of the crop yield will be calibrated once in every two years. The data can be cross checked against the sales records.
Purpose of data	The data used to estimate the baseline emissions.
Additional comments	It is not practical to use weight bridge/ weighing machines at individual farms. Hence, standard commercial weighing machines used by crop purchasers will be used. These are owned by traders/ shop keepers and make payments based on these measurements.

B.7.2. Description of the monitoring plan for a generic CPA

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As per the methodology AMS II F para 11 and 12 monitoring shall consists of

- 1) EC_{py} = Energy use due to the new MIS equipment installed
- 2) ES = Energy savings due to equipment installed
- 3) A_p = Number of ha cultivated (area under cultivation)
- 4) Y_{py} = Crop yield

As per para 10 (a) & (b) of AMS II F version 10.0, EB 66, monitoring shall consist of

- Metering the energy use of the equipment installed (individually or on sample basis with a confidence/precision level of 90/10, applying the ‘Standard for sampling and surveys for CDM project activities and programme of activities’);
- Calculating the energy savings due to the equipment installed.

As per para 11 of AMS II F version 10.0, Monitoring will also involve the scale (e.g. number of ha cultivated, crop yield) of agricultural activities, in order to ensure that reduced energy consumption is not due to downscaling of activities. Energy use must be for equivalent services.

Sampling

⁶⁰ <http://weights.delhigovt.nic.in/FAQs.htm>



Parameters determined through a representative sample will perform sampling as specified by the “*Standard for sampling and surveys for CDM project activities and programme of activities*”, version 04.0, Annex 06, EB 74 and “*Guidelines for sampling & surveys for CDM project activities and programme of activities*”, version 02.0, Annex 5, EB 69.

Objective:

To determine the number of instruments in use, average electricity consumption and electricity savings compared to conventional methods of irrigation. The average efficiency of the appliance will be assessed using a 90/10 confidence/precision if assessed annually.

Field measurements and data to be collected:-

- 1) Electricity consumption of the equipment. This can be done by taking the readings of the 3 phase meters installed on the pump sets.
- 2) Energy savings can be determined by comparing the energy consumption of the project area with base line energy consumption.
- 3) Area under cultivation can be determined by the collecting 7/12 as well as 8A abstract⁶¹ of the farmer and the record maintained at the distributor.
- 4) Crop yields will be determined by the receipts of goods sold by the farmer to the middleman/APMC markets/ etc.

Target Population:

The target population is total area under micro irrigation system e.g. XXX ha. As per the XXX, the average land holding is XXX ha. Thus, average number of farmers/ land owners to be included in CPA is $XXX/XXX = XXX$

Sample Method:

The sampling and survey will be conducted based on the sampling procedure given by “Standard for sampling and surveys for CDM project activities and Programme of Activities”, version 04.0, Annex 06, EB 74 and “Guidelines for sampling & surveys for CDM project activities and programme of activities”, version 02.0, Annex 5, EB 69.

The programme will be spread across India and hence the cultivation pattern and other parameters vary from place to place. The number of samples to be collected from area of land under Micro irrigation on 90% probability level and 10% error of estimation in each CPA.

The sampling of land under each CPA will result in following information:

- Number of hectare cultivated in each year
- Crop yield every year
- Energy consumption
- Energy savings.

The monitoring shall ensure that the energy consumed by the micro irrigation is same for the agricultural activities and in any case the reduction in energy consumption is not due to the reduction in agricultural activities. The cross checking of the energy consumption will be done based on the energy meter reading in each CPA under Micro irrigation. The meter reading is recorded and the energy savings is calculated each year.

⁶¹ It is a proof of total land holding of an individual farmer

The land holders/ staff appointed by CPA Implementer will record the energy consumption by micro irrigation in each land based on the reading by energy meter installed in the project area. The records will be provided to the CPA implementer who in turn will report to Coordinating/managing entity.

The monitoring report will be prepared by each CPA implementer every year based on the energy consumption data recorded by energy meter installed in the project activity

Sample Size:

The determination of sample size will be done either manually or using appropriate statistical software as described in EB 69, Annex 4.

As per “Guidelines for sampling & surveys for CDM project activities and programme of activities”, version 02.0, annex 5, EB 69, for sample size calculation for small scale projects 90% confidence and margin of error of 10% is required.

The illustration of sample size calculation using the formula given in above guidelines is shown below

$$n \geq \frac{1.645^2 NV}{(N-1) \times 0.1^2 + 1.645^2 V}$$

Where:

$$V = \frac{p(1-p)}{p^2}$$

Illustration for 90/10 level:

Where:

n	Sample size
N	Total number of households
p	Our expected proportion (XXX)
1.645	Represents the 90% confidence required
0.1	Represents the 10% relative precision

This gives sample size = XXX farmers with 90/10 confidence level. Assuming that 10% of the beneficiaries’ do not respond, an approach of scale up will be used as follows.

No of sample after scale up = XXX/0.9 = XXX

Assessing the parameters:

The parameter EC_{py} will be assessed by installing the 3 phase meters at farmers’ fields on randomly selected sample of equipments/ motors. The readings will be recorded once in month and aggregated annually. CPA implementer will confirm that the records are being maintained and are collected monthly and aggregated annually. Also the meters will be calibrated once in three years. CPA implementer will make sure that that data collection and calibration will be done by well trained staff. The CPA implementer will verify that the all the staff /third party appointed by the CPA implementer are sufficiently trained. The data will be maintained by CPA implementer and will be submitted to CME at the end of month. The record will be made available to the DOE during verification.



The parameter ES is determined by comparing the energy consumption in baseline i.e. during flood method of irrigation and project i.e. during micro irrigation method.

Implementation:

Staff/ third party agency appointed by the CPA Implementer will conduct the sampling and determines the various monitoring parameters in individual CPAs.

Maintenance of a list of verification procedures to be applied to each CPA

The coordinating/ managing entity will develop and continuously update a list of CPAs for individual verification.

Collection of monitored parameters and elaboration of the monitoring plan

The monitoring report will compile all required monitoring information for all CPAs that will be verified by the DOE. This report will unambiguously set out the data relating to the emission reductions generated by each specific CPA during the monitoring period consistent with the requirements of this PoA-DD and the corresponding CPA-DD.

Emergency Plan

The emergency plan is covered by monitoring 10% more samples than that required as per the sampling guidance. The faulty/ data where there is doubt will be discarded.

QA/QC procedure by CME:

The DOE performs a desk review of the monitoring information of all CPAs as per procedures determined by the CDM Validation and Verification Standard.

At the end of the desk review the coordinating entity shall provide an updated monitoring report elaborated in light of the DOE findings. The DOE approves the final monitoring report provided by the coordinating entity and certifies that (i) the list and type of data collected and provided within the monitoring report is consistent with the monitoring plan of each CPA (ii) ERs are estimated as described in the respective CPA-DD and are not miscalculated.

**Appendix 1: Contact information on entity/individual responsible for the PoA**

Organization	Mahindra & Mahindra Ltd, Farm Equipment Sector
Street/P.O. Box	Gate No. 2, Akurli Road, Kandivali (East)
Building	-
City	Mumbai
State/Region	Maharashtra
Postcode	400 101
Country	India
Telephone	+ 91-22-6648 3051
Fax	+ 91-22-6648 3051
E-mail	sharma.ashok@mahindra.com
Website	www.mahindra.com
Contact person	Mr. Ashok Sharma
Title	Executive Officer
Salutation	Mr.
Last name	Sharma
Middle name	-
First name	Ashok
Department	Farm Equipment Sector
Mobile	-
Direct fax	+ 91-22-6648 3051
Direct tel.	+ 91-22-6648 3051
Personal e-mail	sharma.ashok@mahindra.com

Appendix 2: Affirmation regarding public funding

No public funding will be involved in the proposed PoA.

Appendix 3: Application of methodology(ies)

No further information is necessary as all generic CPA types comply with the applicability conditions of the methodology.

Appendix 4: Further background information on ex ante calculation of emission reductions

Further background information on the ex-ante calculation of emission reduction shall be provided on CPA level, for each individual CPA (where applicable).

Appendix 5: Further background information on the monitoring plan

Further background information on the monitoring plan shall be provided on CPA level, for each individual CPA (where applicable).



History of the document

Version	Date	Nature of revision(s)
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the programme design document form for small-scale CDM programmes of activities" (EB 66, Annex 13).
01	EB33, Annex43 27 July 2007	Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Registration		