Future Strategy - Climate Smart Agriculture and Carbon Credits through FPOs

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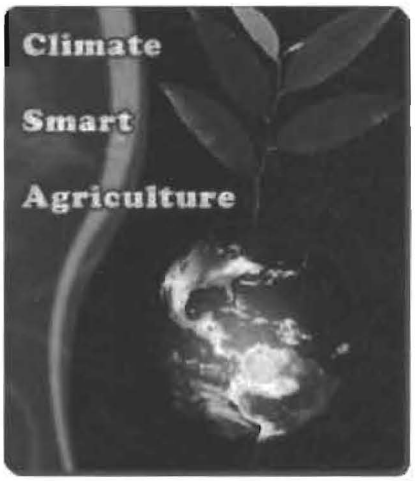
The world is experiencing the impacts of climate change. The year 2014 is expected to be the hottest year of the century. It is likely that average temperatures will rise 2°C from preindustrial levels based on the built in impact of current and past green house gas emissions. The temperature increase may go up to 4°C by the end of the century if appropriate measures are not undertaken. Warming of 2°C may reduce crop yields by 70%, dwindle fish supplies, melt glaciers resulting in floods in certain areas and drought in others, melt permafrost causing increased methane emissions adding to the global warming etc. The efforts are to restrict the temperature rise to 1.5 °C so that the negative effects are restricted. The impacts of global warming has been discussed in many forums and the issue has been staring the world in the face for over 20 years – from the 1992 Rio Conventions to the 1997 Kyoto Protocol and the 2009 Copenhagen summit. Clear commitments with time bound implementation is lacking. It was ironic that Hagupit hit Philippines when the annual ministerial level climate negotiations towards a new global pact was under way in Lima. Negotiations and talks were underway in previous years at Warsaw and Doha also while Typhoon Haiyan and Typhoon Bopha hit the Pacific, especially Philippines. But the negotiators neither sensed the urgency required nor felt the planetary emergency. The Lima talks have reached a much debated draft agreement for the forthcoming Paris Conference in 2015, in that way we can say that it



was successful.

Global Green House Gas (GHG) Emission : The scientific world is practically united in warning that there is no way other than to slash emissions by 4% to 70% by 2050 and to near zero by the end of the century. Human influence on the climate system is very clear as indicated by Dr. Rajendra Patchouri, the Nobel Laureate and leader of the UN panel of Climate Change experts. Climate change makes agriculture more difficult to sustain with higher frequencies of floods, droughts, heat waves, erratic precipitation, increased salinity and rise in sea level. The Global GHG emission is estimated as follows :

Agriculture	-14 %
Forestry	- 17%
Industry	- 19%
Transport	- 13%
Energy supply	- 26%
Residential and commercial buildings	- 8%
Waste and waste water	- 3%

Agriculture and GHGs : Agriculture sector suffers the negative impacts of climate change. Changes in temperature, rainfall pattern, run off, evaporation, soil moisture etc adversely impact the production and productivity of crops. A reduction of 50-70% of crop yields is expected to occur as a result of global warming. And this comes at a time when we have to increase our food production by 70% in 2050 when our population is expected to become nine billion. It has been estimated that out of the total GHG emissions, 14% is from agriculture and 17% from Forestry. GHG emissions from agriculture come to around 6500 million tones of CO_2 equivalent. The major emissions are

Nitrous oxide from fertilizers	- 2128 MT (32%)
Methane from cattle enteric fermentation	–1792 MT (27%)
Biomass burning	- 672 MT (10%)
Rice production	- 616 MT (9%)
Manures	- 413 MT (6%)
Fertiliser production	- 410 MT (6%)
Irrigation	- 369 MT (5%)
Farm machinery	- 158 MT (2%)

But agriculture has a major advantage too, it stores carbon from the atmosphere in the soil and the plant biomass leading to carbon sequestration.

Carbon sequestration is the capture and secure storage of CO_2 that would otherwise be emitted to or remain in the atmosphere. This is a positive impact of agriculture in reducing the impact of global warming by reducing emissions.

IPCC assessments estimate that global climate change mitigation potential from agriculture could be 5500-6000 MT CO_2 equivalent per year which is almost equal to the current GHG emission and 90% of this is achieved through carbon sequestration. This is achieved through Climate Smart Agriculture. The major activities undertaken are water harvesting, cropping system management, mulching and intercropping, tillage management, soil conservation mechanisms, livestock management etc. In agriculture, the components which can either accumulate or release carbon are the above ground biomass comprising of stems, branches, foliage of trees, shrubs, non woody plants etc, below ground biomass comprising of living roots and the soil organic matter or carbon.

Tillage management : Soil disturbance tends to stimulate soil carbon losses through enhanced decomposition and land erosion. Reduced till or no till of fields using spot preparation, subsoilers etc can gain soil carbon compared to traditional tillage. Advances in weed control allow cropping with minimum tillage.

Nutrient management : Nitrogen applied through fertilizer, manures and other sources is often not used efficiently by crops. The wasted nitrogen is not only costly but also susceptible to N_2O emission. Nutrient management includes precision fertilizer application, mulching, manure management, use of compost and organic fertilizers etc.

Residue management : Fields that retain crop residues and mulching tend to increase in soil fertility and soil carbon because these residues add organic matter and thus carbon to the soil. Farmers must avoid or reduce burning of crop residues. Biomass burning results in emission of GHG.

Agronomical practices : Use of improved crop varieties, intercropping, crop rotations or legume crops to reduce reliance on fertilizers, increasing vegetative cover, integrated pest management etc are some of the agronomical practices through which farmers can reap benefits.

Water management : Water harvesting by capturing runoff and effective drainage are also important aspects. Efficient irrigation can enhance carbon storage in soils through increased yields, residue returns and improved soils.

Agroforestry : This includes various practices such as hedges on contours, trees intercropped with field crops, silvopasture etc.

Soil carbon projects : Farmers around the world control the largest installation of a biological technology (photosynthesis) that can extract billions of tonnes of CO_2 from the atmosphere interrupting the rapid rise of global warming. Hence discussions on climate resilience are increasingly focusing on the sustainable agriculture practices which can bring about reduction in GHG emissions. Agricultural carbon finance projects are being conceptualized and implemented in different countries. These projects concentrate on sustainable land management techniques and Climate Smart Agriculture. From the farmer's point of view, the success of this project is the increased risk adjusted crop yields and the food security, apart from the carbon revenues which are co-benefits. The farmers gain skills in increasing the soil fertility. The benefits from such projects are manifold. Primarily, the activities lead to increased yields and productivity followed by enhanced resilience to climate change and better preparedness to droughts and floods. The additional advantage is the payment for the environmental services through carbon sequestration. Climate Smart Agriculture is a means by which small scale producers can be validated and rewarded for their work. And this presents a highly cost effective means of reducing carbon levels in the atmosphere. It can also be a means to address livelihood issues and wealth redistribution from the richer developed nations who have caused the problem to developing and poorer nations that have the potential to provide solutions to the problems.

Accounting for the soil organic carbon changes : Agricultural activities like crop residue management, composting and manure management, application of inorganic fertilizers, water management, erosion control or planting of agroforestry trees influence the soil organic carbon fluxes and change the organic content in the soil. Various models have been developed by organizations like FAO, World Bank etc in accounting the carbon inputs through various activities in agriculture. The amount of carbon

What is CO_2 equivalent ?

For a given amount of GHG, its CO_2 equivalent (CO_2e) is the amount of CO_2 that would have the same Global Warming Potential (GWP) when measured over 100 years. If the GWP of 1 unit of CO_2 for 100 years is defined as 1 CO_2e, then the potential of one unit of methane is 30 CO_2e and that of one unit of nitrous oxide is 300 CO_2e.

added to the soil can be computed using these models which is indicated in tonnes of carbon per hectare per year.

Carbon price and carbon credit

Carbon price is a monetary value attached to a tonne of CO_2 that is emitted into the atmosphere. Carbon credit is credit that you receive in exchange for implementing activities resulting in high levels of carbon sequestration. The price of carbon effectively amounts to the price of human well being on this planet. There are two factors involved : the supply of carbon credit from emission reduction projects in developing countries and the demand for these credits from developed country parties who have to meet binding emission reduction targets. This can be explained by a simple example. General Motors, the maker of Chevrolet has a commitment to reduce carbon emissions. It will take time for the Company to reorient their activities towards zero emission of GHGs. So they have entered into an agreement with land owners to leave 11000 acres of land in agriculture permanently. The carbon sequestration through this activity is estimated and the carbon credits are paid to the farmers as revenue. In this case, the amount of CO_2 removed by the purchase of the carbon credits equals the amount reduced by taking more than 5000 cars off the road. Such is the potential of reducing GHG emission through Sustainable Agricultural land management.

There are exchanges that trade GHG and other pollutants just as commodities like crops and livestock.

The benefits of soil carbon credits are that it earns the farmer carbon revenues apart from increasing the soil carbon, increasing soil fertility, reducing erosion, improving the soil structure, better water use, reducing salination and increasing the biodiversity. The net result is healthy ecology, healthy profit, healthy farm families and stronger rural communities.

Carbon revenues through FPOs

FPOs are being conceived to work together for the overall development of the member farmers by assuring them a fair, reasonable and steady price. FPOs can move one step forward and undertake implementing Climate Smart Agriculture and Sustainable Agricultural Land Management. Agricultural carbon financing projects can be undertaken under the auspices of FPOs. Farmers will adopt practices only if tangible benefits are ensured. The method of Climate Smart Agriculture has triple benefits as discussed above : Increased yield and food security, resilience to climate change and carbon sequestration. The carbon revenues can be used to cover the extension costs. The revenues through carbon sequestration can be divided among the farmers in the farmer groups based on the farm performance . Each farmer group can subsequently decide how to invest the carbon money. In reality, what the farmers receive from the carbon market is very little. What they really gain is increased agricultural productivity, increased knowledge and better resilience to climate change thus reducing the risks of cultivation. Incorporating crop residue into the soil is the single biggest component of any global carbon sequestration strategy.

Coconut being a perennial crop, farmers can plan for a Sustainable Agricultural Land management strategy enhancing carbon sequestration. With the utilization of indigenous knowledge and technology, India can very well implement solutions to address the issues of climate change. Increased use of manures and compost, precision application of nitrogen fertilizers, cover crops in coconut plantations, mulching of crop basins and intercropping with multistoried cropping systems so as to increase crop cover are measures that are undertaken by farmers even now without knowing its impact of climate resilience. Through the FPOs the activities can be streamlined to ensure that the whole farming community in the area adopts the strategies and the benefits through increased yields and carbon revenues are claimed. The immediate tangible benefits will motivate the farmers to continue the activities and in the long run, the carbon revenues will turn immaterial. A sustained method of crop production with climate resilience will be evolved as a result of the implementation of the same. For eg. In the Kenya Agricultural carbon Project implemented in 2009, the project carbon benefits were around 2 million tones CO_2e when verified in 2013 and the payments to farmers were also released. The project was implemented in farms of 60000 small holder farmers grouped in 3000 farmer groups in just two provinces. With the wide network of FPOs organized across the coconut growing tracts of the country, the benefits through implementation of sustained practices is manifold in coconut.

The discussions and the negotiations for climate resilience, reducing GHG emissions and carbon sequestration are happening, but actions have to happen locally. As said earlier, we have to think global and act local. And what better platform than our FPOs to work towards this cause. Let the FPOs work towards quality climate smart agriculture.