BAIF Development Research Foundation
Dr. Manibhai Desai Nagar, National Highway No. 4, Warje, Pune- 411058. India.
Phone: 91 20 25231661 Fax :91 20 25231662 E-mail : baif@baif.org.in Website : www.baif.org.in

Ref. No. 3148 **3 August 2021**

Dear Observer Relations team
Communication & Engagement division
UNFCCC

BAIF Development Research Foundation (BAIF: https://baif.org.in/), is a national level non-profit organization established in 1967, operating in 318 districts across 13 states in India. BAIF has worked with five million farmers in more than 100,000 villages through its 6000+ member team. Its main focus is on empowering people through sustainable rural and tribal livelihoods. The main domain areas of BAIF are livestock development, tree-based farming and natural resource management. Apart from these areas, BAIF works on applied research for development on livestock and crops, cross-cutting themes such as climate resilience, biodiversity conservation, community health, gender concerns, value chain development and enterprise promotion.

With this technical background and field level experiences from various parts of India, BAIF has arrived with few national level strategies and policies required for reduction of GHG. The recommendations in detail are given in the attached file for consideration to the Katowice Committee of Experts, UNFCCC.

Thanking you

For BAIF Development Research Foundation

Bharat Kakade
President and Managing Trustee

Encl: Inputs to Katowice Committee of Experts

BAIF Development Research Foundation

BAIF Bhavan, Dr. Manibhai Desai Nagar, Warje, Pune 411058, India
Phone: +91-20-25231661-9 Mobile: +91-9075002912-5
E-mail: baif@baif.org.in Website: www.baif.org.in

Inputs to Katowice Committee of Experts

Strategies and policies for reduction of GHG emissions:

1. ***Promotion of tree-based farming in small farm holdings can help in reduction of GHG:***

Many developing countries have large human population accounting for low land holding per capita. The current land use and management practices need to be modified especially, in the areas of monocropping, intensive use of chemicals and improper soil management practices contributing to GHG emission. The promotion of tree-based farming (e.g., Agri-Hort–Forestry) is one of the sustainable ways of farming in small land holdings in smallholder farms. The *combination of diversified crops with multipurpose trees and adopting sustainable farming practices on marginal lands can give additional sources* of income and reduce the risks to livelihoods caused by climate change and unpredictable weather. Moreover, the trees in the farming system has added benefit of carbon sequestration which in turn can help to reduce GHG emissions. The reduction potential is substantial, and as estimated by R H Rizvi, ICAR –Central Agroforestry Research Institute, India (2017), the Carbon sequestration potential (CSP) of agroforestry systems would be about 158.55 Tg C (tera gram) for a simulated period of 30 yr or CSP would be 5.28 Tg C yr−1 at country level. The equivalent CO2 absorption was 586.50 Tg for a period of 30 yr or would be 19.55 Tg yr−1 at country level. Hence, the tree-based farming has significant contribution towards reduction of atmospheric CO2.

2. ***Management of Soil Organic Carbon and Prevention of Land Degradation:***

The causes of land degradation in India include, deforestation, mining, population pressure, changing climate and inappropriate agricultural practices that lead to soil erosion and land degradation. Soil Organic Carbon (SOC) is a fundamental ecosystem health indicator and plays multifunctional role in soil fertility. It is also one of the three global indicators of land degradation neutrality (LDN) along with land cover change and land productivity. On-site effects of accelerated soil erosion include decline in soil physical properties, loss of SOC, loss of plant nutrients and subsequently low crop productivity. This threatens the environment, employment and food security for the growing population in India. In view of this fact, during the COP 14 of UNCCD, India has raised its ambition of the total area that would be restored from its land degradation status-from 21 to 26 million hectares by 2030. There are supporting research that have already demonstrated the many sustainable soil management practices and its potential to preserve and boost soil organic carbon. Some of the best practices are:

- Adapting agricultural practices that conserve soil organic carbon can increase crop productivity of soybean, maize and wheat by 17.6 megatonnes per year (De Moraes Sá et al., 2017).
- Agroforestry systems which store carbon in trees as woody biomass and reduce greenhouse gas emissions from soils. Research showed that agroforestry systems sequestered around seven tonnes of carbon per hectare per year (Kim et al., 2016).
- A one-tonne increase in the soil organic carbon pool of degraded cropland can increase wheat yields by 20-40 kg per hectare, maize by 10-20 kg, and cowpeas by 0.5-1 kg (Lal, 2004).

- Cover crops used as green manure are an important management option to increase stocks. Such techniques could bring soil carbon sequestration of up to 17 Gt worldwide (Poeplau and Don, 2015).

  The ongoing climate change impacts implies that preventing land degradation is not a onetime process. Adopting sustainable soil and water management practices continuously in development programmes is essential to bring about a change in the soil fertility restoration, increase in the productivity and livelihood of small land holding farming community. Hence, the national level policies and developmental programmes should consistently support financially and incentivise the smallholder farmers for adoption of practices that prevent land degradation. Through the UN-mandated sustainable development goals (SDG 15.3) of restoring degraded land and soil by 2030, policies and strategies at international level should focus country level polices and mechanisms in achieving the above SDG. Simultaneously, efforts should be made to overcome the constraints such as limited resources, lack of capacity and awareness on land degradation amongst the population that are critical aspects in implementation of sustainable land use plans and management.

3. ***GHG reduction through increasing the efficiency of dairy production applying innovative technologies***

Indian dairy sector is placed as one of the most GHG emission intensive sector which is fuelled by constraints associated with feeding, breeding, health, management and the low levels of milk production. This necessitates brining both genetic and management improvements in the dairy animal population, that would enhance overall milk productivity in the country, and at the same time will have direct impacts on the CH4 emission. Reduction in GHG emission by genetic selection of dairy cows on feed efficiency and possibly methane and nitrogen losses will result in increasing the productivity and gross efficiency. The same quantum of the product could be produced using less number of animals. Another important socio-cultural dimension Indian dairy sector pose is prohibition of cattle slaughter whereby large proportion of old non-productive cows and males keep contributing to GHG emissions. Tackling this aspect and increasing the rates of female production using latest technologies might lead to GHG emission reductions. Therefore, adopting a combination of sex sorted semen that would address the issue of additional male births, genetic improvement program targeted at productivity improvement of the low producing population and improving feeding methods that would combinedly result in increasing of the milk production and reducing the GHG emission levels per unit of milk.

Emerging technological interventions in this regard are:

1. ***Genetic improvement*** of genetically inferior female cattle and buffalo population for high milk productivity and feed efficiency leading to milk production increase and reduction in CH4 emission per unit of milk

2. ***Use of sex-sorted semen:*** to hasten the dispersal of high genetic merit germplasm (frozen semen), that would assist in replacing the non-utility male and female population on a faster stride leading to hastened dairy development in the region where the small holding dairy farming is predominant. The birth ratio of female could be increased up to 90% levels.

3. ***Animal nutrition:***

Estimated emissions of CH4 per kg of milk were lowest when cows were fed more concentrates. As concentrate feeding (DM basis) increased from 3.3 to 6.1 kg/cow/d, estimated Feeding of nutritious feed through concentrates, green fodder and more importantly adopting a balanced feeding practices larger GHG reduction potential. The experiences shows that when the balanced feeding approaches followed, the emissions decreased from 0.52 to 0.34 kg CO2-eq/kg FPC-milk. Simultaneously the supporting policies should be directed towards enhanced forage production, fodder enrichment, promotion of fodder trees in agroforestry and improved and balanced feeding methods.

4. ***Manure management:*** Besides farm level production, the manure management has an added impact on GHG emission, The ongoing intensification and specialisation of livestock production is resulting in increased volumes of manure to be managed in the farm that would help-to reduce GHGs (CH4 and N2O). Manure management via family size biogas units along with an efficient slurry management practices is proven to reduce GHGs to considerable levels. The global warming mitigation potential of a family size biogas plant (Families with 2-3 cattle) was 9.7 t CO_2 equiv. $year^{-1}$ Hence, the adoption of small-scale biogas units on a sustainable model within the smallholder dairy farming is uniquely positioned to help in achieving the emissions reductions as well as mitigating many of the impacts of climate change through capturing organic wastes, producing renewable energy, and returning nutrients and organic content back to the soil. Government should incentivise on this type of technologies that helps in generation of renewable energy. Additionally, there should be support and reward mechanisms for the collection of manure, and capturing of CH4 through biogas unit and energy generation in the form of equivalent to per qu. mt of gas.

For BAIF Development Research Foundation, Pune India

Bharat Kakade

President and Managing Trustee