Result Frame Indicators

SOIL HEALTH

STRATEGIES

For the impact area of restoring and revitalising soil health and soil organic carbon, interventions on soil and water conservation measure, which includes field bunding, land levelling, terracing and bund plantation, will be extremely critical. In geography with high day temperatures and porous soil type, the chance of losing soil carbon is very high due to increased evaporation. Thus, increasing crop coverage to slow down that process will be extremely important. Currently, both in MP and Odisha, the soil carbon content is on a lower spectrum and there is a need to introduce various strategies which include green manuring, tillage reduction as well as mulching (preferably organic mulching). The farmers in the project area also need to be trained to produce scientifically decomposed quality manure, preferably using technology like NADEP, vermicompost or other innovative methods. A significant constraint in this initiative will be the availability of organic biomass, mainly cow dung, as animals are in short supply in the project geography. Thus, either an increased number of cattle are to be introduced in the area, or green enterprises around composting and bio-inputs production are to be promoted. To ensure that the farmers are using the correct dose of organic compost/ FYM, a farmer-specific advisory may be provided using a robust digital platform.

The current soil quality in the project area is moderate, with slightly lower Nitrogen and Phosphorus levels but an adequate amount of Potassium. However, in the absence of any concrete measures, this will reduce substantially in the near future.

BENCHMARKING

Since enhancing soil organic carbon is a complex and tedious process and depends on many factors, including local climate and temperature, crop cycle and agronomic practices, it is difficult to benchmark SOC enhancement for any geography. However, one can deduce that for 0.1% change in SOC, a time period of 5-10 years will be required.

As crop cover is one of the significant variables for SOC enhancement, a result indicator on cropping intensity (CI) is being proposed. Once again, benchmarking CI is complex e.g., the cropping intensity of the entire MP is 165% as per the 2020-21 state economic survey, while that for Odisha stands at 158%. The baseline figures for the surveyed HH are significantly low at 136% for MP and 102% for Odisha (though this is the mean figure, and there is a significant variation across farmers). The mean CI for the surveyed district (from the secondary dataset of 2019-20) are also 155% for MP and 114% for Odisha. Moreover, to bring one additional Ha of land under irrigation, a significant investment, of roughly around INR 100,000, is required. Thus, we think it will be prudent enough to put a realistic target for CI. For enhanced NPK in soil, a conservative estimate of a 25-35% increment is kept as a benchmark.

Two intermediate indicators have been suggested, which will lead to the Result Indicators. These are the percentage of farmers who adopted soil testing every 3 years and the percentage of farmers who adopted NADEP/ vermicomposting or other scientific methods of composting. It is expected that with farmers using properly decomposed manure in their fields and testing for soil status at regular intervals, the probability for soil health and soil carbon enhancement is high. However, such practices are also a function of the availability of NADEP pits, vermi and organic compost as well as access to soil testing services. Since benchmarking is not possible for these two indicators, a realistic target for each state is fixed based on our field-level experience of implementing such initiatives on a scale.

RESULT FRAME INDICATORS			
INDICATOR	**BASELINE**	**TARGET**	**PROCESS & PERIODICITY**
CHANGE IN SOIL ORGANIC CONTENT	0.42-0.55	Difficult to benchmark but can assume a 0.1 unit change at project end	Project mid-term and project end (using soil sample testing for soil health and SOC while survey methodology for CI)
CHANGE IN NPK IN SOIL	N: 182-215 P: 9.3-11.8 K: 450-500	Increment of 25-35%[1]	
CHANGE IN CROP COVERAGE/ CROPPING INTENSITY	136%	160%	
% OF FARMERS ADOPTED SOIL TESTING EVERY 3 YEAR	12.1%	30%	Through MIS, during project mid-term and end term. Data to be corroborated by sample survey during midline and endline evaluation.
% HHs ADOPTED NADEP/ VERMICOMPOSTING/ OTHER SCIENTIFIC METHODS OF COMPOSTING	0%	50%	

[1]*Application of Jeevamrit Improves Soil Properties in Zero Budget Natural Farming Fields (https://www.mdpi.com/2077-0472/13/1/196)*
Effect of organic farming on organic carbon and NPK status of soil in Northern Karnataka, India (https://www.academia.edu/15770982/Effect_of_organic_farming_on_organic_carbon_and_NPK_status_of_soil_in_Northern_Karnataka_India)

WATER MANAGEMENT

STRATEGIES

As the project area has low irrigation availability, significant investment is required on land and water, and a lion's share of this needs to be mobilised from government resources - mainly MGNREGA. This work would include tapping surface water run-off and capturing sub-surface water through upland treatment, field and contour bunding, creation of parm ponds and small water detention structures, and constructing open dug wells/ percolation tanks. Farmers also need to be provided with efficient irrigation systems like sprinklers and drip systems so that larger areas can be irrigated during water-scarce seasons like Rabi as well as rainfall deficit in Kharif months. After considering water availability, specific advisory needs to go to farmers on land and soil-specific crop planning. Moreover, farmers need to be facilitated to shift from water-intensive crops like wheat and paddy in upland areas and diversify to legumes, pulses, oilseeds and low-water requirement vegetables.

BENCHMARKING

Though we have already suggested Cropping Intensity in Impact Area 2, we propose it here also as a Result Indicator. The other critical Result Indicator is the prolonged wetness in the local rivulets. Currently, there is no baseline on this, as we have only collected RS GIS data for the identified villages. Since the prolonged water flow in the rivulet is a function of several variables like soil type, land slope, type of existing NRM structures in the area, soil cover, and rainfall, it is challenging to benchmark. However, from our field experience, we have observed that significant work on land-based activities can prolong rivulets' flow by 2-5 months (if not making them perennial). Since most of the rivulets in the project areas are dry by December, we expect that with the planned set of interventions, this can be extended by 2-3 more months, and thus, making that a benchmark for this project. Apart from the two result indicators, five intermediate indicators are also proposed. Since cropping intensity has a direct correlation with the area that has been cultivated in Rabi, an indicator to measure the area under Rabi cultivation is also proposed. The benchmarking has been done in line with the proposed cropping intensity.

Field data shows that water management is inappropriate as a large area of upland is under crops with high water requirements. Thus, we suggest an indicator that will capture the reduction of upland area from water-guzzling crops and conversion to pulses and oilseeds. A modest target of 10% is being suggested. In sync with the earlier indicator, an additional indicator to track the access and usage of water-efficient enhancement technologies like drip system/sprinkler is also proposed. The project should aspire to target 20% of HHs because there are field-level issues and challenges and low uptake of these technologies.

Since the project plans to invest significant energy to leverage the NREGS fund, tracking the outputs on this front is essential. Since NRM planning has to be conducted to identify the type of work required to enhance soil and water in the villages, and these plans need to be included in the NREGS shelf of work, an indicator is suggested to track the number of villages where NRM planning has been completed and the plan has been submitted to the gram panchayat. Though a proxy indicator, this is a strong indicator to capture the project efforts on this front. Our field experience also indicates that only significant investment in NRM will result in an increased number of labour days generated from MGNREGA for project HHs, and thus, an indicator to track per HH labour day generation is also suggested.

RESULT FRAME INDICATORS			
INDICATOR	**BASELINE**	**TARGET**	**PROCESS & PERIODICITY**
CROPPING INTENSITY	136%	160%	Project midterm and project end (using RS GIS methodology for run off while survey methodology for CI)
PROLONGED PERIOD OF WETNESS IN EXISTING RIVULETS	Locational RS GIS data to be collected for a larger landscape	2-3 months of additional water availability after December in the local streams/ rivulets	
% OF CULTIVABLE AREA UNDER RABI	41%	60%	Data captured through project MIS regularly (monthly in most cases while biannually in some cases) and data corroborated during mid-term and end line survey.
% OF UPLAND CULTIVATING WHEAT/ PADDY CONVERTED TO PULSES/OILSEEDS	29% (Currently 29% of upland is under wheat)	10%	
% HH ACCESS TO EFFICIENT IRRIGATION SYSTEMS LIKE DRIP/ RAIN GUN/ SPRINKLER	0%	20%	
VILLAGES WITH DETAILED INRM PLAN SUBMITTED TO GP	From MIS	75%	
NREGS LABOUR DAYS GENERATED/HH IN THE INTERVENED VILLAGES	43 days/HH	80 days/HH	

IMPROVED INCOME

STRATEGIES

The broad strategies to be adopted should emphasise upon increasing the actual irrigation coverage to ensure that kharif crops are provided with life-saving irrigation during water-stress months leading to larger areas under crops during the Rabi season and also diversifying to high-value crops like vegetables (in some clusters). Apart from diversification, interventions focusing on enhancing crop productivity will enhance HH income considerably- as the current productivity of crops is below the mean of the district average in most cases. The general approach of cost reduction in crop production can also be achieved by centralising the supply of seeds (which is one of the major contributors to farmers' expenses) followed by a reduction in the usage of chemical fertilisers and pesticides (the other two contributors). Labour-saving devices may also be introduced, which not only will help in cost reduction but may also reduce the drudgery of women farmers. To mitigate climate-induced risk factors, one of the interventions may be around the enrolment of farmers in crop insurance schemes apart from introducing climate-resilient agriculture practices. Diversifying the livelihood portfolio by adding livestock rearing and green enterprises would also support the HH-level income raise efforts. Commodity-specific value chain interventions around significant crops, including horticulture and vegetables in selected clusters, with the support of promoted FPOs, will not only help farmers to access remunerative markets but also will streamline backward linkages.

BENCHMARKING

Three result indicators have been suggested under this particular theme. Assessing HH income in the middle and end of the project will help in estimating the impact of the intervention package. Since conducting Living Income studies for every geography/agro-climatic zone may be difficult, we suggest benchmarking HH income against the World Bank norms of the poverty line for Low- and Middle-Income countries, which was pegged at USD 3.2/ per person/day. After adjusting inflation till 2026 and assuming every HH will have two working members, an amount of 2.62 lakh/ HH/annum is suggested.

Even though the productivity of the major crops is high, in most cases, it is lower than the state and the mean of the district average. Field visits also reveal that there is adequate scope for productivity enhancement in most of the crops as the project plans to focus on water availability, water management as well as on climate-resilient agronomic practices. The mean of the state crop productivity is proposed as a benchmark, while the scope of enhancement ranges between 10-25%.

The project strategises to introduce sustainable agronomic practices, thereby reducing the cost of inorganic chemical fertilisers and pesticides. However, the cost of other inputs may rise during the project period. Thus, instead of overall input cost reduction, we suggest that the benchmark should be zero increments in cost, as the savings from using bio inputs will offset the inflationary cost.

In addition, we also suggest four intermediate indicators around access to insurance services, diversified income portfolio, HH being part of FPO and doing transactions and the number of FPOs promoted and strengthened. As discussed earlier, the current penetration of agri-insurance is low, and in surveys and FGDs, the community has repeatedly raised issues around covariant weather risk. A 100% enrolment is preferred, but keeping in mind ground realities, 60% of HH having access to agri and livestock insurance will be a stretched target. On diversification of income portfolio, the community in the project geography largely depends on agriculture and wage labour, though a few have reported substantial income from livestock rearing and enterprise. Further, considering the geographical terrain and the low economic activity in the region, the scope of large-scale diversification to livestock and enterprise may not be a feasible option. Thus, we think that even with a moderate target of supporting 15% of the project HHs to diversify into livestock, vegetable cultivation and/or green enterprise initiation itself will be moderately challenging. On the market integration front, having vibrant FPOs with robust market interface is a prerequisite for enhancing the farm income of HHs. A stretch target of 60% (based on field experience of similar projects) HH being part of FPOs and transacting with them will be a good benchmark. Moreover, any FPOs that work with 3000 odd farmers can only be financially viable with an annual turnover of 4 cr.

RESULT FRAME INDICATORS			
INDICATOR	**BASELINE**	**TARGET**	**PROCESS & PERIODICITY**
CHANGE IN HH INCOME FROM AG AND ALLIED ACTIVITIES	₹132,601/annum ($2.27[1]/ person/day)	$4.5 PPP/ person/day (inflation[2] adjusted for 2026) – ₹2.62 lakh[3]/annum	Survey methods – at mid-term and end term evaluation
% INCREASE IN CROP PRODUCTIVITY	Cotton – 5.8Q/ac Maize – 8.4Q/ac Soybean – 6.4Q/ac Wheat – 11Q/ac Gram – 4.9Q/ac	10-25% increment in all crops (except Soyabean which is currently > selected districts average) State average Cotton[4] – 6Q/ac Maize – 12.9Q/ac Soybean – 5.2Q/ac Wheat – 13.8Q/ac Gram – 5.3Q/ac	
ZERO INCREMENT IN COST OF PRODUCTION FOR MAJOR CROPS	Cotton – 10.2K/ac Maize – 7.5K/ac Soybean – 8K/ac Wheat – 9.4K/ac Gram – 6.9K/ac	Crop production expenses remain the same	
% HHs DOING ORGANIC CULTIVATION	3%	20% (Convincing farmers to shift to 100% organic will be challenging)	
CHANGE IN SYNTHETIC FERTILISER USAGE	Cotton – 443 Kg/ac Maize – 519 Kg/ac Soybean – 230 Kg/ac Wheat – 362 Kg/ac Gram – 297 Kg/ac	30% reduction in the usage of synthetic fertilisers	
% HHs HAVING ACCESS TO CROP/ ANIMAL INSURANCE SCHEMES	2.12%	60%	Data captured through project MIS regularly and data corroborated during midterm and end line survey
% HHs WITH DIVERSIFIED* SOURCE OF INCOME OTHER THAN TRADITIONAL AGRI	1.2%	15%	
% HHs WITH ACCESS TO REMUNERATIVE MARKET FOR AGRI PRODUCE	63%	70%	
NO. OF FPOs WORKING ON SELECTED COMMODITY VC	From MIS	20%	

[1]Calculation assumption 1 USD = INR 80

[2]Average YoY inflation assumption – 6%

[3]For a HH with size of 5.5 and 2 working member

[4]ICRISAT data base as well as state economic survey 2021-21

PRESERVATION OF BIO-DIVERSITY

STRATEGIES

The best strategy for preserving and enhancing biodiversity in the proposed geography would be to promote agroforestry in the upland, with a mix of both fruit and fodder trees, that have the potential to generate income as well as support increased livestock population. Moreover, the reduction of harmful chemical fertilizers and pesticides is a must, as these chemical inputs destroy the soil fauna irreversibly. The project needs to explore the use of local and indigenous varieties of seeds for some of the major crops, along with promoting more intercropping and border crops with maize, cotton and wheat. The promotion of homestead gardens with local greens and vegetables will not only preserve local biodiversity but will also secure nutrition at HH level.

BENCHMARKING

The Result Indicator for this domain should be enhanced crop and tree biodiversity. Currently, we have used the Simpsons Diversity Index for crops using the formula $D = \Sigma ni(ni-1) / N(N-1)$, where ni= area under a particular crop and N= sum total of the crop area and the index is derived by SDI= 1-D. A higher index means higher diversity. The field data indicates higher diversity in MP is that of Odisha. We ran a simulation which reveals that reducing upland area by 30% from existing wheat and paddy crops and introducing oilseeds, minor millets, and pulses along with bringing in larger areas under rabi cultivation with different other crops has the potential to push up the index higher.

Linked to the result indicators are the proposed intermediate indicators where we suggest one on HH adopting intercropping, which is currently relatively low, and it is possible to facilitate around 30% of farmers to adopt it. We also recommend that 30% of the farmers be supported to promote agroforestry in 20% of the upland area. This will ensure biodiversity preservation, ensure income for farmers and fodder for livestock, check soil erosion and enhance soil organic carbon. HH adopted a homestead garden using local indigenous seed variety for vegetables and grains, which is another indicator, and our field experience suggests that 50% of HH is a stretch target.

RESULT FRAME INDICATORS			
INDICATOR	**BASELINE**	**TARGET**	**PROCESS & PERIODICITY**
INCREASE IN CROP AND TREE DIVERSITY	0.76[1]	0.82	Survey methods – at mid-term and end term evaluation
% HHs DOING INTERCROPPING	8%	30%	Data captured through project MIS regularly (biannually) and data corroborated during mid-term and end line survey
% OF UPLAND AREA UNDER AGRO-FORESTRY	0%	20%	
% OF FARMERS ENGAGED IN AGRO-FORESTRY	0%	30%	
% HHs WITH HOMESTEAD GARDEN USING LOCAL INDIGENOUS SEED VARIETY	10%	50%	

[1]*Crop Diversity measurement using Simpson's Diversity Index*

GREENHOUSE GAS REDUCTION

STRATEGIES

Several potential measures can be taken to mitigate greenhouse gas (GHG) emissions in agriculture and enhance carbon sequestration. Reducing emissions from enteric fermentation, a major source of methane in livestock, can be achieved through improved feed management and dietary supplementation. Balanced diets and high-quality forage improve digestion efficiency, reducing methane emissions. Implementing grazing management practices, like rotational grazing, optimises the animals' diet, minimising methane production from high-fibre, low-digestibility forage. To tackle emissions from paddy cultivation and agricultural soils, adopting sustainable and innovative agricultural practices, like the System of Rice Intensification, can help reduce GHG emissions. Improved water management, such as Alternate Wetting and Drying (AWD), can reduce methane and nitrous oxide emissions from rice fields. Conservation agriculture practices, natural farming, controlled-release fertilisers, and site-specific nutrient management can also be employed to minimise emissions. Managing crop residues is crucial in reducing emissions. Techniques like mulching, incorporating crop residues into soil, or using them for bioenergy production can help minimise their impact on GHG emissions. Using drip and precision irrigation methods, modernising infrastructure, and implementing sustainable land management practices can reduce water wastage and associated emissions. Carbon sequestration can be enhanced through cover cropping, agroforestry, crop rotation, and diversification. Natural farming practices and applying soil amendments like biochar or compost can also boost soil carbon sequestration.

BENCHMARKING

One result indicator and five intermediate indicators are suggested to capture the results in this domain. An indicator on per capita GHG emission (focusing only on emissions from enteric fermentation of livestock, paddy cultivation, fertiliser usage, power usage for irrigation, crop residue burning, and net of sequestration done through orchard plantation) is proposed to analyse the impact of all interventions. The current baseline figure for Odisha is high because of the large-scale cultivation of paddy. The project plan of scaling up sustainable agriculture practices and diversification may lead to increased emissions (mainly due to more animal induction as well as emission from irrigation power usage), it is expected that the increase will be offset by a> shifting away from paddy or adoption of SRI/AWD; b> usage of lesser chemical fertiliser and shifting towards organic manure; c> switching of irrigation power source from diesel/ kerosene to solar; d> mulching of residue instead of burning and e> development of agro-forestry in upland or growing trees on bunds and borders.

Since it is difficult to benchmark against these indicators, we are suggesting targets which are practically feasible in the context of the geographical area; achieving those would lead to the attainment of the result indicator.

RESULT FRAME INDICATORS			
INDICATOR	**BASELINE**	**TARGET**	**PROCESS & PERIODICITY**
NET CHANGE IN PER CAPITA GHG EMISSION (tCO2e/ha)	10.56 tCO2e/HH	0% change	Survey methods – at mid-term and end term evaluation
% REDUCTION IN COST OF NITROGENOUS CHEMICAL FERTILISERS	Cotton – 3077/ac Maize – 2293/ac Soybean – 1752/ac Wheat – 2324/ac Gram – 1411/ac	30%	Data captured through project MIS regularly and data corroborated during mid-term and end line survey.
% OF FARMERS SWITCHING TO SOLAR BASED IRRIGATION PUMPS	0%	15%	
% OF FARMERS INCORPORATING CROP RESIDUE IN SOIL AS PART OF REDUCED TILLAGE PRACTICES	0%	15%	
% OF FARMERS TAKING UP AGROFORESTRY IN UPLAND AND/OR GROWING TRESS ON BUNDS AND BORDERS[1]	0%	30%	

[1]*Repeat Indicator*

GENDER EQUITY

STRATEGIES

Improvement in gender equality and empowerment of women in the community can only be possible if the project develops a clear strategy for the involvement of women in agri-production and agri-produce marketing. Women from rural HHs engage in agriculture activities, but decision-making power is extremely low across all dimensions of agriculture practices. Creating an ecosystem where women members are also provided training on agriculture practices would not only increase production efficiency but would also enhance the confidence of the members. Leveraging the local SHGs and converting them into village-level Producer Groups (PG) or Organic Groups (OGs) would provide the much-needed impetus to enhancing women farmers' agency. Several studies point out that the strategy of proactively bringing women in decision-making bodies of PGs and OGs, as well as Farmer Producer Organisations (FPOs), also works positively in making women strong decision-makers in the entire initiative of agriculture value chain interventions. Promotion of group enterprises around green activities like seedling, raising bio input production and marketing also enhances the participation of women in agriculture significantly. One of the best-known strategies is also to introduce drudgery-reducing equipment and technology which positively impact the participation of women in all segments of agriculture activities with increased vigour.

BENCHMARKING

We suggest a Result Indicator on the percentage of women who are assessed as women farmers (irreversible change) using the International Food Policy Research Institute (IFPRI) developed Women Empowerment in Agriculture Index (WEAI). WEAI measures the inclusion of women in the agricultural sector and is designed to look at both sole and joint household decision-making and control over livelihoods, resources, and income, mostly in agriculture and in population-based surveys of both women and men. It is suggested that this tool be administered every season with a small sample of women drawn from every operational district, and the data collected be digitised and analysed. Our field experience shows that with a well-developed strategy and implementation, it is possible to positively change the status of 25-30% of the sampled women as agriculturists in 2–3-year time frame.

The Intermediate Indicators suggested the presence of women in leadership positions in community organisations like FPOs and OGs. The current data is positively skewed towards women, and this needs to continue. An indicator on the percentage of women using drudgery reduction equipment and technology is also proposed and benchmarked at 30% based on field experience. The third intermediate indicator is on ownership of assets in the name of the women/ group of women. The project has been working on this earlier and needs to continue with the existing focus. A target of 20% is recommended from our side based on our field experience.

RESULT FRAME INDICATORS			
INDICATOR	BASELINE	TARGET	PROCESS & PERIODICITY
WOMEN ASSESSED AS 'WOMEN FARMERS' AS PER THE GENDER TOOL (WEAI)	0% Not Initiated	25%	Piloting the tool with a small sample in every district. Data updation across different parameters biannually.
WOMEN MEMBERS IN LEADERSHIP POSITION/ OFFICE BEARERS IN OG/ FPOS	90% women as shareholders; 70% women as BoD in FPOs	Can remain same. Not much change required.	
WOMEN USING DRUDGERY REDUCING EQUIPMENT	0%	30%	Data captured through project MIS regularly (biannually) and data corroborated during mid-term and end line survey.
WOMEN WHO HAVE ASSETS IN THEIR OWN NAME	As per MIS	20%	