Sustainable agriculture and food systems: Channeling CSR investments to promote science backed development in agriculture sector

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Abstract

The investments to sustainable agriculture and food systems contributes directly to reducing hunger, poverty and malnutrition of the targeted population and positive contribution towards environmental welfare. The issues affecting Indian agriculture spread across the entire agricultural value chain right from soil and water conservation to market connectivity and social concerns associated. This paper maps three major focus areas under agriculture where in the CSR investments can be channelized. This include addressing the Environmental constraints, Improving Access to Markets and Social engineering and various sub-elements for financing being suggested under these suggested focus areas. The paper seeks to explore opportunities for promoting responsible investments in agriculture and food systems through CSR investments. This paper takes a case study approach and analyses in the context of the various development work done by ICRISAT and using the impacts as a guiding factor for proposed investment suggestions.

***Keywords**: Science-backed, agriculture, Natural resource management*

1. Introduction

Growth in the agriculture sector is two to four times more effective in raising incomes among the poorest compared to other sectors (Townsend, Robert, World Bank) 2015). The performance of agriculture is important for India as it ensures the food security of above 1.3 billion and growing population of India. Rural India is estimated to have 90.2 million agricultural households which inturn form about 57.8 percent of the total estimated rural households in India. (NSSO 2013). Also, Agriculture contributes to 15.4% of total GDP in India. (CIA worldfactbook, 2017). Sustainably providing improved diet to an increasing population with minimum environmental impact is a major challenge faced by the Indian agriculture today. Corporates irrespective of the size of CSR investment can contribute to the growth of agriculture in India. Agriculture and food system investments can be done to address one or more factors amongst the various interventions.

The issues affecting Indian agriculture vary from shrinking land holdings , climate change, soil degradation and runoff, shrinking ground water resources affecting the irrigation and cropping patterns, lack of timely weather and market information, unscientific production practices, lack of knowledge and unavailability of improved varieties, Lack of diversification both in farm and diet lack of mechanization to financial constraints, underdeveloped value chains and processing, inadequate marketing infrastructure and other supporting arrangements, The lack of opportunities for value addition, storage, market facilities etc.

Commercial agriculture techniques with least focus on sustainability has led to unscrupulous use of natural resources, overuse and unscientific use of pesticides and chemicals affecting the health of people and other ecosystem actors all over India. In the national quest for achieving self-sufficiency in food grains, use of chemical fertilizers rose from less than 2 million tons during the pre-Green Revolution period in 1966-67 to the level of about 26 million tons in 2016-17i

ICRISAT is an international non- profit organization headquartered in Patancheru, near Hyderabad India and doing agricultural research for development. ICRISAT works on a mission to reduce hunger, poverty,

malnutrition and environmental degradation in the dryland tropics. Over the last 46 years ICRISAT has developed various scientifically proven methods on sustainable agriculture and foodsystems that can be scaled up using CSR investments.

This paper is a study on some of the methods and bifurcating it under various elements identified as major investment points under the agriculture and food system. Each suggested elements are further breakdown to sub-elements.

1.1 How it works? : The impact pathway explained

1.Assesss the opportunities and challenges: This is the main driver of success.A thorough study of the area will be done based on visits and scientific methods (GIS etc). This help assess the opportunities of introducing science back interventions and the challenges to be tackled in achieving the same.

2.Community driven selection of development initiatives: Trials over time at ICRISAT shows that for sustainability of any intervention the community should be involved in all process of the development program. Communities should be looking for help to address their concerns regarding scarcity of water, low crop productivity and other vulnerable to impacts of climate change. (Kane-Potaka,2018).

3. Initial interventions: Basically the low hanging fruits that show immediate results and that help build confidence in the community on the project.

4. Agriculture Productivity enhancement: Based on the agro-ecological potential and market demand, suitable varieties of established crops as well as new crops will be made available for the farmers to evaluate and select. As a PR&D (participatory research and development) approach will be used, farmers will select the suitable crops and cultivars. The PR&D approach will also be adopted for testing best-bet INM and IPM options that take into consideration local resources to be used as sources of plant nutrients and for biopesticide production. All PR&D trials will involve large number of farmers, ensuring small and marginal farmers are direct beneficiaries.

5.Holistic approach to solutions: Investment in any one intervention without considering the whole value chain development is a futile effort. Thus, this holistic approach in agricultural development includes: natural resources management; climate-smart crop varieties; seed systems; diversification of farming systems; modernizing farm practices; institution building, capacity development, processing options and facilitating market access for income generation; and driving market development.

6. Sites of learning: Field days and workshops will be conducted in the model watersheds for dissemination of results to large numbers of farmers, the project implementing agencies, policy makers, media and researchers in the region.

7. Scale up: can be through private sector or government investments for a larger area and for a larger scale of operation..

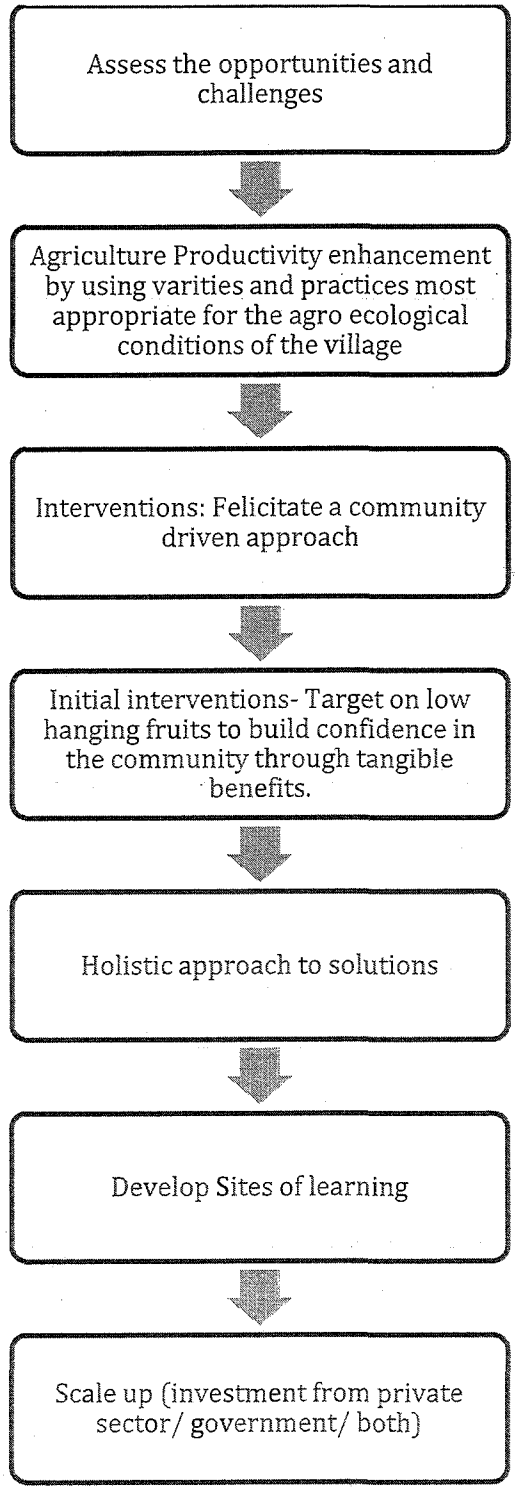

Figure 1. The impact Pathway explained

1.2 Proposed method

The proposed method is to use science supported interventions by addressing the three main elements. The CSR Investments planned in the agriculture sector can be addressing one or more of the suggested elements or the sub elements

I. Addressing the Environmental constraints

II. Improving Access to Markets

III. Social engineering.

1.3 Addressing the Environmental constraints

Investing on environmental sustainability is important for all stakeholders- the farming and non-farming communities and the companies. This topic covers an entire gamut of soil, land and water as well as the effects of climate change for agriculture.

1.3.1 Natural resource management for sustainability

This covers Farmer centric and holistic rural development approach with watershed development and other natural resource management activities.

Soil analysis is done for individual farms and the input recommendations will be based on this report. This help reduce the unwanted use of fertilizers thereby decreasing the burden on farmers as well as avoiding nutrient leaching and eutrophication of water bodies.

Soil and water conservation practices help conserve water and arrest soil loss through erosion and surface run off.

Rainwater management through watershed development interventions increases the availability of water available for agriculture and based on geography helps increase production and productivity at farmers field. Availability of rainwater and surface water encourages farmers to diversify to more remunerative crops like agriculture based on market demand.The approach is need based and community driven.

Convergence to existing government programs and strategic partnerships are given due importance in the implementation program.

1.3.2 Increasing agricultural productivity through proven sustainable science backed measures

Convergence to existing government programs and strategic partnerships are given due importance in the implementation program. Impact here can be achieved using, high yielding, disease and pest resistant crop varieties. As per the area selected climate adapted verities and even alternate cropping pattern can be introduced. Bio fortified verities can be incorporated for increasing the nutrition status without much change in the dietary patter. For export oriented cultivations and generally for edible products prone to aflatoxin contamination in situ Aflatoxin management techniques can be introduced.

On farm generation of organic manure can be introduced by growing Glyricidia in field bunds etc to build organic matter for soil. This can reduce the use of synthetic fertilisers. Integrated nitrition management and integrated pest management strategies can also be introduced to decrease heavy investments by farmer on pesticides and fertilizers. Use of biopesticides, microdosing, vermicompost usage etc are other scientific interventions that can be used to increase farm yield in a sustainable and environmental friendly manner. Crop livestock integration is also suggested to increase income and decrease the risk by diversifying income sources. Using modern or improvised machinery is also suggested.

These interventions help increase area under cropping and also the yield from farms which in turn will lead to increase in the farmer's income. Usually, these interventions follows the environment

management techniques and water conservation interventions after.assuring enough ground water but also based on the geography can be a standalone investment too.

1.1.1 Climate smart agriculture

This includes scientifically developed solutions to help farming communities adapt to climate change and cope up with associated stresses.

Using Artificial intelligence supported digital tools, Advisories, Linking insurance with technology , Climate resilient crops etc. are the ones which can help farmers cope up with the climate change and associated risks.

A well planned set of climate-smart agricultural practices equips farmers to rehabilitate their ecosystem and earn up to 12% – 27% better crop yields even in uncertain weather. Adoption of innovative crop insurance schemes to mitigate the growing agriculture risk at affordable cost is also part of the strategy. Bundling crop insurance with a range of risk management and climate change adaptation strategies is an effective mechanism for reducing the losses farmers suffer due to seasonal climate variability as well as natural calamities such as floods, droughts, and outbreaks of pests and diseases.

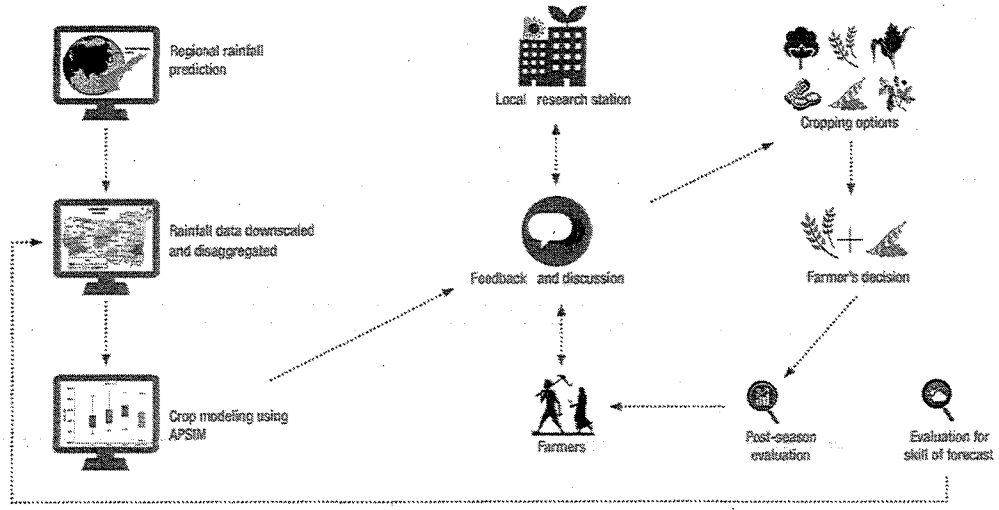

Figure 3. The schematic diagram explains how Climate smart technologies enable cropping decision options using climate simulation modeling studies. Farmers who followed the modeling based advisory earned up to 20% more yield (ICRISAT, 2016)

1.1.1 Efficient use of agricultural waste

Almost 70-80% of total water supplied for domestic use generates wastewater (Kaur et al, 2012). The domestic waste water from rural areas can be reused for agriculture. Decentralized domestic waste water treatment using constructed wetlands is a safe way for waste water reuse in agriculture. Biodegradable solid waste can be processed by composting or vermicomposting for producing a solid biofertilizer or directed to anaerobic digestor for producing biogas. The compost obtained is an excellent fertilizer for agricultural purposes and the vermicompost in suitable quantities can even help enhance the soil characteristics.

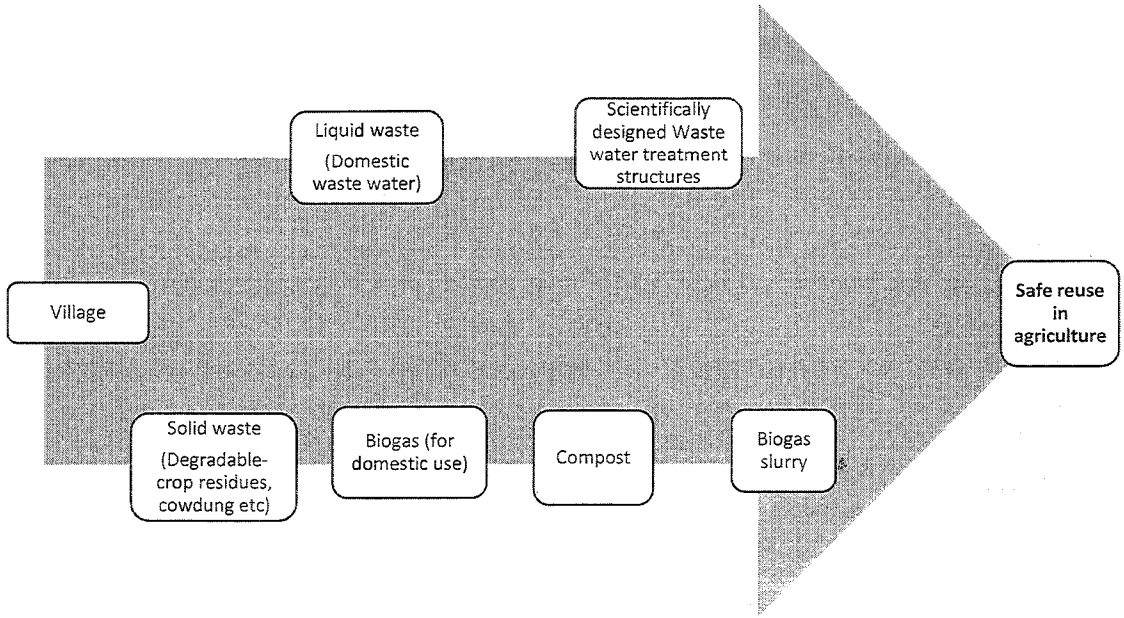

Figure 4. Sustainable waste recycling of both solid and liquid waste from a village and its efficient reuse in agriculture

Snap shot of Impacts of some projects addressing the Environmental constraints implemented by ICRISAT (Source: IDC, ICRISAT)

- Increased groundwater availability by 50-80%
- Reduced runoff by 30-40% and soil erosion by 50-60%
- Improved carbon sequestration (335 kg ha-1 yr-1)RWUE increased by 70% vs. 36% in the traditional system
- Increased cropping intensity by 30-40%
- Crop diversification with high value crops
- Increased crop yield by 30-60%
- Increased resilience to climate aberrations
- Increased fodder availability additionally by 2-3 months
- Increased milk yield by 1-2 litre/day/animal
- Increased additional income by 5000-10000/year/HH
- Increased livelihood opportunities for woman & landless
- Increased additional net income of Rs. 9685/- per family through various livelihood activities

2.1 Improving Access to Markets

This factors are focused on converting agriculture from a subsistence model to a profitable business. This includes developing inclusive value chains and other approaches that lead to better incomes and help connecting farmers directly to markets, better information on market prices, setting up quality control for end produces and assistance with forming formal and informal farmer collectives including FPO's.

- Promoting agribusinesses
- Improving market access
- Promoting Smart Food
- Social engineering

Capacity building

Capacity building at various levels of the value chain for different stakeholders (Youth, Women, Etc.) is also an integral part of the social engineering. Capacity building can be done at various levels of the Agriculture supply chain and each demand a separate skill. Specific ones will be handled by corresponding subject matter specialists. Generally the capacity building activities include exposure visits, Field days,hands-on training, demonstrations, leadership skill development, communication skills, introduction to various digital tools etc for the farmers.

Digital interventions

Use of satellite imageries through GIS tools, use of drones in various aspects of Agriculture and surveillance etc help enhance the the status of agriculture by taking it to the digital platform.

Women empowerment and livelihood support

Women empowerment and livelihood support through SHG's or women FPO's women empowerment is addressed in all the development projects in all aspects of the value chain. This include revolving funds for SHG's to start own business/ manufacturing units. This diversification of income sources help mitigate the risk due to heavy reliance on a single source of income from farming to the farm families an independent earning source for women..

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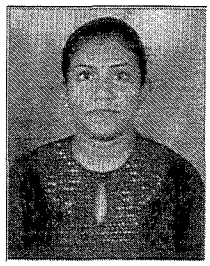
Author's Profile



Ms. Lakshmi R Pillai is currently working as Manager- Grants management with ICRISAT an International nonprofit organization working in the agriculture research for development space.

Lakshmi is a post graduate in Agribusiness Management having more than 12 years' experience in Banking and International nonprofit sectors. She is experienced in marketing and resource mobilization in the context of agriculture development, environmental sustainability and active private sector engagement for scaling up Science backed agriculture development projects. She was a presenter at the workshop on CSR for Agricultural development organized at National Institute for Agricultural Extension Management (MANAGE), Hyderabad in 2018.

Joanna Kane-Potaka began her career as an agricultural economist with the Australian Bureau of Agricultural and Resource Economics and later moved into market research in the agribusiness area of the Queensland Department of Primary Industries. Since then she has worked in a wide variety of other marketing-related areas including strategic marketing, communications, fundraising, knowledge management, and uptake of scientific research. She has worked for government, private industry (manufacturing and consulting) and with non-profit organizations (including four CGIAR agricultural research centers). As part of this she has lived and worked in India, Sri Lanka, Italy, Malaysia, the Philippines and Australia and has 25 years professional experience. She has a Bachelor of Economics, Graduate Diploma of Management, Professional Post Graduate Diploma of Marketing and a Master of Science (Global Marketing). She is a certified practicing marketer in Australia, an Associate of the Chartered Institute of Marketing in the UK and a fellow of the Australian Marketing Institute.

Sreenath Dixit joined ICRISAT Patancheru, India in January 2018 and took over the position of Head, ICRISAT Development Center (IDC) in July 2018. He is currently leading a 20-member strong multidisciplinary team of scientists at IDC under the Research Program-Asia that is working on scaling up of impacts of science-backed agricultural technologies. Besides, he is also mentoring the team to undertake research on issues of technology delivery to create large-scale impact; contribute to science and policy of technology delivery/dissemination aimed at improving the livelihoods of the poor. With a doctorate in Agricultural Extension from the Universality of Agricultural Sciences, Bangalore, India (1993), he works on capacity building strategies to implement multi-disciplinary, multi-institute consortium projects on ground with focus on scaling up across large areas. He belongs to the 1990 batch of Agricultural Research Service (ARS) of the Indian Council of Agricultural Research (ICAR). His efforts have led to many ICAR awards, such as Vasantrao Naik Award for Dryland Agriculture and Fakhruddin Ali Ahmed Award for Tribal Agriculture improvement besides the Young Scientist award of the Indian Society of Extension Education early in his career.