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VANCHIT: STRATEGIES TO EMPOWER THE MARGINALIZED

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Editors:
Dr. Meena Galliara
Director,
Jasani Center for Social Entrepreneurship
& Sustainability Management, SBM, NMIMS

Ms. Bhawna Kothari
Research Officer
Jasani Center for Social Entrepreneurship
& Sustainability Management, SBM, NMIMS

Cover Page Design:
Ms. Katha Roy Biswas, MBA HR, SBM, NMIMS
Ms. Esha Panpalia, MBA, SBM, NMIMS
Mr. Shubham Bhoir, MBA HR, SBM, NMIMS

VANCHIT: STRATEGIES TO EMPOWER THE MARGINALIZED

A presentation

By

Jasani Center

For

Social Entrepreneurship

&

Sustainability Management

School of Business Management, NMIMS

SVKM's NMIMS, V.L. Mehta Road, Vile Parle (West), Mumbai – 400056 (India)

Foreword

India is among the fastest-growing major economies of the world. Over 58 per cent of the rural households depend on agriculture as their principal means of livelihood. Within the sector, the sub-sectors of horticulture, livestock and fisheries have been contributing a larger share of value to agri-GVA since the last decade. It is an irony, that despite owning a powerful asset like land, small and marginal farmers have remained poor and are caught in the vortex of more serious challenges. Due to twin vulnerabilities of risks & uncertainties of production environment and unpredictability of market forces, there is an agrarian distress. Agricultural development is key to attain Sustainable Development Goals and facilitate economic growth, poverty reduction as well as ensure food and nutritional security of the country.

The current phase of agriculture and allied sector development aims at greater inclusiveness and equitable transformation, whereby all farmers can reap economic benefits. To achieve income growth among 85 per cent of our small and marginal farmers, apart from offering various types of support there is a need to bring cultural transformation among the farmers and encourage them to think like agripreneurs.

Agriculture is the largest enterprise in the country. An enterprise can survive only if it can grow consistently. Growth is incumbent upon savings and investment, both of which are a function of positive net returns from the enterprise. The net returns determine the level of income of an entrepreneur, farmer in this case.

Our MBA students placed in different parts of the country in the duration of We Care internship have examined grass root realities of small & marginal farmers, salt farmers and tribals. They witnessed that a large number of rural youth are forced to quit agriculture or their traditional occupations and migrate to urban areas in search of employment. They have witnessed the struggles of the NGOs in addressing the issues of farmers and creating alternate livelihood support strategies. As business students, they have realized that the demand for income growth from farming or allied activity, has translated into demand for the government to procure and provide suitable returns. Hence, there is a need to reorient this approach. To create sustainable agriculture there is a need to create self-sustainable models empowered with improved market linkage as the basis for income growth of farmers. This can be addressed by bridging the information gap and disseminating real-time information even in the remotest places on production, crop insurance, processing and marketing systems aided by new science & technology. To bring cultural transformation among farmers and encourage them to think as

agripreneurs there is a need to develop appropriate social capital in the community and foster managerial competence of farmers and extension professionals.

The current anthology *Vanchit: Strategies to Empower the Marginalized* is based on our students' experiences concerning challenges faced by farmers as well as resource-poor groups in rural and tribal India. The articles indicate that despite advances in technology, small and marginal farmers in remote parts of the country have not benefitted from the same. Extension advisory on pre and post-harvest management and marketing is mostly absent in remote places. The articles discuss that while there is a need to develop market intelligence kiosks at the village level and facilitate farmer's linkages with markets, agro-processing industries and financial institutions, there is a much bigger need to transform farmers as agripreneurs. In this direction, the articles discuss the interventions proposed by NGOs to design alternate agriculture supply chain models and other subsidiary occupations as commercial pollination centers for honey production.

The article on Salt Farming in Kutch and Yanadi tribes of Nellore describes the plight of the most marginalized communities in the country and the interventions taken by NGOs with their shoestring budgets to improve their standard of living. These articles expose us to the diversities and varied inequities existing in the country and propel an alternate thought to strengthen the development model adopted by the NGOs for scaling up their impact.

Despite various challenges, the future to me looks promising because there are highly qualified young professionals who are experimenting with their start-up ideas and developing agri based enterprises in places like Bengaluru, Hyderabad, Pune and Gurugram. Whether these trends become a part of mainstream occupations or remain fads is the big question. I am optimistic and believe that some of our MBA students interested to develop rural economy and markets will be real game-changers. Through their knowledge, scientific temperament, innovative thinking and unflinching commitment, they will create pro-poor and inclusive business models to support sustainable rural economy.

Dr. Rajan Saxena
Vice Chancellor,
NMIMS

Unfolding the Pages of the Anthology...

Acknowledgments

Nine years ago to socially sensitize MBA students the Jasani Center for Social Entrepreneurship & Sustainability Management was entrusted with the responsibility of executing We Care: Civic Engagement internship. The support from our top Management Team - Shri Amrish Patel, Chancellor, NMIMS, Dr. Rajan Saxena, Vice-Chancellor, NMIMS, Dr. Sharad Mhaiskar, Pro Vice-Chancellor and Dr. Ramesh Bhat, Provost & Dean, School of Business Management, NMIMS, as well as all the Office Bearers of SVKM Trust has been phenomenal. We take this opportunity to express our sincere gratitude towards them.

Despite having various constraints NGOs, government departments, as well as corporates, accommodated our request to place our students. They ensured that the We Care learning journey transforms and enables students to understand the importance of being humane and compassionate while devising pro-poor approaches. Their cooperation in strengthening the We Care internship is highly acknowledged.

Special thanks to all our faculty colleagues for providing their unstinted support to mentor and supervise the students. It is because of them the students were able to examine social issues from managerial lens.

Ms. Anjalika Gujar, Community Development Officer, Jasani Center is the central pillar for the We Care internship. The repository of We Care reports maintained by her, enabled us to select appropriate reports and select contributors for the anthology. We sincerely thank her and look forward to her continuous support.

This publication would not have been possible without the support of our student contributors. They had a tough time balancing their time between curricular and co-curricular activities and the demands placed by us. We take this opportunity to sincerely acknowledge their support.

Our thanks are due to Ms. Katha Roy Biswas (MBA HR final year), Ms. Esha Panpalia (MBA core) and Mr. Shubham Bhoir (MBA HR first year) for designing an appropriate cover page for the anthology. We also thank Ms. Sushma Louis, Secretary for willingly providing necessary support in all our work.

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Dr. Meena Galliara,
Director,
Jasani Center for Social
Entrepreneurship and
Sustainability Management
NMIMS

Preface

The School of Business Management initiated *We Care: Civic Engagement* internship in 2010 to socially sensitize its full-time MBA students. The internship provides students with a positive environment for understanding of the issues concerning the society. It helps students to shift from being knowledge receivers to idea creators and thereby motivates them to be conscientious citizens and managers.

The internship is in its ninth year. The 2019 We Care placement was spread across 22 states and two union territories with 624 students.

The present publication *Vanchit: Strategies to Empower the Marginalized* is an outcome of the experiences gained by our students through the We Care: Civic Engagement internship. The articles in the anthology highlight that economic growth and prosperity in India has generally excluded a large number of marginalised population consisting of small and marginal farmers, tribals and indigenous communities residing in remote places of India. Socially excluded groups become victims of prejudice and are ignored by the village elite and government officials. Their extreme poverty coupled with poor social capital in the community prevents them from taking advantage of government schemes. The grass-root reality has stimulated our students to understand that exclusion can rob individuals of dignity, security, and the opportunity to lead a better life and can cause certain groups to opt-out of markets, services, and spaces, with costs to both individuals and the economy.

The experiential learning gained by the students is captured in the current publication in two sections. The article on *Overview of the Agrarian Economy of India* in Section I describes the complexities of Indian agricultural sector. It analyses micro and macro factors contributing to the malady of small and marginal farmers and its cascading impact on attaining the UN mandated SDGs. It argues that development cannot be sustainable if it is not fair and equitable. The paper identifies the current growth drivers for promoting agri-businesses and discusses the interventions designed by both public as well as private sector organizations to address the needs of small and marginal farmers. The paper offers a few recommendations to strengthen the backward & forward linkages in the agricultural value chain and underscores the importance of creating an eco-system to transform farmers into agriprenuers.

Section II comprises of six articles highlighting the challenges faced by farmers, the plight of Agarias performing salt farming and the Yanadi tribe of Nellore and the interventions designed

by the NGOs. It also focusses on the need to design alternate agriculture supply chain models and other subsidiary occupations as commercial pollination centers for honey production and enhancing farm productivity. These articles describe the existing inequities across the country and enable a thought process to adopt innovation to create positive long term impact.

The first article, *Situational Analysis of Small and Marginal Farmer's in Bihar* examines the agricultural challenges faced by marginalised farmers in five villages of Sakra cluster in Muzaffarpur, Bihar. The article indicates while external factors like climate change, lack of finance, poor access to water, energy and market support impede farmer's progress, his attitude and social capital prevents him from becoming entrepreneurial. The article offers a few economically feasible recommendations to improve the status of the marginalized farmers in Bihar.

The second article, *Study of Supply chain of Ragi in Nashik*, highlights the growing demand for Ragi in the consumer market due to its growing popularity as 'a humble superfood of the Indian diet'. The paper elaborates on the scope for enhancing farmer's income by cultivating Ragi and conducts a detailed study of its supply chain. The article recommends that to ensure better returns and gain control over the supply chain the Ragi Farmers can directly approach the market via Farmer Producer Organizations (FPO).

The third article*, Commercial Pollination Services: Feasibility Analysis* describes the nature of the beekeeping business undertaken by Under the Mango Tree. It discusses the idea of commercial pollination services and proposes a financial model for setting up the same. Based on the competitor analysis a few recommendations are proposed to design the business model.

Driving Change through Technology: Case of Shikhar Yuva Manch is the fourth article in this section. The article emphasizes the need for infusing technology to improve transparency and accountability of social sector organizations. It describes the change management process for incorporating technology to monitor its vermi compost project performance and allied activities. The article recommends that before introducing technology in NGOs, there is a need to educate the staff about the importance and benefits of technology.

Fifth article in this section is *Situational Analysis of the Yanadi Tribe in Nellore*. The article

portrays the profile of Yanadi tribes and assesses the impact of the interventions carried out by the Association for Rural Development (ARD). To empower Yanadis the article stresses on scaling up efforts in the areas of skill development, capacity building and development of mental health support centers.

The sixth article, *Salt Farming: From Ocean to Cube* examines the socio-economic situation of Agarias and details the salt manufacturing process. To enhance the earnings of Agarias the article evaluates the opportunity for the NGO to enter the retail salt market. For product differentiation in the market, the author proposes the NGO to consider offering salt cubes in lieu of salt powder. The article further discusses the feasibility of the proposed idea and the associated challenges with its implementation.

It has taken six months to enable students to draft their articles and subsequently edit them. Despite observing due diligence in editing the document, there is a possibility of grammatical/typographical errors in the publication. Readers are requested to kindly excuse us for the same.

Dr. Meena Galliara,
Director,
Jasani Center for Social
Entrepreneurship and Sustainability
NMIMS

Prologue

In contemporary India, the instabilities in the stock market make more important news than the agrarian distress faced by the farmers and other marginalized sections of the society. We lack mechanisms to protect many socially excluded groups and communities. While some problems stem from the diversity of socio-cultural systems, others emerge from the economic growth policies pursued by the governments. To project growth, the government has launched high profile projects such as 'Smart City', 'Bullet Train', 'Interlinking of Rivers' and so on. However, the fact remains that from villages to cities, from drought-prone areas to flood-affected zones, disparities, discrepancies, and variations are increasing in quantum. At a time when the country commits itself to the Agenda 2030 to attain the Sustainable Development Goals (SDGs), such records of distress and exclusions have every potential to overpower these commitments and have a detrimental impact on businesses as well. In this context, business schools have a responsibility to orient and train their students to use SDGs as tools for developing inclusive business models and create a sustainable society.

In February 2019, as a part of We Care: Civic Engagement Internship Program, 624 full-time MBA students, were placed in 254 social sector organizations for three weeks across 22 states and two union territories. In all, about 88,680 working hours were deployed to gain first-hand experience of working on projects addressing different sustainable development goals (SDGs). Prominent among those were no poverty (SDG 1), zero hunger (SDG 2), good health and well-being (SDG 3), quality education (SDG 4), gender equality (SDG 5), decent work and economic growth (SDG 8), reduced inequality (SDG 10) and peace and justice strong institutions (SDG 17).

While many students found the gravity of contemporary issues daunting, they reported having learned life-altering lessons. The current Anthology: 'Vanchit: Strategies to Bridge Gaps of Agrarian Economy' is based on the internship projects undertaken by the students in the area of rural and tribal development. Our students who worked with the Agarias of Kutch and Yanadi tribes of Nellore, witnessed the impact of social exclusion on the socio-economic life of these communities. The grassroot challenges of the small and marginal farmers were examined by students placed in interiors of the Sakra cluster in Bihar and Nashik in Maharashtra. The rustic life led by poor farmers, and tribals indicates that the poor in India generally feel exclusion.

Despite the interventions made by the NGOs and the state, the poor are not sure if their children in the future will be able to escape this life of breaking toil and self-humiliation. The

efforts made by social enterprises like "Under the Mango Tree" and "Shikhar Yuva Manch" to promote livelihood with available skill-sets of local communities facilitated students to apply their managerial logic for strengthening the business model for increasing the social impact.

Collectively, the articles penned by the students advocate a strong case for developing social solidarity among cross sectors for creating an enabling environment to promote equitable and inclusive economic growth. Among other things, the articles indicate that while there is a need to bring cultural transformation among the beneficiary groups to liberate them from their rigid and fatalistic ideologies, there is a larger room for each one of us to be compassionate, pragmatic and humane while dealing with the deprived.

I am sure that the experiential learning gained by students will develop them as future leaders with a conscience for sustainability.

We are delighted to present this publication and hope it will be of use to readers who are interested in promoting sustainable and inclusive growth.

Dr. Ramesh Bhat,
Provost - Management Education, NMIMS &
Dean, School of Business Management

Section I

Sustainable agriculture is at the core of the 2030 agenda of achieving 17 sustainable development goals (SDG). Sustainability in agricultural practices is vital to achieving food security, fulfilling the nutritional requirements, preserving the ecosystem and ensuring a decent living. This section provides information about the complex nature of agriculture in India, the factors causing agrarian distress and the resulting impact on the SDGs. The section discusses the growth drivers for the agribusiness in India and briefly documents the efforts undertaken by Government as well as private sector organizations to adapt to the changing market scenario. The paper recommends promoting inclusive growth through the facilitation of public-private partnerships for strengthening backward and forward linkages in the agriculture value chain as well as promotion of agripreneurship.

Overview of the Agrarian Economy of India

Abstract: *The current article reviews the complex agrarian economy of India and its cascading impact on the lives of small and marginal farmers. The article is divided into four sections. Section I gives a glimpse of the achievements of the agriculture sector in India and the changing trends in the agrarian policies of the country. Section II elaborates on the causative factors of agrarian distress. It highlights the pressing concerns plaguing the agriculture sector in India owing to poverty, poor education of farmers, ignorance, unpredictable weather, low productivity, lack of financial security, policy failure, and value chain linkages.*

The impact of the causes of agrarian distress on the farmers, consumers and the ecosystem at large is detailed out in Section III. The section highlights that India's food and agriculture indicators related to the United Nations-mandated Sustainable Development Goals (SDGs) present a worrisome picture. Discussion on agricultural growth drivers are presented in Section IV. The paper offers a few recommendations to strengthen profitability and sustainability of small and marginal farmers in the country.

1. Introduction

Despite tremendous progress made by India in the field of industry and services, agriculture continues to play a pivotal role in India's $2 trillion economy (Chowdhary, 2019). Agriculture remains a key contributor to India's economic development not only by its share of the Gross Domestic Product (GDP) but also as a driver for industrial growth. India hosts nearly one-fourth of the world's farmers and possesses 48 per cent of the world's arable land. In 1947, India was dependent on foreign food aid and imports. Over the years the country has adopted scientific technologies and appropriate policy measures for not only gaining self-sufficiency in food production but is also a net exporter of food (Mehta-Bhatt, 2015). As cited in Ibef.org (2019), Indian Agriculture and Allied Industries Report (2019), “India is the largest producer of spices, pulses, milk, tea, cashew & jute; and the second-largest producer of wheat, rice, fruits & vegetables, sugarcane, cotton, and oilseeds. India is second in global production of fruits & vegetables and is the largest producer of mango and banana”. The food and grocery market in India is the sixth-largest in the world. The food processing industry is one of the largest industries of India and is ranked fifth in terms of production, consumption, export and expected growth (Ibef.org, 2019).

The Economic Survey 2017-18 & ILO Study 2019 indicates that India is still known as an agrarian economy as majority of the workforce is dependent on agriculture. It continues to remain the only sector that has a direct combined impact on poverty, rural livelihoods, health and nutrition (Mehta-Bhatt, 2015).

1.1. Agrarian Policies

Post-independence agricultural development focused on land reforms - giving land titles to actual cultivators by abolishing intermediaries and setting up of Agricultural Price Commission (APC) to ensure remunerative prices to producers. Between mid-sixties to 1980 the focus shifted to attain food security through Green Revolution, research & extension services, provision of credit, and improvement in rural infrastructure (Tripathi & Prasad, 2010). Agriculture support and subsidies increased substantially during this period

Post liberalization the government designed several economic reforms to enable farmers to trade in the global market. In 2000 GoI launched its first Agricultural Policy to "Strengthen rural infrastructure to support faster agricultural development, promote value addition, accelerate the growth of agro-business, create employment in rural areas, secure fair standard of living for the farming community, discourage migration to urban areas and face the challenges arising out of economic liberalization and globalization over the next two decades." (Yadav, 2010). The National Agriculture Policy emphasized increasing public investment for narrowing regional imbalances, accelerating development of supportive infrastructure like rural electrification, rural connectivity, development of market infrastructure, setting up of agro-processing units to reduce wastage particularly of horticulture produce, and creating off-farm employment in rural areas. The National Agricultural Insurance Scheme launched in 1999-2000 covers all farmers and crops throughout the country with built-in provisions for insulating farmers from financial distress caused by natural disasters and market fluctuations.

By 2012, livestock, poultry, fisheries, and horticulture surged ahead in production growth. Though the agriculture sector over the years had recorded satisfactory growth due to improved inputs, technology, irrigation, and pricing policies, the achievements of Indian agriculture remain confronted by unsolved, un-addressed issues of low productivity and marginal income to farmers.

In terms of gross capital formation (GCF), investment in agriculture as a percentage of GDP in agriculture and allied services decreased from 18 per cent in FY12 to 15.2 per cent in FY 19 (PRS India, 2019). The government has been injecting funds through various schemes introduced in

its Five Year Plans. However, a large section of public spending has been mostly in the form of providing subsidies rather than addressing the root causes of agrarian distress. To address the issues of farmers, agricultural budgets increased from INR 35,984 crore in 2016-17 to INR 1,30,485 crore in 2019-20. The budgetary allocation for agriculture and farmer's welfare almost doubled from 2018-19 to 2019-20 due to the Income Support Scheme (PM-KISAN) which was announced in the interim budget of 2019-20 (PRS India, 2019). The government has introduced many agro-centric initiatives like Pradhan Mantri Fasal Bima Yojana, Soil Health Card, Pradhan Mantri Krishi Sinchayee Yojana, National Agriculture Market (eNAM), Pension Scheme for Small & Marginal Farmers and Kisan Credit Card. To safeguard the interests of farmers and provide them with financial stability the government regularly enhances the Minimum Support Price (MSP) for different crops.

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2. The Agrarian Distress

Despite all efforts invested by the government and NGOs, agrarian distress prevails. There are multiple reasons for the same stemming from, lower levels of education, fragmented landholdings, lack of resources, issues concerning climate change, financial exclusion, failure in crop insurance, lack of infrastructure and market support. The same are elucidated in the following paragraphs:

2.1. Educational Background:

NITI Aayog's study on 'State of Indian Farmers' (2018) conducted across 18 states having a sample size of 6412 respondents, highlights that 28 per cent farmers were found to be illiterate, 14 per cent had passed matric (Class X) and only 6 per cent had enrolled for a college degree. The poor educational background of the Indian farmers is the major impediment in their progress. Due to lack of knowledge and financial resources, they are compelled to practice non-mechanized agriculture. The farmer is barely empowered as a supplier as the larger community does not foster

entrepreneurial thinking among farmers. The farming community continues to be small & marginal, inadequately resourced, ill-informed on markets, ill-equipped to manage risk, burdened with credit & debts and are dependent on traders to reach the buyers (Mudholkar, 2018). A large section of small and marginal farmers survive in isolation and are refrained from having access to best practices or technological innovations to enhance their agricultural yield. The testimony to this fact is supported by NITI Aayog's study which indicates that only 10 per cent farmers are members of farmer's organization.

2.2. Landholding:

As per Census 2011, the surge observed in farm labour can be attributed to the falling size of landholdings over time. Agriculture Census 2015-16 highlights that, the average landholding size for marginal farmers was 0.38 Ha (Hectares). For small farmers, it was 1.40 Ha, while for large farmers it was 17.07 Ha. This implies that not more than 4.9 per cent of farmers control 32 per cent of India's farmland. Thus a 'large' farmer in India has 45 times more land than a 'marginal' farmer. Census 2011 further observes that small and marginal holdings taken together (0.00-2.00 Ha) constituted 86.08 per cent of the total holdings. The semi-medium and medium operational holdings (2.00-10.00 Ha) were only 13.35 per cent. Whereas the large holdings (10.00 Ha & above) were merely 0.57 per cent of the total number of holdings. 56.4 per cent of rural households own no agricultural land (Chartuvedi, 2016). According to a rural survey carried out by the National Bank for Agriculture and Rural Development (NABARD) in 2018, states like Bihar, West Bengal, Tripura, Sikkim, and Jammu & Kashmir had more number of small and marginal farmers with average land parcel of 0.5 Ha per household (BusinessLine, 2018).

2.3. Access to Water:

Water is the leading input in agriculture. As per the World Resource Institute (WRI), 54 per cent India faces high to extremely high water stress. Only four months of monsoon, irregular and scattered rainfall, droughts, poor water management practices, and distorted water pricing policies make

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India a water-poor country (Dhawan, 2017). Agriculture has to compete for water with urbanization, drinking water and industrialization.

Indian farmers majorly practice dryland agriculture. Due to dependency on rains and unpredictable climatic conditions, small and marginal farmers face major losses (Planning Commission, n.d.). According to Shroff (2019), only 47.68 per cent of gross cropped area is irrigated leading to low productivity. Lack of water restricts the farmers to take a second crop in the year resulting in low cropping intensity. This also impacts the yield and overall agricultural revenue of the farming community. Small farmers depend more on groundwater compared to large farmers who have more access to canal water. Although most parts of India have relatively abundant groundwater, it is depleting at a pace of two to three meters per year. The Central Groundwater Board (CGWB) has categorized 16.2 per cent of the total assessment units as 'over-exploited' with an additional 14 per cent as either at 'critical' or 'semi-critical' stage. North-west India is experiencing the highest depletion in groundwater levels (Dhawan, 2017). States like Haryana, Punjab, Rajasthan, and Delhi utilize more groundwater than the upper limit of 70 per cent thus hampering its natural replenishment rate (NITI Aayog, 2018).

To minimize groundwater extraction, micro-irrigation system such as drip irrigation was introduced in 2006 to enable small farmers to have access to water. Till 2015, the micro irrigation scheme covered about 5.5 per cent of India's cropped area (OECD, 2018, p87). However, during the expansion of the scheme in 2017-18 only five states accounted for 78 per cent of coverage (Haq, 2018 & Narayanmoorthy, 2019). Unfortunately, the provision of free electricity for generating access to irrigation has resulted in overuse of water thus declining groundwater tables. It is estimated that Indian farmers use two to four times more water to produce a unit of major food crops than in China or Brazil (Dhawan, 2017). As urea is heavily subsidized, farmers due to lack of scientific knowledge use it more than required leading to soil salinity, degradation of soil, waterlogging and depleting micronutrients. Consequentially, the water needed to absorb

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2.4. Climate Change:

There have been droughts in India since 2015. Irregular rainfall, flooding, and rise in temperatures in various parts of the country due to climatic changes has added more misery to the lives of farmers. For instance, in 2019 Madhya Pradesh received 44 per cent above average rainfall resulting in reducing the soya bean yield (Jadhav, 2019). In the same year, 42 per cent of the country's land faced drought situation of which six per cent was exceptionally dry. States comprising 40 per cent of the nation's population such as Andhra Pradesh, Bihar, Gujarat, Jharkhand, Karnataka, Maharashtra, parts of the North-East, Rajasthan, Tamil Nadu, and Telangana were the worst hit due to climate change impact (Gogoi & Tripathi, 2019). Low or poor cultivation due to climate change has impacted the individual income and the national food supply (PTI New York, 2019).

2.5. Financial Exclusion:

According to the Financial Inclusion Survey (2016-17) out of the total agricultural households having a land size below 2 Ha, on an average 52 per cent were found to be indebted. Across states, Telangana, Andhra Pradesh, and Karnataka showed the highest levels of indebtedness (NABARD, 2018, pp 61-72). The editorial published by Business Line (2019) states, “Nearly 60 per cent of India's small and marginal farmers still do not have access to institutional credit from scheduled commercial banks”. The RBI's Internal Working Group to review agricultural credit indicates two major reasons for farmers being left out of institutional credit. Firstly the farmer's need for consumer loans and secondly their inability to offer collateral security (Mathew, 2019). From an institutional perspective, the small ticket size of loans needed by farmers accrue higher transaction costs of reaching and servicing them. Regional disparities in the disbursement of institutional credit are observed largely due to political factors, awareness levels among farmers, accessibility to banks and so on (OECD, 2018, p22). The variation in accessing institutional credit is also influenced by factors such as farmer's experience, education, landholding size, clear title of the land, family size and ability to

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provide collateral security by farmers' (Kumar, Mishra, Saroj & Joshi, 2017).

Though microfinance is available, loans from microfinance institutions and NBFCs are expensive. Therefore, agricultural money lenders constitute a major source of credit for smaller farmers which are exploitative.

2.6. Lack of enabling infrastructure:

Infrastructure has a direct impact on growth and agricultural productivity. Primitive and traditional practices of farming cannot enhance the production and productivity of agriculture in India. Farm mechanization in India is still in its nascent stage with five per cent growth in the last two decades. According to FASAR, Yes Bank & GAA (2016), the mechanization rate in India is lower than the United States, Western Europe, Russia, Brazil, and China. Additionally, India has lower than average farm power availability than other developing countries like Korea, China, and Japan. Farm mechanization in the country faces challenges related to farm technology, markets, processes, legislation, policy framework and so on. The government has funds for setting up Custom Hiring Centres to make farm machinery accessible, but private players are not inclined to invest on account of scattered landholdings, longer maintenance periods of equipment, low success rates and so on.

As cited by Chaudhry (2015), due to poor value chain infrastructure, India has one of the world's highest levels of post-harvest food loss. There is a staggering lack of infrastructure across the entire agricultural value chain. As quoted by Rawat (2015), “The degree of organization and governance of the value chain continues to be a challenge. The existence of several middlemen, absence of information about other links in the chain and inability to invest in improving the performance in almost every part of the chain has led to inefficiencies and lower incomes especially in the lower end of the chain”. Fragmented supply chain has added to the woes of the farmers such as post-harvest losses of fruits & vegetables due to gaps in storage, cold chains, and limited connectivity.

There is a staggering lack of infrastructure across the entire agricultural value chain. Fragmented supply chain also has added to the woes of the farmers such as post-harvest losses of fruits & vegetables due to gaps in storage, cold chains, and limited connectivity.

2.7. Agricultural Research: Low Priority

Investment for agriculture research in India is minuscule. "According to the Economic Survey 2017-18, the total R&D expenditure in India as percentage of GDP has been stagnant at 0.6 to 0.7 per cent in the last two decades — much lower than the US (2.8 per cent), China (2.1 per cent), South Korea (4.3 per cent) and Israel (4.2 per cent)" (Bhaskar, 2018). The low investment in research is attributed to high capital investment and a long gestation period. Government has to give priority to addressing the immediate needs of its people and hence research in agriculture is considered a luxury.

2.8. Cost and Pricing:

Major factors that have transformed the positive state of Indian agriculture into a negative state for peasants are the rising costs of production and the fluctuating prices of farm commodities. Latest reports like 'Report of the High-Level Committee on Reinventing the Role and Restructuring of the Food Corporation of India', (2015), Evaluation Report on Efficacy of MSP on Farmers' (2016) and 'State of Indian Farmers' (2018), indicate that the price which farmers receive in the market and the MSP offered by the government, are lower than the cost of production. Middlemen are the biggest beneficiary of the agricultural value chain (Dev, 2018).

Entire agricultural sector is falling prey to the large agribusiness, agrochemicals, commodity trading, food processing and retail sectors that lay the rules of trade, decide the crops to be produced and process them (Todhunter, 2019). This indicates that there is corporatization of agriculture, where corporate structures control the means of agricultural production and distribution (Meena, 2016). Due to corporatization, the input cost of farming has increasead but the output price has not increased at the same pace. Downfall in the prices of farm commodities is subsequent to the international markets controlling the prices. The players at the extreme ends of the value chain (farmers and consumers) are

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at the receiving end. Value realization to the farmers is very poor even if the consumer pays a high amount for the agricultural commodities (Dev, 2018).

2.9. Agricultural Risk:

Risks related to climate change, an outbreak of pests, losses in storage & transport, price uncertainty and so on are not evenly distributed among all players in the agriculture value chain like grain traders, aggregators or processors (Mudholkar, 2018). Unfortunately, farmers are required to bear the entire risk in the farm to market cycle.

2.10. Crop Insurance: Failure

In the context of inequity of landholdings and the socio-economic status of Indian farmers, crop insurance has remained a failed attempt. Despite repeated revision of the schemes, provision of support for premium subsidies, crop insurance has failed to produce the desired results. As cited in Agarwalla & Barua (2017) the study conducted by the National Institute of Securities Markets(NISM)'s in 2014 concludes that average awareness about crop insurance in the country was reported to be 38.8 per cent and the usage was merely 6.7 per cent. Agarwalla & Barua (2017) indicate that “Crop insurance has failed to provide much-needed relief to farmers from destitution. The reasons for failure include: a) reluctance on the part of governments to allocate adequate funds for providing subsidy required to support cost of insurance exacerbated by the problems that arise when the central and the state governments have to agree on a subsidy-sharing formula, b) delays in payment of compensation arising from bureaucratic hurdles in assessment of damage and disbursal of compensation, and c) inadequacy of the compensation amount in the case of crop failure.”

2.11. Subsidy Culture:

The extraordinary focus on subsidies has resulted in tremendous wasteful expenditure and has not led to reaping any benefit to the sector. Input subsidies i.e. government-sponsored subsidies to farmers for fertilizers, irrigation, electricity, and food are the most expensive aspect of India's agricultural policies. India has witnessed a high subsidy budget over time. This has resulted in our agriculture sector being more dependent on input subsidies when compared with other large emerging economies like Brazil and China. These countries have done away with subsidies which do not give long term benefit (OECD, 2018). In India, of the total planned revenue expenditure, 88 per cent is spent on subsidies whilst a mere 12 per cent is earmarked for capital investment in 2019-20 (PRS India, 2019). Inappropriate and low utilization of subsidies has resulted in larger market inefficiency.

2.12. Lack of Market Support:

Though farmers can use different types of marketing channels to market their produce, each marketing channel has associated costs for managing logistics, transportation, and other related tasks. Before choosing a marketing channel a farmer has to consider these costs. The farmers' choice of marketing channel can pose problems and result in lower earnings. As a result, small and marginal farmers are dependent upon agents to market their produce. They have no bargaining power due to lack of formal education, marginal digital penetration, poor social capital in the community, caste and other factors (Agritech.tnau.ac.in., n.d.).

The initiatives towards generating access of farmers towards markets have not been successful due to reasons such as connectivity issues to the market, lack of infrastructure to create an electronic market place and so on. The reforms to the Agricultural Produce Market Committee (APMC) Act, 2003 has been slow to ensure modifications in the dealings of the market (Chand, 2016). Often market regulation like APMC and Essential Commodity Act, 1955 (ECA) inhibits entry of modern capital into the system which can bring innovative method, competition, e-commerce, investments and integration of agriculture value chain.

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3. Agrarian Crisis & Attainment of SDGs

Indian farmers are exposed to global competition due to economic reforms. In the neoliberal regime, farming has got delinked from the earth, the soil, the biodiversity, the climate and is now linked to global corporations and global markets. The generosity of the earth is replaced by the greed of corporations, the viability of small farmers and small farms are destroyed. Consecutive droughts and lack of options for alternative livelihoods are creating conditions of despair. Due to lack of resources and smaller landholdings, farmers are squeezed between seed & fertilizer corporations and powerful retail

interests. Degraded soil owing to fertilizer overuse, pest infestation, contaminated and depleted water supplies are resulting in less diverse and nutrient-deficient diets, poor health and destruction of rural communities (Todhunter, 2019).

"India is the largest extractor of groundwater in the world" (RIS, n.d.). The rate of groundwater extraction is severe. NASA's findings suggest that India's water table is declining alarmingly at a rate of about 0.3 meters per year. Declining groundwater table will result in the rise of irrigation costs and, thereby, increase the cost of cultivation. Almost one-third of India's harvest has been estimated to be at risk due to groundwater depletion. As cited by Narayanmoorth & Alli (2019), Central Groundwater Board's (CGWB) survey indicates that Andhra Pradesh, Tamil Nadu, Kerala, and Karnataka are in a worse state as far as groundwater decline is concerned. Increasing water-use efficiency over time is strongly linked with sustainable food production (SDG 2), economic growth (SDG 8), infrastructure and industrialization (SDG 9), cities and human settlements (SDG 11), as well as consumption and production (SDG 12). According to India's SDG 6 target of increasing water use efficiency requires the country to annually extract only 70 per cent of the net available groundwater. It will be difficult to adhere to this target as already the withdrawal is at 62 per cent of the net available groundwater (NITI Aayog, 2018). If the present rate of groundwater extraction persists, India will only have 22 per cent of the present daily per capita water available in 2050, possibly forcing the country to import its water (Narayanmoorth & Alli, 2019). Productivity of most crops is expected to decrease marginally due to climate change by 2020 (Shrivastava, 2016). According to the SDG India Index Baseline Report (2018), India is expected to have 5,018kg/Ha of agricultural produce of rice, wheat and coarse grains from 1 Ha of land annually by 2030. However currently, it produces only 2,509kg/Ha.

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Lack of physical infrastructure such as electricity and roads directly affects productivity which has poverty reduction effects on both farm and non-farm labour. Electric power is required for groundwater extraction, domestic water supply, cold storage, dairy industry, food processing, cattle feed grinding and so on (Llanto, 2012). Poor road infrastructure increases the post-harvest losses adding to the farmer's misery. Consequentially, farmer suicides are the most tragic and dramatic symptom of the crisis of survival faced by Indian peasants. Suicide rates among Indian farmers are 47 per cent higher than they were for the rest of the population in 2011 (Haq 2018). The Union Government in 2017 had informed the Supreme Court that on an average, over 12,000 suicides by farmers had been reported every year since 2013 (Mahapatra, 2017). As cited in an editorial by Economic Times (2015), Borkar in his book on 'Farmers Suicides in Vidarbha: An Agrarian Crisis' published in 2013 highlights that, two-thirds of the suicides have taken place in Maharashtra, Karnataka, Andhra Pradesh, Madhya Pradesh, and Chhattisgarh and 80 per cent of the farmers committing suicide were cultivators of cash crops.

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There is a disconnect amongst what the Indian farmer produces and what the consumer demands. The disconnect has led the farmers to shift from producing for nutritional security to cultivating cash crops enabling them to free themselves from debt. Unfortunately, this has not worked in their favor because of the high input cost, issues of climate change, the uncertainty of rainfall and market volatility (Holla, 2019). There is a significant impact of this on the nutritional status of farming families, whose nutritional status is already low. The income gap among farmers and the rest of the population in India has widened to a point where the food consumption in rural India per head of population is far lesser than it did 40 years ago. Data from various governmental sources shows that while the farmers income is falling in real terms, the price of food that the family is forced to buy from the market is rising, resulting in reduced consumption of

protein and micronutrients from flesh foods, pulses, eggs, milk, vegetables and fruits (Todhunter, 2019). The increased income inequality among small farmers and lack of access to resources will make it difficult for the country to attain SDG 10 which aims at reducing inequality within and among countries and SDG 3 which aims at attaining good health and well-being for all.

The agrarian crisis has also affected the consumer's diet due to contamination of food using hormones, steroids, antibiotics and a range of chemical additives (Todhunter, 2019). It is an irony that despite the achievement of food grain security in 2019, India was ranked 102 out of a total of 117 countries by the Global Hunger Index indicating that the country suffers from a level of hunger that is serious (GHI, 2019). 38.4 percent of under-five children are malnourished and stunted in India (SDG India Index Baseline Report (2018). Thus ending hunger, achieving food security, improved nutrition through the promotion of sustainable agriculture (SDG 2) seems like a far-fetched dream.

As quoted by Sainath in Nair (2018) “Two decades of neoliberal globalization have caused massive growth in inequality. The agrarian crisis is now a social crisis with people leaving agriculture and not getting absorbed anywhere else. Between 1991 and 2011, 1.5 crore farmers dropped out of agriculture, with most becoming landless farm labourers. Lakhs went to other villages and cities in search of jobs. It is a civilizational crisis now, a crisis of humanity”. With no increase in jobs in the non-agricultural sectors, it can be concluded that the cultivators are either converting to agricultural labourers or serve as cheap labour in the industrial supply chain in urban areas adding to casualization and informalization of labour (Sainath, 2018 & Todhunter, 2019). Migration impacts the education of children and further pushes the next generation towards exclusion. As male farmers migrate in search of jobs, the burdens of female farmers have risen in many ways (Sainath, 2018).

Migration in search of better livelihoods adds to the number of urban poor. SDG India Index Baseline Report (2018), indicates that there are 10 homeless households in every 10,000 households. According to United Nations estimates, India is expected to add the largest number of urban dwellers by 2050 (Down To Earth, 2018). High level of migration to urban areas in search of livelihood, better education, and social infrastructure has multiple implications on the planet.

According to the Technical Group on Urban Housing Shortage in 2012 estimated that there was a housing deficit of 18.78 million of which 96 per cent belonged to the economically weaker

sections and low income group families (PIB, 2013). Thus making it difficult to attain SDG 11 which aims at making cities and human settlements inclusive, safe, resilient and sustainable. Fast-track unplanned urbanization increases stress on available water and energy resources. People find it difficult to access clean water and sanitation (SDG 6) and have access to affordable clean energy (SDG 7). This has a cascading impact on productivity and deteriorates the quality of life.

4. Agriculture Growth Drivers

Agriculture even today is the biggest employer of labour in India. This puts agriculture, food systems, and the ecosystem processes that sustain societies at the core of delivering on the SDGs in India. Hence, systemic, long-term perspectives are needed to ensure that agricultural growth is attained. Agriculture sector is likely to grow at an approximate rate of 2.1 per cent on a year on year basis (Economic Times, 2018). "The Gross Value Added by agriculture, forestry and fishing was estimated at INR 18.53 trillion (US$ 271.00 billion) in FY18" (Ibef.org, 2019). The demand factors for the agriculture sector in India include the promising population growth, rise in per capita GDP, better propensity and surge in agricultural exports. Increasing population is a key demand driver for agricultural produce in the country. India has to meet the food, feed and fiber consumption needs of over 1.2 billion people. This reflects the increasing need for agri commodities and the overall ecosystem required to support agricultural development. Strong growth in per capita income has resulted in greater demand for agricultural outputs. Legal reforms, an increase in government incentives, rise of private participation in agribusiness and deployment of technology infusion in farming are some of the key growth drivers for the progress of the agri industry in India. The subsequent discussion substantially elaborates on the same.

4.1. Legal Reforms & Government Incentives

To generate interest among the private sector and to incentivize them for investing in agriculture sector, GoI has introduced several reforms. For instance, the Model Agricultural Produce and Livestock Marketing (Promotion and Facilitation) Act – 2017 facilitates the private sector to set up private markets and alternate marketing platforms both offline and online.

The State/UT Agricultural Produce and Livestock Contract Farming and Services (Promotion & Facilitation) Act 2018 facilitates better price realization and risk mitigation for farmers and consequentially motivates them to associate with bulk-purchasers, exporters and agro-companies (OECD, 2018). To incentivize partnerships between corporates and farmers, all FPCs with a turnover of up to INR 100 crore per annum are offered tax exemption under the Income Tax Act, 1961.

To make the food processing sector competitive and market-oriented government has offered 100 per cent FDI to encourage foreign investments in forming appropriate post-production setup (PIB, 2019). Government is offering fiscal incentives such as capital subsidies, tax rebates, and reduced customs and excise duties for setting up food processing facilities. To boost infrastructure government has established 60 fully equipped Agri-Export Zones (AEZs), in addition to 42 mega food parks and 128 cold chains. Ministry of Food Processing Industries (MoFPI) is offering grant-in-aid at the rate of 35 per cent of project cost in general areas and 50 per cent in North-East, Himalayan States, island areas & Integrated Tribal Development Project (ITDP) areas to private players to own and operate cold storage units (MoFPI, n.d.). All these efforts will accelerate exports. Scheme for Agro-Marine Processing and Development of Agro-Processing Clusters (SAMPADA) commonly known as Pradhan Mantri Kisan SAMPADA Yojana has been launched to boost food processing and create forward & backward linkages (Rastogi, 2017). To accelerate growth government plans to increase the total quantum of private investment from INR 61,000 crores in 2015-16 to INR 139,424 crore by 2022-23 (PIB, 2019). India has signed 64 MOUs/agreements with various countries for the development of agriculture in India (Agricoop.nic.in, 2017).

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4.2. Role of Private Sector

While public investment usually strengthens the infrastructure of the sector, private investment is associated with enhanced productive capacity (PIB, 2019). In early 2000, the private sector facilitated the agri-business transformation as its investment increased in the agri-food value chain. According to Ashok Gulati, as cited in Sally (2017), "About 80 per cent of the agriculture sector is driven by private companies". Private investments in agriculture are mainly seen in areas of agri research, plant genetics, seed treatment, agricultural chemicals, biologicals, plant growth regulation, animal genetics & health, biofuels, machinery, irrigation, soil analysis, and data-intensive precision farming tools (Ferroni & Zhou, 2017).

4.2.1. Investment in Research:

Agribusiness companies such as Monsanto, Godrej, Rallis, Advanta and so on make heavy investments in agricultural research and technological innovation. Private research has facilitated the export of crops, technology, and agricultural inputs such as agrochemicals and machinery.

4.2.2. Use of Scientific Technology

Private players have been instrumental in innovating and enhancing farm productivity and reducing the input cost. For instance, the 'Subh Mint' project by Mars Wrigley Confectionery works towards improving mint plant science and long term viability by providing inputs. Companies like Mahyco and Syngenta provide superior quality seeds, Mondelez India provides seedlings, technical know-how, and support in post-harvest processing to the farmers. Mahindra provides technological inputs required for adopting micro-irrigation. Hindustan Unilever offers the latest agricultural techniques for farming, irrigation practices, adequate knowledge support and recommendation of right seed varieties (Sally, 2017).

Precision farming is the latest information and technology-based farm management system. It uses technology like remote-sensing, Geographical Positioning System (GPS), Geographical Information System (GIS) for precise application of inputs to improve productivity and profitability. It supports sustainable farming by reducing the usage of chemicals and water for crop production. It is an opportunity for reducing wastage of resources by better resource management (Kumar, 2018). Tech Mahindra has innovated a homegrown solution called 'Farm Sensor'. The Farm sensor measures critical farm attributes at soil level, above soil level and crop level of a farm. The collated data with regards to soil moisture, it's nutrient value, plant susceptibility, weather conditions, humidity and so on aids the farmers in taking accurate decisions. Based on the data available, farmers are able to practice precision agriculture (Tech Mahindra, n.d.).

4.2.3. Emerging Business Models:

Private sector has been active in the area of hybrid technology for increasing seed production and distribution. It is gradually opening up its avenue to fulfill most of the gaps existing in the agri sector by creating customized solutions for the farmers and customers. To integrate farmers with agro-industries private corporations are engaging small and marginal farmers in contract farming.

To provide a comprehensive legal regime for protecting farmer's interest and enable facilitation of contract farming, government has formulated draft model contract farming law titled

Agricultural Produce and Livestock Contract Farming (Promotion and Facilitation) Act, 2018. Through the enactment of this Act government proposes to double the farmers' income by 2022.

By entering into a legal contract with farmer's, corporate partners ensure a steady supply of raw material by providing scientific & technological inputs and ensuring a fair price. Better price realization and risk mitigation motivates farmers to associate with bulk-purchasers, exporters, and agro-companies (OECD, 2018). For instance, established companies such as Jain Irrigation, Bayer, ITC, Godrej have created successful business models through contract farming. Jain Irrigation worked on a dual contract with farmers as well as Coca Cola for mango pulp production and sale in both domestic and international markets. The company procures mangoes from contracted farmers at attractive pre-decided value. To increase their yields, the company educates them about cluster farming for space optimization and provides them with good quality seeds. The contract ensures remunerative prices for the farmers enabling them to live a secured life (Bhaskar, 2019).

Several incubators and accelerators are encouraging innovation and entrepreneurship in food and agriculture. Educated youths having science-based and technological backgrounds are working on solutions to bridge the technology gaps faced by farmers to improve precision in agriculture and create new market opportunities for farmers (Psa.gov.in, n.d.). Startups are intervening in the supply chain to provide end to end support to farmers. For instance, startups like Sabziwala and Dehaat work with the entire value chain helping the farmers to save cost, connect directly with the end consumers or food processing giants eliminating the middlemen and ensure better returns (Sally, 2017).

4.3. Public Private Partnership (PPP)

Considering the resource constraints and the urgency for much-needed transformation, government has facilitated PPP as a game-changer in agriculture (Chaudhry, 2015). In the context of challenges and constraints to farm mechanization faced by small and marginal farmers, Custom Hiring Centres (CHCs) have been introduced to offer expensive farm equipment on rent to farmers. The concept of operating CHCs in partnership with private players to leverage their technical expertise and risk-taking abilities is an emerging PPP model. For instance, “EM3, has created a pan India network of farm service centers – “Samadhan Kendras”, these specialized centers started as CHCs are equipped with various kinds of modern agro machinery. Similarly, Zamindara Farm Solutions uses a combination of library model and radio taxi model to provide farm equipment services. For better backward linkages, corporates like OLAM have been running CHCs for sugarcane harvesting in Madhya Pradesh through a tie-

up with the local agri tech service providers" (FASAR, Yes Bank & GAA, 2016, p19).

Food Processing industry is driven by growth and is expected to reach US$482 billion by 2020. It has a central role in driving improvements in the country's nutrition situation because it is the first organized linkage between the farm and shelf. In this context, the Ministry of Food Processing Industries (MoFPI), is making all efforts to encourage investments in the business. It has approved proposals for joint ventures (JV), foreign collaborations, industrial licenses, and 100 per cent export-oriented units (Agricoop.nic.in, 2017). For instance, under the Maharashtra Public-Private Partnership for Integrated Agriculture Development (PPPIAD) project, the state is developing integrated value chains for selected crops through PPPs and co-investment (Chaudhry, 2015).

As the agriculture extension system is burdened with a lack of manpower, inadequate financial support, and infrastructural constraints, harnessing the technological strength of the private sector has aided in improving the effectiveness of the system. For instance, the Department of Agriculture, Madhya Pradesh partnered with the Dhanuka group of companies to strengthen the state agriculture extension system in areas of soil testing, training, transfer of technology, establishment of markets and provision of credit facilities (Sajesh & Suresh, 2016). Similarly, social media platforms such as Facebook and WhatsApp are being extensively used by farmer groups for sharing best practices and dissemination of information at an informal level. These are engaging platforms for farmers to interact with other fellow farmers, exchange knowledge and collaborate with peers to discuss challenges and implement possible solutions.

The agriculture extension system is burdened with a lack of manpower, inadequate financial support, and infrastructural constraints, thus harnessing the technological strength of the private sector has aided in improving the effectiveness of the system.

4.4 Market Support:

Market intervention by private players for procurement has

facilitated price regulation. For instance, Mahindra launched MeraKisan, a start-up for the online procurement of fresh fruits & vegetables. The online platform ensures that farmers get 10 to 15 per cent more returns by removing middlemen (Sally, 2017). Whereas in Himachal Pradesh farmers earned INR 25/kg of apples, however, when Adani Group started working with 15000 farmers, they earned INR 65/kg with a better quality of apples (Sally, 2017).

To encourage income revolution, GoI has launched an electronic trading platform for National Agriculture Market (e-NAM) in 2016. eNAM integrates the physically dispersed markets virtually, thus increasing the universe of players (Boettiger & Sanghvi, 2019).

4.5. Corporate Social Responsibility (CSR)

To promote sustained, inclusive and sustainable economic growth (SDG 8) there is a huge potential for investing CSR funds in the agriculture sector by 'creating shared value'. For instance, the JSW Foundation in partnership with Government of Karnataka, Community-Based Organizations (CBOs) and NGOs has designed Integrated Watershed Management in Bellary district of Karnataka for reducing input costs to double farmer's income (Icrisat.org, n.d.).

JFarm services and JFarm Services App introduced by Tractors and Farm Equipment Limited (TAFE) facilitate farm equipment rental platform for reaching out to the small and marginal farmers for enhancing their productivity and income (Economic Times, 2018). Walmart has designed interventions for the agriculture value chain. Through its implementation partners, it enables programmes that assist smallholder farmer's access to agriculture technology, facilitates training on sustainable farming methods, enhances access to formal markets and capacity building for effective management of FPOs (Walmart, 2019). Similarly, corporations should facilitate development of the farming community by encouraging their CSR arm to design farmer-friendly interventions. Demonstration plots should be created to help farmers witness the application of good agricultural practices, deliver hands-on training and adopt technology. NGOs should develop capacities of the farmers to utilize modern technology, understand customer demands, work with agribusinesses and upgrade their knowledge about agriculture markets. They should make efforts to instill and foster entrepreneurial thinking among farmers.

5. Conclusion & Recommendations

The Indian economy is among the fastest-growing major economies of the world. Over 58 per cent of the rural households depend on agriculture as their principal means of livelihood. Within the sector, the sub-sectors of horticulture, livestock, and fisheries have been

contributing a larger share of value to agri-GVA since the last decade (Psa.gov.in, 2019).

Agricultural development continues to remain critical for economic growth, poverty reduction and ensuring food and nutritional security of the country besides meeting other mandates of the agricultural sector. In spite of being the largest producer with 25 per cent of the global food production the share of agriculture to the GDP has been declining during the past 67 years (Sunder, 2018). This is the result of rising costs of cultivation and non-remunerative market prices. Thus, the sustainability of agricultural growth faces serious doubt. Additionally, the agrarian challenge even amid surpluses has emerged as a core concern.

It is important to note that agriculture is key to meeting half of the 17 SDG targets set for 2030, which includes eliminating poverty, hunger and reducing inequalities. To achieve these SDG targets, the agriculture sector requires a boost. In this regard, government has formulated various policies to increase access to agricultural inputs and participation of private sector. Private players have been instrumental in facilitating technological revolution in agriculture for increasing farm productivity, reducing post-harvest losses, minimizing risk and so on.

To attain the goal of sustainable agriculture and inclusive growth there is a need to bring synergy between all the stakeholders of the agricultural sector. In this regard, a few recommendations are proposed below:

First and foremost, government should reposition subsidies by pulling it away from products and design them to facilitate technology-based farming (Madhavan, 2018). Leveraging the power of technology can help connect farmers to markets, optimize agricultural output, and improve livelihoods.

As farmers need financial support, commercial banks and financial institutions should develop hassle-free loans to avail farm machinery on custom hiring basis. Regions with low mechanization should be offered a higher rate of refinance (FASAR, Yes Bank & GAA, 2016).

Private sector participation via contract farming, land leasing, precision agriculture, price regulation and so on should be encouraged to give a boost to the farmers. To meet the food demand of the nation PPPs should be established with the food-processing industry as they can enhance better price realization, cut out intermediaries and improve the supply chain. PPP in cold chain supply should be encouraged as it has the potential of reducing the cost of cultivation by minimizing post-harvest losses, transportation cost, loss of energy via optimal

use of available resource, enhancing environmental quality and earning better profit from the better quality product (Kendurkar & Tiwari, 2017).

In a country having a high farmer suicide rate due to crop failure and losses, solutions to absorb environmental shocks such as crop insurance should be designed. To gather credible data for the insurance company, private players with government support can bring technology in the form of geo-tagging, satellite data and drone technology to verify crop-cutting experiments and improve intelligence on the area insured (Boettiger & Sanghvi, 2019).

Markets should be developed to absorb the additional output that will come with special emphasis on value addition through processing of the produce. Failing which, the benefits of precision farming will be lost due to low prices (Madhavan, 2018). Government should also develop associations with private partners for effective implementation of e-NAM to realize its perceived benefits of regulating agri-markets.

The welfare of the humungous size of India's population is dependent on a robust agricultural growth strategy. To achieve income growth, there is a need for deploying higher scales of operation. In this regard CSR funds can be effectively channelized to empower small and marginal farmers for meeting their agricultural requirements. The funds can be used by NGOs to strengthen the extension services for providing details on agri-business companies providing specialized services, contract farming opportunities, credit institutions, modern technology like precision and SMART farming, common infrastructure, processing opportunities and setting up 'Farmer Producer Organizations'. The provision of this new information also demands developing capacities and skillsets of extension workers along with the farmers. This will improve the social capital of the farming community and will be instrumental in alleviating the agrarian distress.

References

Agarwalla, S., K. & Barua, S., K. (2017, June 23). Crop insurance and the agrarian crisis in India. *Live Mint*. Retrieved from https://www.livemint.com/Opinion/h2uWBKUe2aQNPVEpkZ4u8J/Crop-insurance-and-the-agrarian-crisis-in-India.html

Agriculture Census Division. (2019). Agriculture Census 2015-16. Phase 1. Department of agriculture, Co-operation & Farmers Welfare. Retrieved from https://agcensus.nic.in/document/agcen1516/T1_ac_2015_16.pdf

Agricoop.nic.in. (2017, July, 13). List of MOUS signed by India only with Other Countries for Cooperation in the Field of Agriculture and Allied Sectors. Retrieved from http://agricoop.nic.in/sites/default/files/list%20MoU_0.pdf

Agritech.tnau.ac.in. (n.d.). Marketing Channels. Agricultural Marketing & Agri-Business: Agro Processing. Retrieved from http://agritech.tnau.ac.in/agricultural_marketing/agrimark_Marketing%20channels.html

Bhaskar, B. (2018, October 11). Agriculture R&D spend: A reality check. *Business Line.* Retrieved from https://www.thehindubusinessline.com/opinion/agriculture-rd-spend-a-reality-check/article25194401.ece

Bhaskar, RN. (2019, July 2). Contract farming isn't a new idea, but govt needs to incentivise its spread across India. *Firstpost.* Retrieved from https://www.firstpost.com/business/contract-farming-isnt-a-new-idea-but-govt-needs-to-incentivise-its-spread-across-india-6916941.html

Boettiger S. & Sanghvi, S. (2019, May). How digital innovation is transforming agriculture: Lessons from India. Retrieved from https://www.mckinsey.com/industries/agriculture/our-insights/how-digital-innovation-is-transforming-agriculture-lessons-from-india

Businessline. (2018, August 17). Average farm landholding size shrinks to 1.1 ha. Retrieved from https://www.thehindubusinessline.com/economy/agri-business/average-farm-landholding-size-shrinks-to-11-ha/article24719240.ece

Buisnessline. (2019, September 19). Institutional credit: Small farmers need better access for farming, allied activities. Retrieved from https://www.thehindubusinessline.com/opinion/editorial/institutional-credit-small-farmers-need-better-access-for-farming-allied-activities/article29451165.ece#

Chaturvedi, S. (2016, May 18). Land reforms fail, only 5% of India's farmers control 32% land. *Rediff.com.* Retrieved from https://www.rediff.com/business/special/special-land-reforms-fail-only-5-of-indias-farmers-control-32-land/20160518.htm

Chand, R. (2016). E-Platform for National Agricultural Market. *Economic & Political Weekly EPW July 9, 2016 Vol LI no. 28.* Retrieved from http://www.remsl.in/presspdf/e-Platform_for_National_Agricultural_Market_0-epw%20july%209%202016.pdf

Chaudhry, S. (2015, November 3). 3 ways to boost Indian agriculture. *World Economic Forum.* Retrieved from https://www.weforum.org/agenda/2015/11/3-ways-to-boost-indian-agriculture/

Dhawan, V. (2017). Water and Agriculture in India. Federal Ministry of Food and Agriculture. Retrieved from https://www.oav.de/fileadmin/user_upload/5_Publikationen/5_Studien/170118_Study_Water_Agriculture_India.pdf

Dev, M., S. (2018, December). Transformation of Indian Agriculture? Growth, Inclusiveness and Sustainability. Indira Gandhi Institute of Development Research. Retrieved from http://www.indiaenvironmentportal.org.in/files/file/TRANSFORMATION%20OF%20INDIAN%20AGRICULTURE.pdf

Down To Earth. (2018, December 28). Rewind 2018: Urbanisation creates chaos in India. Retrieved from https://www.downtoearth.org.in/news/urbanisation/rewind-2018-urbanisation-creates-chaos-in-india-62618

Economic Times. (2015, March 31). Multiple factors responsible for farmers' suicide in country: Report. Retrieved from https://economictimes.indiatimes.com/news/politics-and-nation/multiple-factors-responsible-for-farmers-suicide-in-country-report/articleshow/46755714.cms?from=mdr

Economic Times. (2018, January 29). Agriculture sector to grow 2.1%: Can it double farm income by 2022? *Economic Times.* Retrieved from https://economictimes.indiatimes.com/markets/stocks/news/agriculture-sector-to-grow-2-1-can-it-double-farm-income-by-2022/articleshow/62692884.cms?from=mdr

Economic Times. (2018, September 18). Small and marginal farmers are to see better days with a free-of-cost farmer-to-farmer rental program through this revolutionary app by TAFE's JFarm Services. *Economic Times.* Retrieved from https://economictimes.indiatimes.com/news/india-unlimited/csr/small-and-marginal-farmers-are-to-see-better-days-with-a-free-of-cost-farmer-to-farmer-rental-program-through-this-revolutionary-app-by-tafes-jfarm-services/articleshow/65900120.cms

FASAR, Yes Bank & GAA. (2016, July). Farm Mechanization in India: The Custom Hiring Perspective. Food and Agri Strategic Advisory and Research (FASAR), Yes Bank, German Agribusiness Alliance at OAV - German Asia-Pacific Business Association (GAA). Retrieved from https://www.yesbank.in/pdf/farm_mechanization_in_india_%E2%80%93_the_custom_hiring_perspective.pdf

Ferroni, M. & Zhou, Y. (2017). The Private Sector and India's Agricultural Transformation. Global Journal of Emerging Market Economies. Retrieved from https://journals.sagepub.com/doi/pdf/10.1177/0974910117716406

GHI. (2019). Global Hunger Index. India. Retrieved from https://www.globalhungerindex.org/india.html

Gogoi, A. & Tripathi, B. (2019, April 14). 42% of India's land area under drought, 500 mn people severely affected. *Business Standard.* Retrieved from https://www.business-standard.com/article/current-affairs/nearly-half-of-india-under-drought-40-population-severely-affected-119040300143_1.html

Haq, Z. (2018, March 22). Farmer suicides dropped 10% in 2016: Govt tells Parliament. *Hindustan Times.* Retrieved from https://www.hindustantimes.com/india-news/farmer-suicides-dropped-10-in-2016-govt-tells-parliament/story-qRFrvNq8LJlN2v4BZ5PnpL.html

Haq, Z. (2018, May 1). '5 states account for 78% of progress in micro-irrigation". *Hindustan Times.* Retrieved from https://www.hindustantimes.com/india-news/5-states-account-for-78-of-progress-in-micro-irrigation/story-Wy81Whx6ApW6FOHtlh4bzN.html

Holla, R. (2019). Agricultural crisis in India and its impact on nutrition. Retrieved from https://www.researchgate.net/publication/330511775_Agricultural_crisis_in_India_and_its_impact_on_nutrition_final

Ibef.org. (2019). Indian Agriculture and Allied Industries Industry Report. Retrieved from https://www.ibef.org/industry/agriculture-india.aspx

Icrisat.org. (n.d.). Corporate Social Responsibility. Retrieved from https://www.icrisat.org/csr/

International Labour Organization. (2019, September). Employment in agriculture (% of total employment) (modeled ILO estimate). *The World Bank.* Retrieved from https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS

ILO. (2016, July). India Labour Market Update. ILO Country Office for India. Retrieved from https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/---sro-new_delhi/documents/publication/wcms_496510.pdf

Jadhav, R. (2019, October 11). Why strong monsoon rains are not necessarily good news for Indian farmers. *Reuters.* Retrieved from https://in.reuters.com/article/india-monsoon-agriculture/why-strong-monsoon-rains-are-not-necessarily-good-news-for-indian-farmers-idINKBN1WQ06X

Kendurkar, P. & Tiwari, A. (2017). Cold Chain Supply and Public-Private Partnership: A Proactive Interaction. *International Journal of Scientific Research in Multidisciplinary Studies. Vol.3, Issue, 9. pp 1-6.* Retrieved from https://www.isroset.org/pub_paper/IJSRMS/IJSRMS-0311-88.pdf

Kumar, A., Mishra, A., Saroj, S. & Joshi, P. K. (2017). Institutional versus Non Institutional Credit to Agricultural Households in India Evidence on Impact from a National Farmers' Survey. *International Food Policy Research Institute.* Retrieved from http://www.indiaenvironmentportal.org.in/files/file/Institutional%20versus%20noninstitutional%20credit%20to%20agricultural%20households.pdf

Kumar, S. (2018, August 19). Precision Farming in India – Features, Merits, De-merits and Challenges. Retrieved from https://www.iasexpress.net/precision-farming-in-india-features-merits-demerits-and-challenges/

Llanto, Gilberto M. (2012). The Impact of Infrastructure on Agricultural Productivity. *Discussion Papers DP 2012-12, Philippine Institute for Development Studies*. Retrieved from https://ideas.repec.org/p/phd/dpaper/dp_2012-12.html

Madhavan, N. (2018, October 25). Precision farming is a game-changer. *Business Line.* Retrieved from https://www.thehindubusinessline.com/opinion/precision-farming-is-a-game-changer/article25324585.ece

Mahapatra, D. (2017, May 3). Over 12,000 farmer suicides per year, Centre tells Supreme Court. *Times of India.* Retrieved from https://timesofindia.indiatimes.com/india/over-12000-farmer-suicides-per-year-centre-tells-supreme-court/articleshow/58486441.cms

Mehta-Bhatt, P. (2015, February 19). The two keys to unlocking India's agricultural potential. *World Economic Forum.* Retrieved from https://www.weforum.org/agenda/2015/02/the-two-keys-to-unlocking-indias-agricultural-potential

Meena, T. (2016, August 15). Corporatization of Agriculture and Its Effect. Retrieved from https://ssrn.com/abstract=2823387

Mathew, G. (2019, September 15). Financial exclusion: 40.9 per cent of small, marginal farmers not covered by banks. *Indian Express.* Retrieved from https://indianexpress.com/article/business/banking-and-finance/financial-exclusion-40-9-per-cent-of-small-marginal-farmers-not-covered-by-banks-5996062/

Ministry of Finance. (2018, January). Economic Survey 2017-18. Volume I. Retrieved from http://www.indiaenvironmentportal.org.in/files/file/economic%20survey%202017-18%20-%20vol.1.pdf

Mudholkar, R. (2018, March 13). Indian Agriculture - what ails and fails the farmer? *Business Today*. Retrieved from https://www.businesstoday.in/opinion/columns/indian-agriculture-what-ails-and-fails-the-farmer-and-a-look-at-policy-imperatives-for-sustainability-in-agriculture/story/260922.html

MoFPI. (n.d.). Pattern of Assistance. Retrieved from https://mofpi.nic.in/Schemes/pattern-assistance-7

NABARD. (2018). NABARD All India Rural Financial Inclusion Survey 2016-17. NAFIS. Retrieved from https://www.nabard.org/auth/writereaddata/tender/1608180417NABARD-Repo-16_Web_P.pdf

Narayanamoorthy, A. (2019, June, 7). Tap drip irrigation to save water. *Business Line.* Retrieved from https://www.thehindubusinessline.com/opinion/tap-drip-irrigation-to-save-water/article27688289.ece

Narayanamoorthy, A. & Alli, P. (2019, January 14). It's time to tax groundwater use. *Business Line*. Retrieved from https://www.thehindubusinessline.com/opinion/its-time-to-tax-groundwater-use/article25994382.ece#

Nair, P. (2018, December 6). Agrarian Crisis Is A Social Crisis Now: P. Sainath. *Outlook India.* Retrieved from https://www.outlookindia.com/website/story/agrarian-crisis-is-a-social-crisis-now-p-sainath/321306

NITI Aayog. (2016, January). Evaluation report on Efficacy of Minimum Support Prices (MSP) on farmers. Development Monitoring and Evaluation Office. Government of India. Retrieved from https://www.niti.gov.in/writereaddata/files/writereaddata/files/document_publication/MSP-report.pdf

NITI Aayog. (2018). SDG India Index Baseline Report 2018. Retrieved from https://niti.gov.in/sites/default/files/2019-01/SDX_Index_India_21.12.2018_2.pdf

NITI Aayog. (2018) State of Indian Farmers: A Report. Retrieved from https://www.lokniti.org/pdf/Farmers_Report_Final.pdf

OECD. (2018). OECD Food and Agricultural Reviews. Agricultural Policies in India. Retrieved from https://www.oecd-ilibrary.org/docserver/9789264302334-en.pdf?expires=1575107976&id=id&accname=guest&checksum=3F213B569146F7CEBDDC75130B69476A

OECD. (2018). Trends and evaluation of agricultural policy in India. Agricultural Policies in India. *OECD Publishing. Paris*. Retrieved from https://doi.org/10.1787/9789264302334-6-en.

Psa.gov.in. (2019, August 30). Report on Policies and Action Plan for a Secure and Sustainable Agriculture. Retrieved from http://psa.gov.in/sites/default/files/pdf/Report of Policies and Action_4-9-2019.pdf

PRS India. (2019, July 4). Economic Survey 2018-19, PRS Legislative Research. Retrieved from https://www.prsindia.org/report-summaries/economic-survey-2018-19

PRS India. (2019). Union Budget 2019-20 Analysis. PRS Legislative Research. Retrieved from https://www.prsindia.org/parliamenttrack/budgets/union-budget-2019-20-analysis

PIB. (2013). Shortage of Houses in Urban Areas. Ministry of Housing and Urban Poverty Alleviation. Retrieved from https://pib.gov.in/newsite/PrintRelease.aspx?relid=95412

PIB. (2019, July 19). Increasing private expenditure in agricultural sector. Ministry of Agriculture & Farmers Welfare. Retrieved from https://pib.gov.in/Pressreleaseshare.aspx?PRID=1579545

PIB. (2019, June 3). 3rd Advance Estimates of production of major crops for 2018-19. Ministry of Agriculture & Farmers Welfare. Retrieved from https://pib.gov.in/newsite/PrintRelease.aspx?relid=190227

PTI New York. (2019 June 18). Climate change affects major crops in India: Study. *Business Line.* Retrieved from https://www.thehindubusinessline.com/news/science/climate-change-affects-major-crops-in-india-study/article28033035.ece

Rastogi, V. (2017, May 9). The Food Processing Industry in India: Investment Prospects. *India Briefing.* Retrieved from https://www.india-briefing.com/news/the-food-processing-industry-in-india-investment-prospects-14169.html/

Rawat, M. (2015, October 26). Need for Efficient and Robust Agri Value Chain in India. KrishiJagran.com. Retrieved from https://krishijagran.com/interviews/need-for-efficient-and-robust-agri-value-chain-in-india/

Sajesh, V. K. & Suresh, A. (2016), "Public-Sector Agricultural Extension in India: A Note," Review of Agrarian Studies, *Review of Agrarian Studies. Vol. 6, no. 1*, Retrieved from http://ras.org.in/public_sector_agricultural_extension_in_india

Sally, M. (2017, December 8). How private sector is helping cultivators with technology, buyback and improving their social standards. *The Economic Times.* Retrieved from https://economictimes.indiatimes.com/news/economy/agriculture/how-private-sector-is-helping-cultivators-with-technology-buyback-and-improving-their-social-standards/articleshow/61989717.cms?from=mdr

Sainath, P. (2018, April 13). In India, Farmers Face a Terrifying Crisis. *The New York Times.* Retrieved from https://www.nytimes.com/2018/04/13/opinion/india-farmers-crisis.html

Shroff, S. (2019, April 8). Rethinking India's Battles against Chronic Agrarian Distress. *The Hindu Centre.* Retrieved from https://www.thehinducentre.com/the-arena/current-issues/article26754462.ece

Sunder, S. (2018, January 29). India economic survey 2018: Farmers gain as agriculture mechanisation speeds up, but more R&D needed. *Financial Express.* Retrieved from https://www.financialexpress.com/budget/india-economic-survey-2018-for-farmers-agriculture-gdp-msp/1034266/

Tech Mahindra. (n.d.). Precision Agriculture and Potential Markets in India. White Paper: Research Insights. Retrieved from https://www.techmahindra.com/sites/ResourceCenter/White%20Papers/New_Gen_Services/PrecisionAgriculture-PotentialMarket-India.pdf

Tripathi, A & Prasad, A., R. (2010). Agricultural Development in India since Independence: A Study on Progress, Performance, and Determinants. 10.7885/1946-651X.1007.

Todhunter, C. (2019). India's agrarian crisis: Dismantling “Development”. Santa Rosa: Newstex. Retrieved from https://ezproxy.svkm.ac.in:2099/docview/2252940726?accountid=32277

Walmart. (2019, August, 27). The Walmart Foundation Announces Two New Grants, Contributing Over $10 Million in Funding to Benefit Over 81,000 Smallholder Farmers in India. Retrieved from https://corporate.walmart.com/newsroom/2019/08/27/the-walmart-foundation-announces-two-new-grants-contributing-over-10-million-in-funding-to-benefit-over-81-000-smallholder-farmers-in-india

Yadav, K. (2010, May 13). National Agricultural Policy. Agropedia. Retrieved from http://agropedia.iitk.ac.in/content/national-agricultural-policy

Section II

This section consists of six articles which give glimpses of the agony of farmers and resource-poor communities in different parts of India. First two articles in the section discuss factors leading to marginalization of small and marginal farmers, interventions made by NGOs and the need to promote alternate thinking and behavioural change among farmers.

The efforts taken by NGOs to develop alternate livelihood for sustaining farmers' income is discussed in the third article. The article also presents a financial model for setting up micro-enterprise. The fourth article discusses the importance of technology infusion for better project management to sustain rural livelihoods.

The fifth and sixth article describes the current state of the most marginalized Yanadi tribe of Nellore and Agarias (salt farmers) of Little Rann of Kutch. The articles discuss the work undertaken by NGOs to reduce the inequities and prejudices experienced by these tribes. To scale up the impact of the work undertaken by the NGOs, the authors propose a set of recommendations.

Situational Analysis of Small and Marginal Farmer's in Bihar

Abstract: *Agriculture plays a pivotal role in the Indian economy. Although its contribution to gross domestic product (GDP) is now around one-sixth, it employs 56 per cent of the Indian workforce. The future of sustainable agriculture growth and food security in India depends on the performance of small and marginal farmers. Aga Khan Rural Support Programme (India) (AKRSP (I)) has been instrumental in supporting marginalized farmers across the country. The organization in 2008 commenced its work in Bihar.*

The current paper conducts a situational analysis of the agricultural challenges faced by marginalized farmers in five villages of Sakra cluster in Muzaffarpur, Bihar. The paper attempts to determine the scope of allied farming activities for income enhancement and study farmers' opinions about incorporating Solar Group Irrigation (GI) and Solar fencing. Primary research identifies farmers' poor educational background, fragmented landholding, high input cost, water crisis, limitations in accessing agricultural information, menace of wild animals and farmer's mindset as key reasons for their low income. It further discusses the disenchantment of youth with the farming profession and the need for bringing behavioural change among farmers. The paper concludes with a few recommendations for AKRSP(I) in their efforts to improve the lives of farmers in Bihar. The paper is an outcome of Mr. Shubham Kumar's 'We Care: Civic Engagement' internship with AKRSP (I) in February, 2019.

1. Introduction

In September 2015, 193 Member States of the United Nations designed a plan for achieving a better and more sustainable future by 2030 through the adoption of 17 Sustainable Development Goals (SDGs). Over the next fifteen years, with these new goals that universally apply to all, countries will mobilize efforts to end all forms of poverty, fight inequalities and tackle climate change, while ensuring that no one is left behind (Farming First, 2019). Attaining the SDG targets will not be possible without a strong and sustainable agriculture sector. Development in agriculture sector is not only linked with the Goal 2 to eliminate hunger and malnutrition and Goal 12 about responsible consumption and production but also to other goals as poverty elimination (Goal 1), economic growth and employment (Goal 8), reducing inequality (Goal 10) and so on.

Post liberalization Indian agriculture has undergone rapid transformation due to steady investments in technology, irrigation infrastructure, use of modern agricultural practices,

provision of agricultural credit and subsidies (Ibef, 2014). Growth in agricultural output over the past three decades has been strong and, importantly, crop production has been able to broadly keep pace with the demands of a growing population (Cagliarini & Rush, 2011). In 2017-18, total food grain production was estimated at 275 million tonnes (MT) (India, Industries and Analysis, 2019). While the agriculture sector's share of GDP has decreased from 51.8 per cent in 1950-51 to 15.4 per cent in 2018-19, it is still the largest source of livelihoods in India (Directorate of Economics & Statistics, 2019).

1.1 Sustainable Agriculture:

Sustainability in agricultural production depends on several factors. These include the availability and quality of agricultural inputs such as land, water, seeds and fertilizers, access to agricultural credit and crop insurance, assurance of remunerative prices for agricultural produce and storage and marketing infrastructure among others (Deshpande, 2017). In this context, the Government of India (GoI) formulated National Mission for Sustainable Agriculture (NMSA) in 2014. The mission aspires to double farmer's income by 2022 by initiating various farmer friendly schemes like Pradhan Mantri Krishi Sinchai Yojna which provides end-to-end solutions in irrigation supply chain, viz. water sources, distribution network and farm level applications (Agricoop.gov.in, n.d.). To protect the farmers from agricultural risks and fluctuations GoI in 2016 launched Pradhan Mantri Fasal Bima Yojana (PMFBY) to provide the biggest risk cover and safety net to the farmers (Rai, 2019). To connect farmers directly with buyers across the country, GoI launched National Agriculture Market scheme- eNAM, an online market portal in 2016 (Kapoor, 2018). In response to unstable pricing of agricultural commodities due to variation in supply of crops, lack of market integration and information asymmetry, GoI established Minimum Support Price (MSP) for all the crops.

Sustainability in agricultural production depends on several factors. These include the availability and quality of agricultural inputs such as land, water, seeds and fertilizers, access to agricultural credit and crop insurance, assurance of remunerative prices for agricultural produce and storage and marketing infrastructure among others.

1.2. Scenario of Farmers in Bihar:

Agriculture is at the core of Bihar's economy, employing 77 per cent of the workforce and generating only 35 per cent of the state's domestic product (Singh, Singh, Kumar, Meena & Shahi, 2015). The agricultural sector in Bihar is plagued with numerous constraints and challenges. Inspite of having agricultural institutes in the states and Krishi Vigyan Kendra (KVK) in 38 districts, the productivity is low due to slow adoption of modern technology. Average yields of the widely cultivated crops, rice and wheat are 20 to 25 per cent less than that of the nation's average. 91 per cent of all the landholdings in the state fall below 1 Ha which is further fragmented in small parts. Economy of scale is a serious problem in small farm. The farmers have limited market access due to poorly developed rural road infrastructure connecting less than half of Bihar's villages. The state has volatile agricultural output due to high dependence on monsoon with flooding and droughts experienced almost every year. Access to electricity is limited to only five per cent of rural households compared to 44 per cent nationally. As a result, farmers are forced to rely on diesel to tap groundwater sources with only 30 per cent of irrigation from surface sources. Thus raising the production costs and affecting competitiveness (Economic Survey of India, 2019 & NITI Aayog, n.d.).

Inspite of having agricultural institutes in the states and Krishi Vigyan Kendra (KVK) in 38 districts, the productivity is low due to slow adoption of modern technology. Average yields of the widely cultivated crops, rice and wheat are 20 to 25 per cent less than that of the nation's average.

Additionally, due to lack of strategic focus by State Agriculture Departments, there is a thin dispersal of available resources. Limited operating budgets and the inability to effectively utilize available funds as the staff does not ensure the spread of extension services to marginalized farmers. With 88 per cent of the state's poor living in rural areas, improving agricultural performance and related rural non-farm activity is critical for improving livelihoods and reducing poverty (Singh, et. al, 2015).

To address these gaps and respond to failures in the public and private sectors in providing the basic services to the farmers, the role of NGOs has become essential. Many NGOs across the

country have reached out to poor communities and demonstrated the ability to work in inaccessible areas, innovate and in many ways achieved better results than official agencies. Thus, they are the quintessential bodies for catalysing rural farmers for better farming practices, building model experiments and supplementing government efforts. Aga Khan Rural Support Programme (India) is one such organization in Bihar that is working towards enhancing farmers' incomes by researching, developing and training farmers to pursue agriculture and allied activities.

2. About Aga Khan Rural Support Programme (India) [AKRSP (I)]:

AKRSP (I) was set up by Prince Shah Karim al-Husseini, Aga Khan IV in 1983 with an inspiring vision 'to uplift the quality of lives of the most marginalized communities in remote rural locations of the country'. AKRSP(I) started its operations in Gujarat in 1986 and has over the years expanded to 2400 villages of Gujarat, Madhya Pradesh and Bihar. It has impacted the lives of over 1.5 million people from marginalized sections of the society (Mulk & Masoodul, 1991).

AKRSP (I) initiated its work in Bihar in 2008. Its major interventions are in the area of provsion of drinking water, sanitation, women empowerment, sustainable agriculture, livestock development, natural resource management, early childhood development & primary education, skills & enterprise development of youth, rural governance, agriculture extension services and development of farmers' institution (Akrspindia.org.in, n.d.).

AKRSP (I) was set up by Prince Shah Karim al-Husseini, Aga Khan IV in 1983 with an inspiring vision 'to uplift the quality of lives of the most marginalized communities in remote rural locations of the country'. AKRSP(I) started its operations in Gujarat in 1986 and has over the years expanded to 2400 villages of Gujarat, Madhya Pradesh and Bihar.

3. Project Focus

AKRSP(I) has been focussing to improve the lives of farmers in Bihar since 2008 through Multiple Input Area Developmental approach (MIAD). For income enhancement of farmers, it had

ideas to venture into the allied farming activities. In alignment with this, they generated awareness about the benefits of practicing organic farming, encouraged farmers to practice vermicomposting by providing vermicomposting bins. To grow seeds in a controlled environment, they educated the farmers on poly-house farming. Besides, the organization has also installed solar group irrigation systems which are fully operated and maintained by the farmers themselves (Akrspindia.org.in, n.d.).

To map the impact of its intervention in Sakra cluster, Muzzafarpur, the organization assigned the We Care intern to carry out a study of five villages with the following objectives:

- To identify the agricultural challenges faced by the farmers.
- To study the opinion of farmers about Solar Group Irrigation (GI) and Solar Fencing in the sampled villages.
- To determine the scope of allied farming activities for income enhancement.

4. Methodology

To attain the research objectives, secondary research was carried out to develop a basic understanding of the AKRSP (I) developmental activities and the impact on farmers' lives based on reports and articles published by AKRSP (I). Data pertaining to the challenges faced by marginalized farmers in Bihar was also studied. Literature review was done for understanding the agricultural scenario and developmental strategies in Bihar along with the feasibility of solar fencing for warding off animals. Websites such as NABARD, Technoserve, Food, and Agriculture Organization of United States (UNFAO) official, Ministry of Agriculture and Farmers Welfare GOI official were accessed. Papers and journals such as 'An Introduction to collective marketing by smallholder farmers' by David Neven, 'Advice manual for the organization of collective marketing activities by small scale farmers' by P. Robbins, F. Bikande, were scrutinized to avail data about marketing and capacity building support for farmers.

It was decided to undertake primary research in five villages of Sakra cluster to gain hands-on learning about the farming practices, challenges faced and establish the scope for allied farming activities.

Unstructured interviews were conducted with Mr. Krishna Kumar Verma, Block Agricultural Officer, Sakra block and Dr. S. K. Singh, Soil Science Professor, Tirhut Agriculture College based on following data points: a) current farming practices, b) scope of systematic and organic farming in the region, c) possible best practices for the marginalized farmers in the localities.

Focus group discussions (FGD) were conducted with farmers with the support of AKRSP (I) team. Subsequently, a quantitative survey was carried out with the farmers to identify agricultural practices. 52 farmers were interviewed and four FGDs were conducted in the sampled villages to gather data based on following data points: a) crops grown, b) farmer's educational background, c) landholding size, d) fertilizer used and associated cost, e) menace caused by wild animal, c) productivity, d) income, e) current water usage practices, f) agricultural challenges faced, g) market channels, h) agricultural information required, i) scope of agriculture enhancing activities, j) scope of women participation in food processing as income enhancing activities. Refer Table 1 & Table 2 for details on the number of respondents across various locations where interviews and FGDs were conducted.

Table 1
Farmers Interviewed

Village Name	No. of farmers interviewed
Sunderpur Ratwara	12
Qutubpur	12
Harpur Muslim Tola	3
Bhartipur	12
Dardha Chosaz	13
Total	**52**

Table 2
Focus Group Discussions

Village Name	No. of participants
Sunderpur Ratwara	8 farmers
Qutubur	10 farmers
Dardha Chosaz	FGD1: 8 farmers FGD2: 8 spouses of farmers
Total	**32**

Interactions with the farmers and agricultural officers assisted in understanding the background of the farmers and current farming practices in the region. The data gathered based on personal interviews, discussions, and observations was coded based on the above data points. Wherever possible descriptive statistics were used to analyze the data. Inferences related to contemporary agricultural status and challenges faced by the farmers were drawn from descriptive statistics, personal discussions and observations.

Process of Tillage

Focus Group Disussion with Farmers in Bihar

5. Findings

5.1. Profile of the Respondents

Respondents of the study were in the age group of 21-65 years. They had a family size ranging between 5-10 members. Figure 1 gives the educational background of the 52 farmer respondents covered under the study.

Figure 1
Farmers: Educational Background

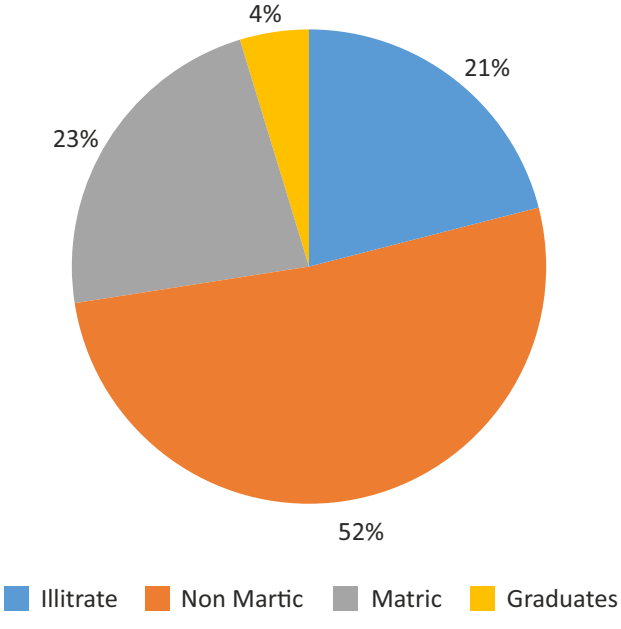


Figure 1 depicts that 21 per cent farmers were illiterate, 52 percent of the surveyed farmers had education below tenth standard and only four per cent were graduates. This indicated a poor educational background of the farmers in Sakra cluster.

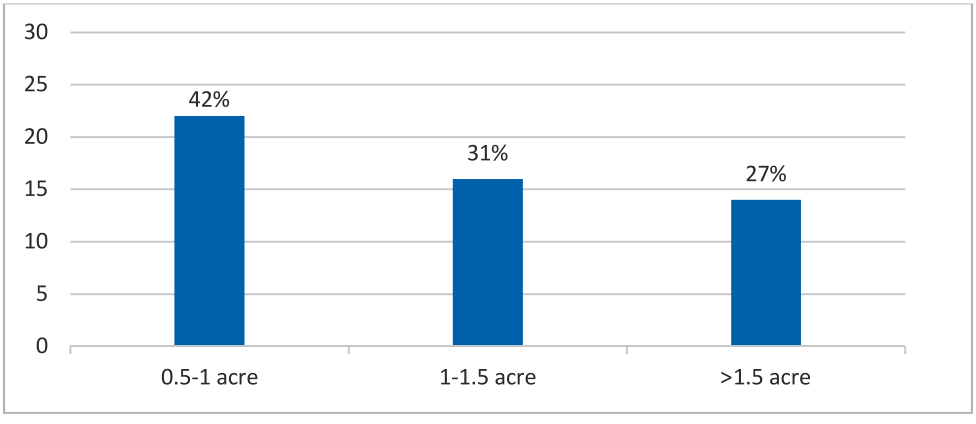
5.2 Agricultural Challenges: Sakra Cluster

Farmers in Sakra cluster were mostly involved in growing rice, wheat, pulses, jute, maize, oilseeds and so on. They had small landholdings and practiced subsistence-level farming. The farmers faced infrastructural, economical and knowledge related challenges which are elucidated below:

5.2.1. Landholding Size:

The literature review highlighted that 82 per cent farmers in India are small and marginal farmers having landholding of less than 2 Ha i.e. 5 acres. Figure 2 reflects the landholding size of farmers in the region under the study.

Figure 2
Landholding Size



It can be inferred from the above figure that 42 per cent were marginal farmers owning 0.5 to 1 acre land i.e. 0.4 Ha land. Due to smaller landholdings and fragmented land, many farmers could not produce vegetables and other cash crops., The farmers were engaged in producing crops like rice, maize, wheat and so on. One of the farmers said, *"Small and fragmented land parcel- makes it difficult for them to grow cash crops."*

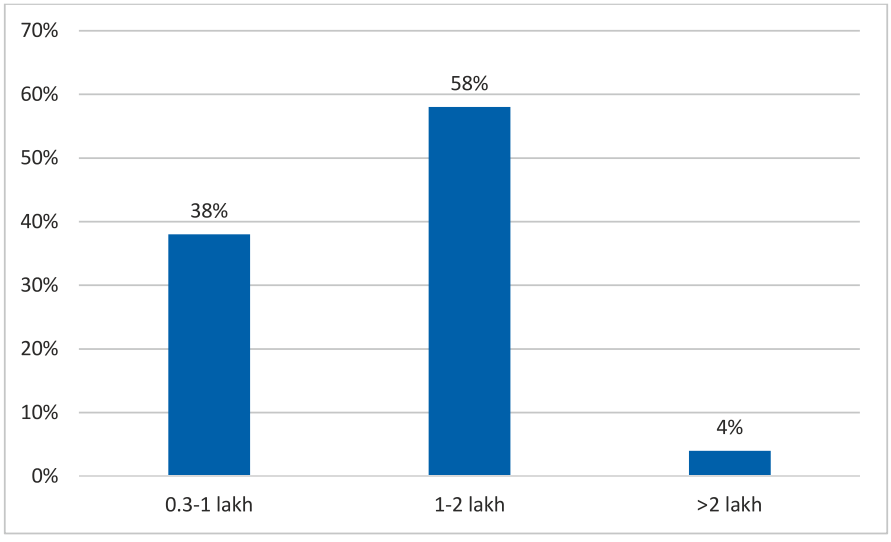
The productivity in the villages varied according to the types of crops, vegetables, fruits grown, soil fertility and farming practices followed. Field discussions also indicated that farm productivity has been deteriorating every year. Further farmers shared that, to maintain the same amount of productivity in the future, they had to utilize approximately ¼th times more chemical fertilizers of the current quantity.

5.2.2. Cost of Chemical Fertilizers:

Farmers use chemical fertilizers to boost crop yield and gain better returns. They opt for chemical fertilizers because, of their quick absorption capacity. Chemical fertilizers have

nutrients that swiftly dissolve into the soil and are readily available for plants to soak up. However, excessive use of chemical fertilizers builds up toxic concentrations of salts and creates a chemical imbalance if added too frequently or in the wrong amounts. Figure 3 indicates that 58 per cent farmers spent INR 1 to 2 lakhs in a year to procure chemicals for a land-size of less than 2 acres. The amount spent is substantially large in proportion to the land size they own.

Figure 3
Chemical Fertilizer: Estimated Cost (per year)



It was observed that, as farmers are influenced by their peers and have competition with each other to have higher yields they end up using excessive amounts of chemical fertilizers. They also complained about the substandard quality of chemical fertilizers available in the market. Often during the peak season of cultivation, due to the unavailability of good quality fertilizers, they used adulterated fertilizers in their farms. One of the farmers said, *"Often there is dearth of quality fertilizers. Thus, inpsite of being aware of the quality, we end up buying it as we do not wish to compromise the volume of the produce"*.

5.2.3. Wild Animal Menace:

NABARD study on 'Solar Power Fencing for Crop Protection…' highlights that "As per Department of Agriculture and Department of Horticulture, Government of Himachal Pradesh estimates, an area of 1.56 lakh Ha is affected by wildlife menace which annually causes loss of INR 229 crores to the farmers. The extent of loss is up to 89 per cent of crops in some cases. Gyan Vigyan Samiti, an NGO in Himachal Pradesh identified that the wild animal menace causes loss of INR 400 crore to INR 500 crore every year in the state". Similarly, the extent of crop damage in Bihar due to wild animals such as Nilgai (Blue Bull) and wild boar was 90 Ha in 2012 (Mittal, 2016).

The primary study undertaken in the sampled villages also shows similar findings. The farmers shared that wild animals like Nilgai, wild Rabbits, rodents, wild bulls, wild pigs and monkeys destroyed their harvest. The yearly estimated monetary loss was between INR 20,000 to 70,000. Due to the menace from wild animals, many farmers refrain from growing vegetables in their fields. Farmers find themselves in a helpless situation as they are unable to locate a feasible solution.

5.2.4. Water Crisis:

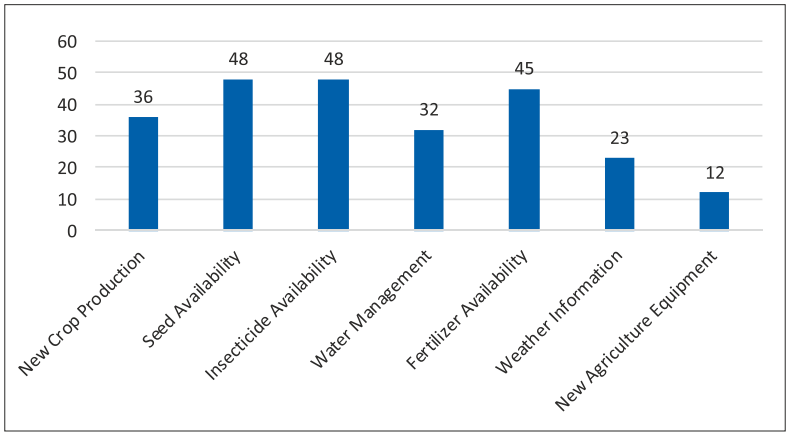
Since 1999, Bihar has borne the brunt of four droughts. The erratic weather conditions have led to reduced agricultural produce and depletion in groundwater levels thereby increasing the woes of the marginalized farmers. Field survey indicated that 90 per cent of them have no permanent water channels for irrigation and they are mostly dependent on rains for the same. Although, in the current decade, the groundwater levels have been replenished in Bihar, it is economically taxing to access the same due to the dependence on expensive diesel for operating power pump-sets. As a result, farmers cannot afford to transplant paddy using groundwater irrigation, simply because it is too expensive.

5.2.5. Agricultural Information:

It was observed that the farmers in sampled villages did not have access to agricultural information. The surveyed farmers followed popular farming practices which were negatively affecting their soil productivity and final quality of produce. Shankar Rai, a farmer from Dardha Chosaz expressed, *"If my neighbor uses one kg of fertilizer for one acre, I will use twice the amount for more produce".*

To improve the produce, farmers indicated support in receiving various types of knowledge inputs (See Figure 4).

Figure 4
Knowledge Input



The major problem which farmers face is the lack of information on farm inputs. In the surveyed villages farmers sought knowledge support in the availability of seeds, insecticides, and fertilizers. They lack knowledge about various resources available related to farming and the right advice on the way to use them.

5.3. Feasibility of Participation of Women:

During the field visits it was observed that after attending their domestic chores, women assisted their spouses at farms for carrying out basic activities like soil preparation, sowing, leveling and cutting the cultivated produce. In some of the cases, women cultivated vegetables like potato, ladyfinger, cabbage, and cauliflower in the small farm area in the backyard of their houses for domestic consumption.

It was interesting to observe that one of the Solar Group Irrigation projects by AKRSP (I) was implemented by an all-women team. They managed all aspects of the project including finance and operations. This was a positive example for other women in the villages. Interactions were carried out to assess the willingness of women to be involved in the food processing industry. It was observed that women were interested in associating with income enhancement activities to support their families.

5.4. Scope of Solar GI and Solar Fencing:

The staff of AKRSP(I) had observed that in many rural villages of Bihar the access to the electricity grid is not always guaranteed. In the absence of availability of energy, there are concerns related to accessing water for agriculture. To provide water to the farms a few farmers used diesel pumps, but as the system relied on fuel availability and negatively impacted the environment, the farmers were in search of a sustainable solution. AKRSP (I) introduced farmers to solar-powered group irrigation system i.e Solar GI. The farmers were made aware that though solar-powered systems have initial investment costs, the source of energy is free, therefore, after the amortization period, there is no

AKRSP (I) introduced farmers to solar-powered group irrigation system i.e Solar GI. The farmers were made aware that though solar-powered systems have initial investment costs, the source of energy is free, therefore, after the amortization period, there is no operating cost. Only the maintenance costs had to be considered. Therefore, solar pumps turn out to be a viable long term investment.

operating cost. Only the maintenance costs had to be considered. Therefore, solar pumps turn out to be a viable long term investment.

As a pilot project, AKRSP (I) installed Solar GI at few of its project locations in 2017 for addressing irrigation requirements. After witnessing success in those locations, AKRSP (I) decided to expand its outreach by installing more Solar GI pumps. AKRSP (I) designed a scheme in which each farmer cluster that wished to install Solar GI had to contribute 10 per cent of the total installation cost and the balance would be borne by AKRSP (I). Farmers were educated about the scheme and the organization hoped that the farmers would utilize the scheme.

Solar Pumps Installed in the Villages

As AKRSP (I) wanted to scale up solar-powered irrigation and bring more farmers under its fold, it was prudent for them to assess the willingness of the farmers to adopt the Solar GI technology. During the field visits and field interactions undertaken by the intern, farmers reported that the cost of using electricity and diesel for irrigation was about INR 50/ kattha and INR 140-170/hour. In the given scenario, farmers did find hope in the Solar GI method of irrigation. Farmers having large holdings in Sunderpur Ratwara, Dardha Chosaz Qutubpur were willing to participate in solar group irrigation project of AKRSP(I). Small farmers from Haripur Muslim Tola were reluctant to adopt the technology because of social, infrastructural and economic barriers. For instance, due to the lack of community cohesion formulation of farmers' clusters was an area of concern. Farmers having small landholdings were unwilling to contribute a small part of their land for installing the solar panels as it meant economic loss for them.

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Farmers also reported about their farms being invaded by wild animals and thereby creating an economic loss. To address this issue the intern proposed developing solar fencing[1]. Solar power fencing gives a live non-lethal shock to the intruder and creates fear against fence tampering. The alarm in the fencing system gets activated and alerts the inmates of the protected area. While the staff of AKRSP(I) found the idea useful, it decided to study the views about farmers regarding adopting solar fencing.

In this context, discussion with farmers of Sakra Cluster was undertaken. This cluster was selected because farmers of this cluster had adopted a solar irrigation system and they were aware of the benefits of solar energy. The discussion with the farmers revealed several apprehensions they had in adopting solar

1 The solar fencing ensures that the battery remains charged at all times. The system has an energizer with a built-in alarm, a 72 Wp solar PV module, a flash light and a lightening diverter. The energiser transforms the low voltage current in the battery to high voltage current (up to 10,000 volts), and sends it to the electric fence. The non-lethal high voltage shock keeps animals away from the fence and protects the field" (Renewable Watch, 2019).

fencing as a strategy to keep wild animals away. Most of the farmers were skeptical about the idea owing to the small landholding. To implement this idea, the farmers would require to collaborate with neighboring farmers. As there was a lack of community cohesion and trust, they were unwilling to undertake the collaborative effort. The farmers of Dardha Chosaz did not feel the need for solar fencing because they cultivated tobacco for the major part of the year which is consumed/damaged less by animals.

5.5. Assessing willingness: Poly-house & Vermicomposting

AKRSP(I) in 2016 piloted the idea of poly-house farming and vermicomposting in Sakra cluster to improve the quality and quantity of yield. The organization felt that as resource-poor farmers get impacted due to the risk of pests and climate change they need to shift to poly-house[2] farming. Similarly, as long term farm productivity depends on soil fertility, farmers need to learn and practice vermicomposting[3]. The quality of vermi-compost being superior to other composts in terms of nutrients and other plant growth-promoting substances it would give better farm yield. After a year or so it was observed that the farmers who practiced vermicomposting and poly-house farming were able to reap the benefits in terms of an increase in soil productivity, better quality produce and increased revenue.

The field study indicated that 87 per cent of the surveyed farmers were not willing to opt for poly-house farming as they were not aware of how it works. Whereas, 85 per cent farmers were already aware of vermicomposting but did not practice.

As AKRSP(I) wanted more farmers to adopt poly-house farming and vermicomposting it proposed to study the willingness of the resource-poor farmers in other project locations. In this regard, the field study indicated that 87 per cent of the surveyed farmers were not willing to opt for poly-house farming as they were not

2 Poly-house or a greenhouse is a house or a structure made of translucent material like glass or polyethylene where the plants grow and develop under controlled climatic conditions. The size of structure can differ from small shacks to big-size buildings. A greenhouse is a glass house whose interiors become warm when exposed to sunbeams as the house stops the greenhouse gas to leave. So when it is cold outside, the temperature inside is survival friendly and warm for the plants (Toppo, 2018).

3 Vermicomposting is a process in which the earthworms convert the organic waste into manure rich in high nutritional content (Byjus.com, n.d.).

aware of how it works. Some farmers expressed that they require to see the economic performance of the poly-house farming method. The survey indicated that 85 per cent farmers were already aware of vermicomposting but did not practice either because they were not comfortable handling earthworms or were not sure about the monetary returns. Only 21 per cent farmers were willing to adopt and use vermicomposting to increase the soil fertility and crop productivity.

The field study also highlighted that each village that was surveyed had one or two progressive farmers who had relatively larger or similar landholdings. These farmers were willing to adopt modern farming practices and were ready to financially contribute their bit.

This indicates that the economic constraints of the farmers owing to small landholding and unpredictable yield has left them in a fix. In spite of having a brief idea about the benefits of alternative farming methods, they are not willing to take the risk by investing their resources. They were only willing to participate if they saw tangible results themselves in other fields where it was being practiced.

6. Discussion

The micro research assesses the agricultural challenges faced by the farmers in Sakra cluster of Muzaffarpur, Bihar. The field study highlights the challenges faced by the farmers and maps their willingness to adopt solar technologies to increase their farm productivity. Farmers of the cluster are aggrieved due to the shrinking size of farm-lands. Three-fourth of all the surveyed farmers were marginal farmers having landholding size of less than 1 Ha. Farm holdings in Bihar are small and scattered. There are about 1.61 crore farm holdings of which 91 percent are marginal (Government of Bihar, n.d.). This has been a primary factor for lower incomes of the farmers. Marred by debts, the local farmers have sought to increase the productivity of their lands by using more chemical fertilizers. High illiteracy and lack of information about correct agricultural practices further exacerbates their situation. Consequentially they succumb to poor unsustainable farming practices. For instance, in many cases, it was observed that the farmers use extra fertilizers to have better yield and earn more money. This affects the farm productivity in the long run.

Lower level of productivity is also attributed to extreme water crisis due to droughts and depleting groundwater levels which has added to misery of farmers. Increasing heat waves to intermittent heavy rainfall followed by cyclical droughts and floods have impacted the farmers in the worst possible ways. While the 2018 monsoon had left the villages mostly dry with the

state government declaring 25 out of 38 districts as drought-affected. The wells and tube-wells did not have any water. Later in 2019, the farmers in the same villages were battling floods. Interactions with the farmers revealed that there were almost 50 ponds in the five villages surveyed in the late 1980s but due to increasing population, climate change and poor or zero water conservation, the number of ponds has reduced to three in the same villages. To address the water crisis, the schemes designed for the farmers such as Bihar Groundwater Implementation Scheme, State Tubewell Project and cash subsidy on diesel for irrigation in drought-affected blocks should be effectively utilized. In the current scenario awareness about the above schemes was found to be low.

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To improve the agriculture productivity AKRSP (I) piloted solar irrigation in Sakra Cluster. Field interactions revealed that scaling up solar irrigation is a moot point of debate. Though few farmers agree that solar irrigation will help, but as the installation of solar technology requires a small part of the agricultural land most farmers with small landholdings refrained to part with their land for public benefits. Despite AKRSP (I) bearing 90 per cent of the installation cost farmers have not been able to take the benefit due to their inability to comprehend larger gains through technology support. Similarly, the idea of solar fencing to address the menace of wild animals has received a lukewarm response. This implies that the adoption of solar technology in a rural setting can become a success only when farmers are shown tangible benefits.

The field study also indicated that there are a few progressive farmers who are excelling in terms of better productivity and returns by practicing organic farming in the same villages. Sunderpur Ratwara farmer, Naval Mahato grew organic potatoes, cash crops like turnips, carrots and spices and he is in the process of installing solar-powered irrigation facilities on his land. But even a champion farmer like him is not able to motivate others to

practice sustainable natural farming due to mistrust and skepticism. This implies that the social capital of the cluster needs rebooting by continuously educating the farmers to examine the cause-effect relationship of their behaviour and facilitating formal avenues to have direct interactions with farmers who have been benefitted through the adoption of modern technologies.

The farmers are stuck in the vicious cycle of debt. Most of the farmers interviewed were in losses and they were channeling money from one lender to another. Defaulting on Kisan Credit Card (KCC) has been a common denominator in most of the instances. The government gives a subvention of three percent to farmers who make timely payments to banks for KCC loans. However, farmers stare at the prospect of paying an extra three percent interest on their KCC loans, in addition to the usual four percent as the defaulters have to pay seven percent interest.

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One of the major issues identified from the survey was the farmer's need for credible agriculture-information sources. Relevant and timely information helps the farmer community to take the right decision to sustain growth of agricultural activity. Government of India has developed an Agricultural Extension System to provide information regarding weather, market prices and available subsidies. Information is disseminated through Krishi Vigyaan Kendras (KVK), Kisan Call Centres (KCC), mass media channels, government websites, exhibitions and so on (PIB, 2015). Despite all efforts, information is not percolated to farmers due to reasons such as a centralized department for processing agricultural information and monologic communication. Policymakers should know that adults learn by demonstration and hence the need for demonstration farms.

The field interactions also indicated that after sailing through all the hindrances, once the farmer is ready with the produce, there is no assurance for him to fetch the correct price for his produce. Volatility in the prices of crops play a key role in determining the

incomes of farmers. The intermediaries of the multi-layered supply chain take large percentages of consumer rupee while farmers get a small share. Due to illiteracy and poor marketing condition, a set of middlemen at different stages have emerged as a channel for selling the agricultural product. As there is variation of price across the rural market, the farmers get only 1/3rd of retail or consumer price. Rest is absorbed by intermediaries which is a loss to actual producers.

Further, when output increases well beyond the market demand at a price remunerative to producers, market prices decline. In the absence of an effective price support policy, farmers are faced with a loss in income. For instance, respondents reported that growing cabbage and cauliflower fetched huge remunerations to the farmers in 2018-19, subsequently in the following year all farmers having small landholdings grew the same vegetables. As the output was much higher than the actual market demand it resulted in a decline of market price and farmers were forced to sell their output at loss. Some of the farmers could not even find markets to recover their basic input cost so the produce was left to rot in the field or used to feed the cattle. Ironically, good produce and increase in production does not ensure better income for the farmers.

The field study also indicated that selling to Government of Bihar is a long and cumbersome process. Hence, farmers are forced to sell paddy and wheat at much lower prices to private players as they get immediate payment which helps them to meet the demands of the next sowing season. This implies that the minimum support prices (MSP) have been ineffective.

Surplus Cabbage Served to Cows

It was evident that the traditional mindsets of the farmers in Sakra cluster prevented them from adopting any new farm technologies or participate inallied farming activities. As farmers were resource deficient, they needed assurance for the present. Their world view being limited, they feared adopting new agricultural practices. The social capital of the cluster did not promote the diffusion of new ideas or facilitate co-learning. Young millennials had left hope to practice farming due to the existing condition of the farmers. To change the scenario, the entrepreneur instinct of the young farmers has to be revitalized. There is a need to bring about behavioral change among the farmers and enable them to look at a bigger picture by changing their skeptic mindset. Besides agriculture support, NGOs like AKRSP will have to invest more time and effort in capacity building and developing market-led non-farm livelihood opportunities to increase the incomes of farmers'.

To change the scenario, the entrepreneur instinct of the young farmers has to be revitalized. There is a need to bring about behavioral change among the farmers and enable them to look at a bigger picture by changing their skeptic mindset.

7. Conclusion & Recommendations:

It can be concluded that personal, infrastructural and market factors are responsible for the deploring conditions of farmers belonging to Sakra cluster. The discussion indicates that behavioural change among farmers is crucial for enabling them to develop sustainable agriculture. Local governments should ensure that infrastructural resources and market factors responsible for the deploring conditions of farmers should be immediately addressed. SDG 2 target of ending hunger and achieving food security cannot be attained when a sizeable number of farmers are neglected. Farmers need to be treated as entrepreneurs and they need to be supported with an appropriate eco-system that facilitates backward and forward integration in agriculture.

A few recommendations proposed below in the area of facilitating cultural shift, providing market & technical support and setting up agro-processing units will go a long way in strengthening the livelihoods and quality of life of small and marginal farmers in Bihar.

7.1. Cultural Shift: First and foremost, AKRSP (I) should make efforts to address behavioural barriers which is a major impediment in enabling the farmers to progress. Communication experts, psychologists, and sociologists should be engaged at the micro level to design appropriate messages and strategies which can influence the local farmers to develop scientific temperament. Good knowledge exchange and education initiatives should be undertaken both at the individual and group levels in an engaging manner. Active demonstration projects could be designed to enable farmers to evidence the change. Knowledge exchange activities must be sustained, not just using one-off events. It is difficult to change individual behaviour without including trusted people, such as advisors, family, and peers, and so, efforts should be made to engage all those who are involved in influencing the farmer.

Continued engagement should be seen as something more valuable than simply providing information through leaflets. It is important to incentivize changed behaviour and hence AKRSP(I) could consider designing an appropriate reward strategy to accelerate change. For instance, farmers practicing scientific farming methods could be rewarded as 'KRISHI-CHAMP' at village fairs and festivals. Interacting live with successful farmers will not only boost morale but also encourage fellow farmers to practice systematic farming methods. Similarly, farmers who use solar technology for irrigation or protecting their crops from animal menace under the 90 per cent subsidy from AKRSP(I) also need to be engaged effectively to convince other farmers in the locality. This will help small farmers to understand the farm economics in a much better manner. Fees for farmer study tours could be waived if the farmers visibly display a learning attitude.

7.2. Market & Technical Support:

To bridge the information gap, AKRSP (I) can set up a Farmer's Information Centre. The center should offer complete information about the availability of seeds, crop production, insecticide availability, fertilizer availability, weather information and so on. The field experts can answer calls related to agriculture, horticulture, animal husbandry, fishery, sericulture, market prices, weather forecast and so on. Farmers must be able to get information delivered to them at their doorstep and at a time when they require it most. This will facilitate developing trust and enable the farmer to make use of the same to increase their productivity and mitigate crop losses.

Local collaborations with Tirhut Agriculture College for creating a detailed plan for scientific and systematic cropping for different sizes of lands at the adopted villages can also be considered. This will enable the transfer of knowledge from the academic institution to the field and facilitate future agricultural research. Similarly, Kisan-Melas can be organized at

regular intervals, supported by field visits and discussions to educate farmers regarding new agri-technologies, advanced seeds, new farming methods, best agro practices, and agro-processing schemes.

7.3. Set-up Agro processing units:

Agro-processing units can stir up new crop and livestock opportunities to the farmer. Farm and horticulture yield can be converted into various products like flours, cookies, flakes, jams, jellies, pickles, ketchup, sauces or juices/ syrups This will enable small farmers to increase their incomes and boost local employment. AKRSP (I) can form entrepreneurial farmers group and educate them about PM Kisan Sampada Yojana which provides infrastructure support to set up Agro-processing clusters. As the primary study indicated that 90 per cent of the farmer's wives were willing to work after completing their domestic chores, they should be involved in the local agro-processing units. These women should be organized in the form of Self Help Groups (SHGs) and the agro-processing unit can be registered under the SHG. AKRSP (I) can sustain these groups by building their managerial capacities to govern and manage the Agro-processing units effectively.

References

Agricoop.gov.in. (n.d.). Programmes, Schemes & New Initiatives. Department of Agriculture, Cooperation and Farmer Welfare. Retrieved from http://agricoop.gov.in/divisiontype/rainfed-farming-system/programmes-schemes-new-initiatives

Akrspindia.org.in. (n.d.). Sustainable Agriculture. Retrieved from http://www.akrspindia.org.in/whtvdo_sstnblagrxltr

Byjus.com (n.d.). Vermicomposting Definition. Retrieved from https://byjus.com/biology/vermicomposting/

Cagliarini, A. and Rush, A. (2011). Economic Development and Agriculture in India. Retrieved from https://www.rba.gov.au/publications/bulletin/2011/jun/3.html

Deshpande, T. (March, 2017). State of Agriculture in India. Retrieved from https://www.prsindia.org/ policy/discussion-papers/state-agriculture-india

Directorate of Economics and Statistics. (2017, March). Economic Survey of Maharashtra 2016-17. Retrieved from https://mahades.maharashtra.gov.in/files/publication/ESM_Eng2016_17.pdf

Directorate of Economics and Statistics Department of Agriculture (2019, July). Agricultural Situation in India. Ministry of Agriculture and Farmers Welfare, Government of India. Retrieved from https://eands.dacnet.nic.in/publications.htm

Economic Survey 2018-19. (2019, July 5). PRS legislative research. Retrieved from https://www.prsindia.org/report-summaries/economic-survey-2018-19

Farming First. (2019). What is the story of agriculture and the Sustainable Development Goals. Farmingfirst.org. Retrieved from https://farmingfirst.org/sdg-toolkit#section_2

Government of Bihar. (n.d.). Report of the Task Force on Agriculture, Pg 6. Retrieved from http://niti.gov.in/writereaddata/files/Bihar.pdf.

Gupta, S. (2017, March 1). Why Rasna's new healthy snack has an uphill battle ahead. *Live Mint.* Retrieved from https://www.livemint.com/Consumer/aRys3wBhgKo4Bh7gBotrcP/Why-Rasnas-new-healthy-snack-has-an-uphill-battle-ahead.html

India, Industries, A. and Analysis, I. (2019). Indian Agriculture Industry Analysis. *Ibef.org.* Retrieved from https://www.ibef.org/industry/agriculture-presentation.

Ibef. (2014, May). Agriculture Sector in India. Retrieved from https://www.ibef.org/archives/detail/b3ZlcnZpZXcmMzYzMDMmODY=

Kapoor, M. (2018, September 18). Can eNAM flip Indian farmers' fate? *Business Today.* Retrieved from https://www.businesstoday.in/top-story/can-enam-flip-indian-farmers-fate/story/282538.html

Mittal, S. (2016, June 11). Crop Damage By Wild Animals Declined 33%: Govt. *IndiaSpend.* Retrieved from https://archive.indiaspend.com/cover-story/crop-damage-by-wild-animals-declined-33-govt-64401

Mulk, Masoodul (1991). A Microcosm of Farmers Strategies in Chitral. AKRSP. pp. 2–80.

NABARD (n.d.). Solar Power Fencing for Crop Protection from Monkey Menace and Domestic / Wild Animals in Himachal Pradesh. Retrieved from https://www.nabard.org/demo/auth/writereaddata/ModelBankProject/1302170923merged_document_9.pdf

NITI Aayog. (n.d.). Report of the Task Force on Agriculture. Retrieved from https://niti.gov.in/writereaddata/files/Bihar.pdf

PIB. (2015, April 28). Major Agricultural Extension Programmes being implemented in the country. Retrieved from PIB. (2019, July 3). A Government that cares for its Farmers. Retrieved from https://pib.gov.in/newsite/PrintRelease.aspx?relid=191129

Rai, R. (2019, May 28). Pradhan Mantri Fasal Bima Yojana: An assessment of India's crop insurance scheme. Observer Research Foundation. Retrieved from https://www.orfonline.org/research/pradhan-mantri-fasal-bima-yojana-an-assessment-of-indias-crop-insurance-scheme-51370/

Renewable Watch. (2019, February). Solar Fencing. Retrieved from https://renewablewatch.in/2019/02/05/solar-fencing/

Singh, K., Singh, R., Kumar, A., Meena, M. & Shahi, B. (2015, October 4). Agricultural Scenario and Strategies for Development: The Case of Bihar. Munich Personal RePEc Archive. Retrieved from https://mpra.ub.uni-muenchen.de/67133/1/MPRA_paper_67133.pdf

Toppo, A. (2018, December 12). What are the Benefits of Polyhouse Cultivation? Retrieved from https://krishijagran.com/agripedia/what-are-the-benefits-of-polyhouse-cultivation/

Study of Supply Chain of Ragi in Nashik

Abstract: *The agricultural sector in India is majorly dominated by the small and marginal farmers, accounting to 126 million out of which 14 million belong to Maharashtra. Farmers face multiple constraints such as lack of technical knowledge, poor access to essential inputs such as water and fertilizers and poor understanding of the agricultural markets resulting in low financial returns. To address these issues, Pragati Abhiyan, a leading NGO in Nashik has been designing interventions for increasing farm productivity through provision of supplying fertilizers, capacity building of farmers and enabling access to irrigation.*

The current article examines the situation of Ragi production and its supply chain in Nashik. The article proposes designing of alternate supply chain owned by the farmers to increase their earnings. The article is an outcome of Mr. Ashay Kamble's and Mr. Siddharth Kumbhojkar's 'We Care: Civic Engagement' internship with Pragati Abhiyan in February, 2019.

1. Introduction

The agricultural sector in India has undergone drastic changes over the past decades. Most notably post the Green Revolution (1967-1978), India was positioned as a net exporter of food grains. Between 2010-2018, total agricultural exports have grown at a CAGR of 16.45 per cent and are currently valued at US$38.21 billion (IBEF, 2017). India is the second-largest producer of rice, wheat, sugarcane, groundnut, vegetables, fruit, and cotton (FAO.org, n.d.). The average annual growth rate in real terms in agricultural & allied sectors has remained at around 2.88 per cent during 2014-15 to 2018-19 (Indiabudget.gov.in, 2019). Agriculture and its allied sectors are the major sources of livelihoods in India.

As per the Agriculture Census 2015-16, small and marginal farmers account for 86.2 per cent of all farmers in India, and in comparison, semi-medium and medium land holding farmers owning between 2-10 hectares of land account for 13.2 per cent (Bera, 2018). Farmers with large holdings i.e 10.00 hectares & above accounted for merely 0.57% of the total number of holdings. The Agriculture Census further highlights that 126 million farmers together owned about 74.4 million hectares of land. Thus the average holding was found to be merely 0.6 hectares which is not enough to produce surpluses that can financially sustain their families, explaining the rising distress in Indian agriculture (Agriculture Census Division, 2018). Additionally, irrigation facilities not being available to the majority puts the small and marginal farmers at great economic risk.

1.1 Scenario in Maharashtra:

Population wise Maharashtra is the second largest state of India. Despite being highly industrialized 53 percent of the population still rely on agriculture for their livelihood. As cited by the Economic Survey of Maharashtra (2016-17), 27 per cent landholdings in Maharashtra belong to sub-marginal farmers having less than 0.5 Ha (Hectare) of land. 22 per cent landholding belong to total marginal farmers having land between 0.5 to 1 Ha. 30 per cent landholdings belong to small farmers (1-2 Ha). 18 and 3 per cent landholdings belong to semi-medium (2-5 Ha) and medium farmers (5-10 Ha) respectively. Big farmers having above 10 Ha of land account for 0.5 per cent landholdings (Banerjee, 2018). The number of small and marginal farmers in India is close to 126 million, out of which 14.7 million are in Maharashtra (Bera, 2018).

The Economic Survey of Maharashtra projected a negative agriculture growth at 8.3 per cent for the financial year 2017-18 on account of decreased production of food-grains, pulses, and cotton crops (ET Online, 2018). The Agricultural productivity of small and marginal farmers is low not just because of small landholdings but also due to lack of knowledge related to techniques of farming such as seed selection, usage of farm equipment for cultivation, access and usage of fertilizers, crop selection for rotation and so on. Coupled with it poor understanding of the agricultural market and the business know-how pushes the farmers in a loss-making position (Suman, n.d. & Jadhav, 2019). The erratic nature of monsoon and unpredictable weather conditions in Maharashtra has severely impacted the farmers and this has had great fluctuations in the production of food grains (ET Bureau, 2019). Inefficient water management, inadequate pricing policies, and droughts have hit agriculture in the state (ET Online, 2018). This has consequentially increased the number of farmer suicides in the past years. Between 2014-18, Maharashtra witnessed 14,034 farmer suicides (Jadhav, 2019). The landless farmers who work as agricultural laborers survive in dismal conditions due to low wage rates in the presence of surplus labour (Suman, n.d.).

The productivity of small & marginal farmers is low not just because of small landholdings but also due to lack of knowledge related to techniques of farming, marginal usage of farm equipment for cultivation, crop selection for rotation and poor understanding of the agricultural market.

The Government of Maharashtra has introduced several schemes to support the farmers. Some of the schemes include the Prime Minister's Agriculture Irrigation Scheme, Nanaji Deshmukh Krishi Sanjivani Yojana, Krishi Gurukul Yojana, Pandit Deen Dayal Upadhyay Krishi Margadarshak Yojana, and many more (Sarkari Yojana, 2019). In 2017, the state government announced INR 34,000 crore loan waiver to farmers. In spite of the loan waiver, 4,516 farmers committed suicide from June 2017 to December 2018 (Jadhav, 2019). The core reason observed was implementation challenges in the loan waiver scheme due to errors in the Aadhar Card data provided by farmers. Additionally, farm sector experts and activists say that the agrarian distress persists despite the loan waiver due to the core concerns such as "timely access to formal credit, protection against risks, price crashes, social and financial security to cover for medical expenses not being addressed" (Ghadyalpatil, 2017).

Apart from the support received by the Government of Maharashtra, NGOs like Naam Foundation, Paani Foundation, Dilaasa, AFARM also provide a helping hand to the farmers. These NGOs act as catalysts for change and assist small and marginal farmers to acquire necessary knowledge related to water conservation, water management, soil conservation, market linkages, and non-farm related activities. They update the farmers on the available market opportunities and government schemes.

Out of the total 2.6 million farmers in Nashik district, 78 per cent are small and marginal farmers (Ghadyalpatil, 2019). To address their issues Pragati Abhiyan, a leading NGO, has designed interventions for agricultural farmers and rural women in and around Nashik city for their empowerment.

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2. About Pragati Abhiyan

Founded in 2005, Pragati Abhiyan is registered as Society and Charitable Trust. It has been working for the upliftment of the rural poor in Nashik district. The organization focuses on

development of agriculture, employment, food safety and promotes awareness about government initiatives.

Many government-led initiatives such as MNREGA and PDS do not reach the intended population owing to the operational issues in the implementation phase. Pragati Abhiyan helps the governments to address these operational barriers by providing insights through its research on various rural issues. It has integrated the ideology of 'Implementation is Everything' in the organization, thus promoting experiential learning for the last 13 years (Pragatiabhiyan.org, n.d.).

Pragati Abhiyan has been working on increasing the 'Ragi' (finger millet) yield for the small and marginal farmers in villages around Nashik city. Besides supporting farmers with access to irrigation facilities and fertilizers, they provide inputs on better cultivation practices.

2.1. Millet Project:

Pragati Abhiyan has been working on increasing the 'Ragi' (finger millet) yield for the small and marginal farmers in villages around Nashik city. Besides supporting farmers with access to irrigation facilities and fertilizers, the organization developed their capacities by providing training on better cultivation practices. This triggered behavioral change among farmers and has resulted in two to three-fold growth in the production of Ragi. Farmers grew Ragi as well as Bhagar (small millet) predominately for their consumption purposes, however due to surplus produce, Pragati Abhiyan realized that farmers could sell the surplus grain and earn some income.

3. Project Focus

To enable farmers to earn income from the surplus Ragi production, Pragati Abhiyan aspired to study the current supply chain system of Ragi in Nashik. They wished to enhance their understanding of the functionality, role and margins of each intermediary involved in the supply chain. Additionally, through this study, the organization could explore if Ragi farmers themselves could intervene at any stage in the value chain and thereby procure financial benefits.

Accordingly, the We Care interns were requested to conduct a detailed study of Ragi market and its supply chain with the following objectives:

- To identify the market scenario of Ragi in Nashik.
- To study the supply chain for Ragi.
- To recommend areas for creating a farmer-friendly supply chain.

4. Methodology

To attain the first objective of identifying the market scenario of millets, secondary research was undertaken. Specifically, data pertaining to a) types of millets, b) changes in production and consumption of millets, c) state-wise area statistics, d) land productivity, e) retail prices of finger millet (Ragi) in India and f) production cost was gathered. Data was collected through websites such as Indiastat, Mordor Intelligence, and ResearchGate. Government portals such as India Brand Equity Foundation (IBEF), Food and Agriculture Organization of the United Nations, Odhisa Millets Mission and Department of Agriculture Cooperation and Farmers Welfare were also referred. Additionally, research papers published on portals like ARCC Journals and DHAN Foundation were scrutinized to collate the information.

In the absence of any secondary literature on the supply chain of Ragi in Nashik district, it was decided to understand the supply chain of these millets through a micro exploratory study around Nashik city and the nearby regions of Harsul and Ghoti. These areas were selected as they were predominantly inhabited by Ragi producers and consumers. To understand the supply chain data was collected from multiple respondents of the supply chain (See Table 1). Data pertaining to the quantity produced, selling prices, market scenario, collection and transportation, prices and margins, market demand and distribution was collected with the help of an interview guide.

Data was segregated as per data points and was analyzed using multiple methods. Microsoft Excel software was used to study trends in production, productivity, and area under cultivation. The quantitative data on price structure and revenue of intermediaries was scrutinized with the help of in-depth interviews of various agents throughout the supply chain. The collected data was cross-verified from multiple players throughout the supply chain. This assisted in the understanding of margins, quantity procured and sold, scale of operations, processing, transportation costs and so on. Qualitative analysis was undertaken to understand various processing methods of threshing, winnowing, polishing (de-husking) and pulverizing deployed by traders and mill owners.

Table 1
Respondents and Data Points

Supply Chain Actor (Respondent)	Sample Size	Data points
Farmers	10	Yield, cropping technique, selling price, quantity produced per farmer, challenges faced
Traders	8	Margin estimate, quantity handled, processing
Wholesalers	4	Wholesale price, the scale of operations
Mill Owners	7	Processing, margins, procurement information
Food Industry owners	4	Ragi products, processing, margins, quantity sold
Retailers	3	Quantity, procurement information, selling price
Experts	3	Contacts, Government data

Based on the quantitative and qualitative data gathered, areas of possible opportunities/intervention where farmers themselves could take up the responsibility for becoming entrepreneurial and have better control in the supply chain were identified. A few recommendations to design a farmer-friendly supply chain were suggested.

5. Findings

5.1. About Ragi (Finger Millets):

Literature reviewed indicated that finger millet can be grown at high altitudes (2000m above sea level) with very little water (National Research Council, 1996). “Millets are eco-friendly, ideal for arid land cultivation and drought-like conditions, and their low-intensity cultivation methods are beneficial for smallholder farms. It is generally planted on hill slopes since the minimal water requirement saves flat land for other crops” (Dey, 2018). They are locally known in each geography by different names such as Ragi, Nagli, Nachni, Mandia and so on.

5.2. Market Scenario of Ragi:

India is the largest producer of millets in the world. However, the country has witnessed a great decline in the consumption of millets post 1960. Owing to the Green Revolution, the

production of rice and wheat increased resulting in a change in dietary habits, pushing millets out of use (Dey, 2018). For more than a decade, millets have captured the attention of conscious eaters around the globe. They have a lower glycaemic index compared to rice. Being gluten-free, they can be used in place of wheat flour in *rotis* and baked products (Dey, 2018). Ragi or finger millet along with sorghum and pearl millets are among the most important millets in India. Out of all the millets, Ragi has the highest amount of calcium content (344 mg per 100 gram), high dietary fibers and is rich in vitamins and nutrients (Devi, Vijayabharathi, Sathyabama, Malleshi & Priyadarisini, 2014).

India is the largest producer of millets in the world. However, the country has witnessed a great decline in the consumption of millets post 1960. Owing to the Green Revolution, the production of rice and wheat increased resulting in a change in dietary habits, pushing millets out of use.

Responding to the rising health concerns and demand for alternate food, millets such as Ragi are reviving in the market. This has brought hope to small farmers across the country to grow the crop and enhance incomes with low efforts and input costs (Gupta, 2017). In order to boost the production and consumption of millets in India, the Government of India has been taking various initiatives such as including millets in the Public Distribution System (PDS), increasing Minimum Support Prices (MSP) and some others (PIB, 2018). The Government of India declared 2018 as the 'National Year of Millets' to encourage its consumption and production (PIB, 2018).

Coarse grains are today's nutri-cereals as can be seen from various millet based products introduced by FMCG companies in the Indian market. For instance, Britannia Industries Ltd has launched Nutrichoice-Ragi cookies, MTR Foods Pvt. Ltd has introduced ready-to-eat Ragi dosa/ idli mix. Brands like Kellog's and Soulfull have introduced Ragi-based breakfast cereals that include chocolate-filled cereals, millet muesli, Ragi flakes and a masala Ragi-oats meal. Rasna, has also launched Vitos, a kid's snack made from Ragi (Gupta, 2017).

Urban consumers see millets as a solution to lifestyle disorders. Farmers too have realized that it requires fewer inputs and is an economically viable option if marketing avenues are created.

5.2.1. Ragi Production: India

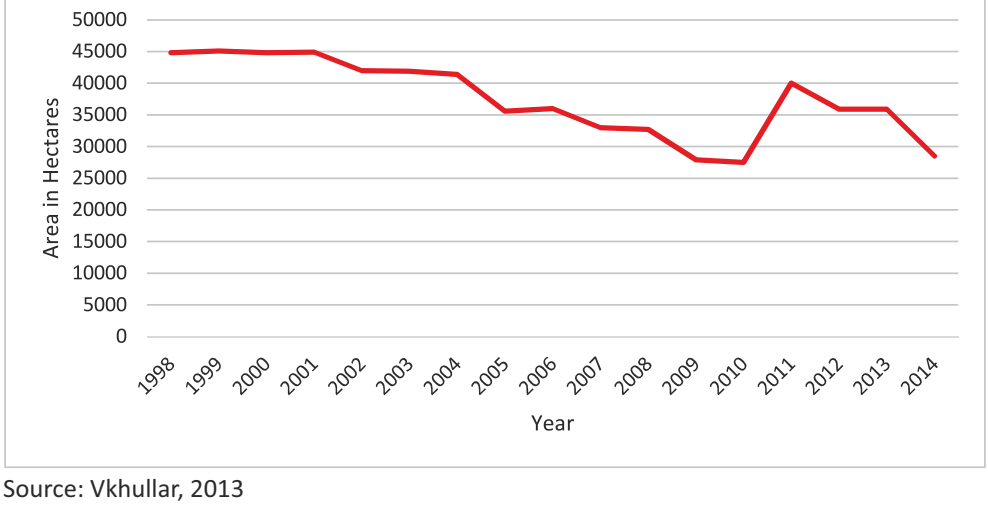
In 2016-17, the total area under millets stood at 14.72 million ha, down from 37 million ha in 1965-66. The production of Ragi was about 2.5 million tonnes for twenty years till 2003 (Commission for Agricultural Costs and Prices, n.d., pp36). The gradual decline of millet production was seen from 2004-05 across India. Coarse grains like Jowar, Bajra and Ragi were completely dependent on rainfall. Nationally, only eight per cent area had access to irrigation. (Commission for Agricultural Costs and Prices, n.d., pp 31). The area under Ragi production declined by 2.56 per cent per annum in Ragi growing states like Orissa, Bihar, Jharkhand, Andhra Pradesh, Gujarat and Maharashtra between 1998-2009 (Commission for Agricultural Costs and Prices, n.d., pp 4).

As millets were culturally stigmatized as 'poor man's crop', farmers did not have access to suitable processing technologies to increase their productivity. The decline in production was further attributed to changing food habits, growing urbanization, increased incomes, and competition from other crops. Though farmers have been cultivating major millets such as Jowar, Bajra and Ragi, production has been volatile largely due to concerns over low productivity and profitability (Kulkarni, 2018).

5.2.2. Ragi Production: Nashik

The area and production of Ragi in Nashik too has seen a steady decline over the past 20 years (See Figure 1, 2 & 3). This can be attributed to the shift in production patterns due to higher financial returns from other crops, decreasing market demand for Ragi, lower government support for production and lack of knowledge with respect to Ragi cultivation techniques (Commission for Agricultural Costs and Prices, 2010, p38 & Sankaran, 2017, pp7-8).

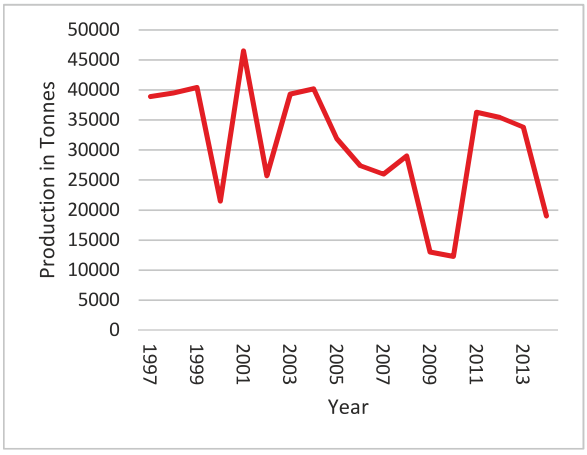
Figure 1
Area under Ragi in Nashik District



Source: Vkhullar, 2013

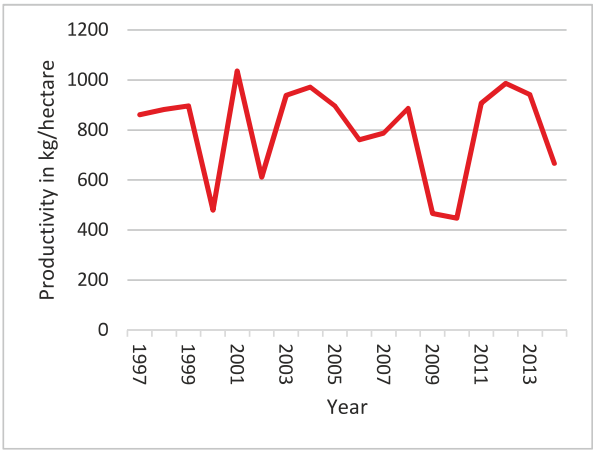
It can be inferred from Figure 1 that post 2003 there was constant fluctuation observed in the area under Ragi production. Fig 2 & 3 indicate constant fluctuation in the production and productivity per hectare of Ragi from 1997 to 2014.

Figure 2
Production of Ragi in Nashik



Source: Vkhullar, 2013

Figure 3
Productivity of Ragi in Nashik



Source: Vkhullar, 2013

5.3. Millet Market Boost:

The government has encouraged cultivation of millets in places that were highly prone to climatic changes by altering the cropping patterns (Kulkarni, 2018). Government's commitment to promoting millets can easily be gauged from the observance of the year 2018 as the National Millets Year (Kulkarni, 2018). To encourage farmers in sustaining their interest in growing millets and boost farmer's income Government of India fixed a higher Minimum Support Price (MSP)[3] for millets (See Table 3). The MSPs for Ragi, Jowar, Bajra and Maize were increased by about 52 per cent, 43 per cent, 37 per cent and 19 per cent respectively in 2018 (Hussain, 2018).

To address the issue of malnutrition and hunger the Agriculture Ministry of India under the National Food Security Mission has rolled out a programme called “nutri-cereals”. Efforts are made to include the nutrient-rich smaller millets in the mid-day meal schemes in government and government-aided schools. It is also commonly used to treat anemia among women and children in low-income groups (Rai, 2018).

Global research on millets has also added to the awareness level of consumers and thereby its demand. It is also called as a humble superfood of the Indian diet (Rai, 2018).

3 MSP is set up by the Government of India in response to the unstable pricing of agricultural commodities. The instability in pricing is due to the variation in the supply of crop, lack of market integration and information asymmetry.

Table 2
Minimum Support Price: Food Grains

Unit: Rs/qtl		MSP of Paddy		MSP of Coarse Grains					
Marketing Season	MSP of Wheat MSP+Bonus	Common + Bonus	Grade A+ Bonus	Jowar Hybrid	Jowar Maldandi	Bajra	Maize	Ragi	Barley
2013-14	1350	1310.00	1345.00	1500.00	1520.00	1250	1310	1500	980
2014-15	1400	1360.00	1400.00	1530.00	1550.00	1250	1310	1550	1100
2015-16	1450	1410.00	1450.00	1570.00	1590.00	1275	1325	1650	1150
2016-17	1525	1470.00	1510.00	1625.00	1650.00	1330	1365	1725	1225
2017-18	1625	1550.00	1590.00	1700.00	1725.00	1425	1425	1900	1325
2018-19	1735	1750.00	1770.00	2430.00	2450.00	1950	1700	2897	1410

Source: Dfpd.gov.in, n.d.

Table 2 indicates that since 2013-14, the MSP of Ragi has been higher than wheat as well as other coarse grains. The average annual growth rate of the support prices from the year 2013-14 to 2017-18 is 5.33 per cent. It can further be observed that in 2018-19, the MSP for Ragi was 67 per cent higher as compared to that of wheat. This was a dynamic step was taken by the Government of India to boost the production of nutrient-rich millets (Mohan, 2018).

5.4. Promoting Ragi Production in Nashik:

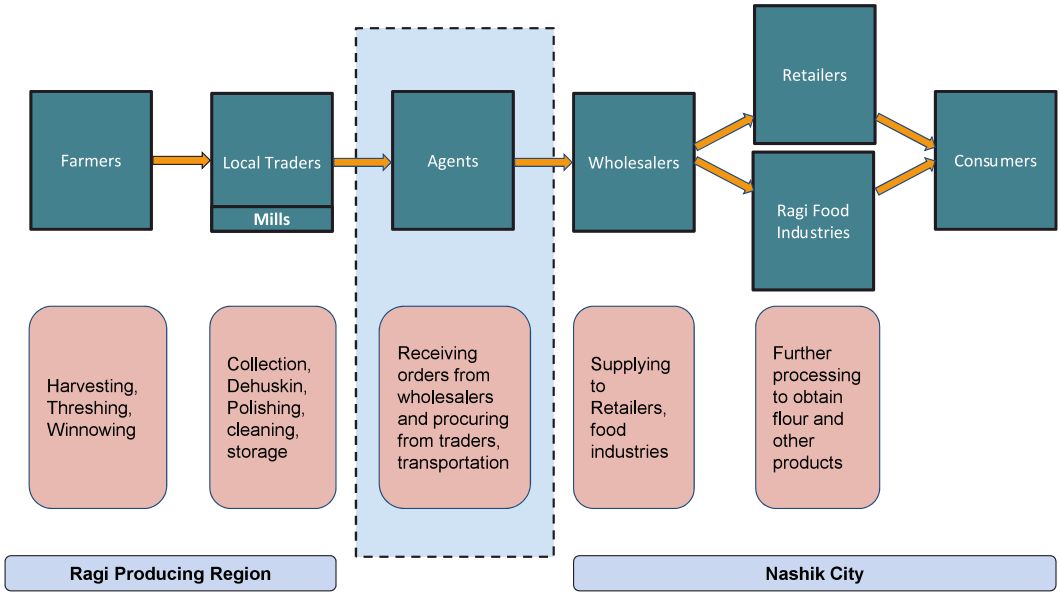
Nashik has been known as a major onion producing region, however in 2014 it was reported that the farmers were turning away from onions and considering to grow other crops such as Jowar, Bajra and Corn (Kasabe, 2017). As Ragi can be grown in harsh weather conditions with less water consumption and low input cost it was an ideal proposition to sustain the small farmer's livelihood. Additionally, Nashik has 37 processing mills for small millets (Dhan.org, 2014). Most of the millet produced in other states such as Madhya Pradesh, Karnataka, Tamil Nadu and Orissa is transported to the processing mills in Nashik (Lesaindia.org, 2018). Hence, producing millets in Nashik is economically viable for the supply chain as compared to other states.

5.5. Supply Chain of Ragi:

The supply chain of Ragi consists of six broad stakeholders i.e. farmer, local traders, agents, wholesalers, retailers, Ragi food industries and consumers. Fig. 4 and subsequent discussion in the subsequent paragraphs describe the role of each stakeholder in the Ragi supply chain.

The functions of each stakeholder in the supply chain and the procurement/selling price of Ragi at each level is summarized in Table 3.

Figure 4
Ragi: Supply Chain



Source: Developed by Authors

5.5.1. Farmers:

The core functions of the farmers, first stakeholder of the supply chain are harvesting, threshing and winnowing of the Ragi crops. Post-harvest the farmers cut the ripe-heads from the crops, dry them and carry out threshing manually or with the use of oxen or harvester machines. Subsequently winnowing is undertaken wherein grains are sieved to separate it from sand particles, hay, and pests. Separated grains are sold to local traders at INR 12-18 per kg.

5.5.2. Local Traders & Mills:

The grains purchased by the traders from the farmers contain an outer layer called as husk. A huller machine is used to separate the husk from the grain to obtain the inner seed, which is slightly red in colour. In the context of Ragi, the process is known as polishing which is carried out in local processing mills at INR 1 to 2 per Kg. Small scale local mills can carry out de-husking of 6-7 quintal Ragi in one hour. Sortex machines are used by some to obtain a cleaner stock of grains, separating any hay residue or stones. Grains processed through Sortex machines are sold at higher prices than the normally processed ones. During processing, 5 to 6 per cent of the total output is filtered out in the form of husk and other impurities. Processed grains are sold at a price of INR 28-30 per kg.

De-hulling Machine: Ragi and Rice

Ragi after Threshing

Processed Ragi:
Left: By Sortex Machine, Right: By Normal Processing

5.5.3. Agent:

The role of an agent is to receive orders from different wholesalers in the city and accordingly procure the quantity from various Ragi traders (located in neighbouring regions such as Harsul or Ghoti). Agents are responsible for the transportation of Ragi from the traders to the wholesalers, and they charge a commission of INR 2 per kg.

5.5.4. Wholesalers:

Wholesalers are responsible for fulfilling requirements from the retailers in the city, as well as various food industries dependent upon Ragi. Wholesalers may sell Ragi at INR 32-34 per kg.

5.5.5. Retailers & Ragi Food Industries:

Retailers are final touchpoints for the consumers. Retailers sell Ragi at INR 35-40 per kg, and if the processing is done through the Sortex machine, the selling price may escalate to INR 45-47 per kg.

Food industries make bulk purchases from Ragi wholesalers as they are involved in manufacturing value added products like flour, biscuits, nutritional supplements and so on.

5.5.6. Consumers:

The consumers consume Ragi by processing it to flour from local flour mills, or in other forms such as supplements and biscuits by purchasing from retail stores.

Table 3
Ragi: Supply Chain: Functions & Pricing

S. N.	Supply Chain Stakeholders	Functions	Quantity	Rate		Margin (% increase)
				Cost Price (CP) - INR/kg	Selling Price (SP) - INR/kg	
1	Farmers	Harvesting, threshing and winnowing.		-	12-18/-	-
2	Local Traders/ Mills	Procuring from farmers and performing de-husking and cleaning.	1-2 quintals	12-18/-	28-30/-	93.33%
3	Agents	Procuring from various traders and supplying to wholesalers.	10-20 tonnes	28-30/-	30-32/-	6.9%
4	Wholesalers	Procuring from agents and selling to retailers or food processing companies.	10 tonnes	30-32/-	32-34/-	6.45%
5	Retailers	Purchasing from wholesalers and selling it to consumers.	2-4 tonne	32-34/-	35-40/-	15.15%
6	Consumers	NA	30-50 kilograms	35-40/-	----	

5.6. Recommendations for Farmer Friendly Supply Chain:

It is evident from Table 3 that the intermediaries in the supply chain earn more margins. To enable the farmers to earn more margins, the interns proposed two scenarios to create a farmer friendly supply chain.

5.6.1. Scenario 1:

From farmer to trader the selling price increase was 93.3 per cent. There is a huge gap observed in the rate at which farmers sold Ragi to traders and the rate at which traders sold subsequently. The trader procures harvested Ragi from various farmers and processes the same at a mill (self-owned or outsourced) for de-husking and cleaning. Assuming that the trader procures harvested Ragi from the farmer at INR 15/kg, the cost incurred by Ragi trader is presented in Table 4.

Table 4
Ragi Trader: Costs incurred*

Cost component per kg	Cost (INR)
Ragi Cost / Purchase Price	15
Processing cost	1.5
Transportation and Labour for processing	2
Material loss due to processing	0.75
Procurement, Storage, Rent	1
Total Costs	**≈ 5**
Total Cost Price	**20**

*Based on assumptions.

From Table 3 and 4, it is seen that a trader sells processed Ragi at INR 28-30 per kg, at a cost price of approximately INR 20 per kg. This earns the trader a profit margin of INR 8/kg. If the activities of processing and cleaning are taken up by an association of the Ragi farmers, the margin of INR 8/kg or INR 800/100kg i.e. per quintal can be transferred to the farmers. Small mills for processing are either owned by a farmer or available nearby in the region. Farmers can thus procure Ragi from producers in the region, process it, and directly sell this to the agent for an additional profit of INR 800 per quintal.

5.6.2. Scenario 2:

Agent plays an important role in supplying the processed Ragi to wholesalers by identifying them in the area and fixing up a competitive selling price. From trader to agent the selling price increases by 6.9 per cent (Refer Table 3). Assuming that the agent incurs INR 1/kg of Ragi for transportation. the cost incurred by the agent is depicted in Table 5.

Table 5
Ragi Agent: Costs incurred

Cost component per kg	Cost (INR)
Ragi Purchase Price	28
Transportation and other costs	1
Profit margin	2
Total Selling Price	**31**

Source: Primary Research conducted by Authors

The agent retains a profit margin of INR 2/kg and sells the same at INR 31/kg to wholesalers. If the farmers' association can directly network with wholesalers or local Ragi food processing industries. This will help the farmers to generate an additional profit of INR 2/kg or INR 200/quintal.

6. Discussion

In a country where agriculture has been the primary occupation, the state of small and marginal farmers is pathetic. Farmer suicides have become a piece of ordinary news. Farmers struggle to meet their basic needs. Due to dearth of information on the expected weather conditions, inappropriate guidance about crop selection and other factors there is loss of return on investment. Being in the occupation of farming for generations, small farmers lack other occupational skills. Thus moving out of farming is not a feasible option as they may not find jobs in other skill oriented industries to earn their living.

Observations from the field revealed that the Ragi farmers in Nashik are largely small and marginal. They have still not optimized on the increasing demand of Ragi in the Indian food market. They are still producing Ragi enough for their consumption purposes and refuse to sell the excess in the market. They are afraid of falling short of supplies for personal use before the next harvest which may compel them to buy Ragi from the market at an exponential price. As a result, many Ragi farmers do not monetize their produce.

This phenomenon thus raises a question that, if consumers have begun to become conscious about the benefits of Ragi and if the Government of India is also trying to push the consumption of Ragi (and millets in general), then why is this positive sentiment still stopping Ragi farmers from commercializing their produce? This can be attributed to the ignorance about the market trends due to lack of exposure, information and knowledge. Farmers are unaware about the rising demand for Ragi. Unfortunately, the supply side is failing to leverage the opportunity. Farmers lack information on the range of Ragi based products being experimented in the market.

For those who wish to monetize on the excess Ragi produce still fail to reap the benefits of their potential due to lack of skills, knowledge about better cultivation techniques and lack farmer friendly supply chain. All these factors lead to a situation where the farmers suffer from low incomes and losses. This further pushes them into poverty trap due to debts, poor health and lack of well-being.

In such a scenario, funding and loan waivers can only help temporarily. The solution, hence, has to be radical in nature. The fundamental way in which the supply chain works needs a change. In this context, it is important to examine what does the farmer earn? The difference between the price at which a farmer sells the produce and at which a consumer buys is significant. Hence it is prudent to share a part of the price difference to the producers themselves. This can only be achieved if the farmers have a larger bargaining power which calls for organizing the farmers into formal associations. An organized group of farmers can take over the supply chain functions and reduce their dependency on the agents. This arrangement will save money and the same can be shared with the group members.

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The idea of intervening in the supply chain has a lot of potential and merit. However, the challenges in implementation prevents farmers from reaping the benefits and improving their livelihood. A major factor to be considered here is the risk involved for the farmers. The primary reason why traders sell the produce procured from farmers at a significantly higher price is because they bear the market risk. Traders are responsible for handling the transportation, processing and storage of the produce. These call for various costs, as discussed earlier in the earlier part of the paper. Storing the produce in large quantities also means that they have to bear the losses when there is demand fluctuation in the market. It is because of this risk that traders enjoy highest percentage increase in the selling price of Ragi, across the supply chain (see Table 3). If farmers' groups have to take up the role of the trader to gain additional revenue, they have to look after the supply chain functions and handle the associated risks as well.

To bring change in the agriculture supply chain, NGOs like Pragati Abhiyan will have to bring behavioural change among farmers and build their capacities, so that they can play a pivotal role in managing the supply chain.

7. Conclusion & Recommendations

Agriculture holds all the 17 sustainable development goals together. Investments in developing capacities of small and marginal farmers will assist the country not only to address hunger and malnutrition (SDG 2) but also address other challenges like poverty (SDG1), water (SDG 6), energy use (SDG 7), climate change (SDG 13) and sustainable production and consumption (SDG 12). The existing state of agriculture in India is majorly influenced by the structure of the supply chain. Although factors such as access to agricultural information, good quality seeds, effective fertilizers and so on do help improve the efficiency of the farmers, it is the supply chain that eventually decides the income for the farmer. It is hence evident that a radical approach to solving the issues of the farmers needs to be taken, rather than temporarily relieving the farmers of their financial problems. A farmer friendly supply chain will ensure that the farmers enjoy the true value of their produce and thus support their livelihood in a better way.

It is recommended that Farmer Producer Organizations (FPO) should be set up in Nashik. It will allow farmers to take control of the supply chain and earn better margins that are usually pocketed by the middle-men. For instance, as discussed earlier, if Ragi farmers can aggregate produce from other farmers, set up processing facilities for de-husking, cleaning and polishing, and sell the processed yield further down the supply chain, the additional revenues for the farmers can be substantial. Aggregation of the supply chain shall ensure proper functioning of food commodity markets and their derivatives and facilitate timely access to market

information.

Farmers should deliberate upon the various advantages of forming FPOs and the benefits to the community as a whole. An entrepreneurial mindset is needed so that the farmers are motivated to take up additional responsibilities other than crop cultivation. This also calls for behavioural change and building the social capital of the farmers. The process should be facilitated by Pragati Abhiyan and backed by appropriate schemes to boost entrepreneurship by the government. The food subsidies offered by the central government for procurement, transportation, distribution and so on should be utilized.

Creation and functioning of different farmer groups/ Producer Organizations (POs) in a city calls for discipline. NGOs like Pragati Abhiyan should act as the primary driver of this idea and educate the farmers about the pre-requisites for forming FPO. It should educate farmers about Pradhan Mantri MUDRA Yojana, eNAM portal, good management and good governance practices to manage the FPOs and help them gain access to larger markets.

References

Agriculture Census Division. (2018). Agriculture Census 2015-16. Phase I, Provisional Results. All India Report on Number and Area of Operational Holdings. Retrieved from http://agcensus.nic.in/document/agcen1516/T1_ac_2015_16.pdf

Banerjee, S. (2018, April 13). There are 'Farmer' and Farmers – A postscript to Maharashtra Farmer' Long March. *Countercurrents.org.* Retrieved from https://countercurrents.org/2018/04/there-are-farmers-and-farmers-a-postscript-to-maharashtra-farmers-long-march

Bera, S. (2018, October 1). Small and marginal farmers own just 47.3% of crop area, shows farm census. *Livemint.* Retrieved from https://www.livemint.com/Politics/k90ox8AsPMdyPDuykv1eWL/Small-and-marginal-farmers-own-just-473-of-crop-area-show.html

Commission for Agricultural Costs and Prices. (n.d.). Report on priced policy for Kharif Crops of 2005-2006 Season. Summary of Recommendations. Retrieved from https://cacp.dacnet.nic.in/ViewReports.aspx?Input=2&PageId=39&KeyId=389

Commission for Agricultural Costs and Prices. (n.d.). Report on priced policy for Kharif Crops of

2010-2011 Season. Summary of Recommendations. Retrieved from https://cacp.dacnet.nic.in/ViewReports.aspx?Input=2&PageId=39&KeyId=398

Dfpd.gov.in (n.d.). Minimum Support Prices of foodgrains. Retrieved from https://dfpd.gov.in/minimum-support-prices.htm

Dhan.org. (2014, February 2). Small Millets market chain in Tamil Nadu. Retrieved from https://www.dhan.org/developmentmatters/2014/february/case2.php

Devi, P. B., Vijayabharathi, R., Sathyabama, S., Malleshi, N. G., & Priyadarisini, V. B. (2014). Health benefits of finger millet (Eleusine coracana L.) polyphenols and dietary fiber: a review. *Journal of food science and technology*, *51*(6), 1021–1040. doi:10.1007/s13197-011-0584-9

Dey, S. (2018, October 13). The millet rises. Live Mint. Retrieved from https://www.livemint.com/Leisure/cvazXsjdfTHbxXaK0yVQFJ/The-millet-rises.html

ET Bureau (2019, June 18). FY19 growth in Maharashtra flat at 7.5%: Eco Survey. *Economictimes.indiatimes.com.* Retrieved from https://economictimes.indiatimes.com/news/economy/indicators/fy19-growth-in-maharashtra-flat-at-7-5-eco-survey/articleshow/69835020.cms?from=mdr

ET Online. (2018, March 12). Why are upset Maharashtra farmers marching to Mumbai? Here is the economics & politics of the row. *Economic Times.* Retrieved from //economictimes.indiatimes.com/articleshow/63265678.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

FAO.org. (n.d.). India at a glance. Food and Agriculture Organization of the United States. Retrieved from http://www.fao.org/india/fao-in-india/india-at-a-glance/en/

Ghadyalpatil, A. (2019, February 8). 80% of Maharashtra farmers to get income support of INR 7,200 cr. *LiveMint.com.* Retrieved from https://www.livemint.com/companies/news/80-of-maharashtra-farmers-to-get-income-support-of-7-200-cr-1549563910450.html

Hussain, S. (2018, October 8). In the Year of Millets, Coarse Grains Remain Neglected Despite Nutritional Benefits. *The Wire.* Retrieved from https://thewire.in/agriculture/despite-nutritional-benefits-coarse-grains-remain-neglected-in-year-of-millets

IBEF. (2017, July 17). Agriculture in India: Information About Indian Agriculture & Its Importance. Retrieved from https://www.ibef.org/industry/agriculture-india.aspx

Indiabudget.gov.in. (2019). Agriculture and Food Management. Retrieved from https://www.indiabudget.gov.in/economicsurvey/doc/vol2chapter/echap07_vol2.pdf

Jadhav, R. (2019, March 14). Maharashtra saw 4,500 farmer suicides despite 2017 loan waiver. *Business Line.* Retrieved from https://www.thehindubusinessline.com/economy/agri-business/maharashtra-saw-4500-farmer-suicides-despite-2017-loan-waiver/article26536877.ece

Kasabe, N. (2014, November 12). Nashik onion farmers turn to other crops. *Financial Express.* Retrieved from https://www.financialexpress.com/market/commodities/nashik-onion-farmers-turn-to-other-crops/7829/

Kulkarni, V. (2018, March 26). From Green Revolution to Millet Revolution. *Business Line.* Retrieved from https://www.thehindubusinessline.com/specials/india-file/from-green-revolution-to-millet-revolution/article23356997.ece

Lesaindia.org (2018, February 14). Millets and Markets – Need for networking and integration. Retrieved from https://leisaindia.org/millets-and-markets-need-for-networking-and-integration/

Mohan, V. (2018, July 5). MSP of 14 kharif crops hiked, millet growers to benefit. The Times of India. Retrieved from https://timesofindia.indiatimes.com/business/india-business/govt-announces-new-msp-of-kharif-crops-nutri-cereals-millets-got-substantial-hike/articleshow/64854455.cms

National Research Council. (1996). Lost Crops of Africa: Volume I: Grains. Washington, DC: The National Academies Press. https://doi.org/10.17226/2305

PIB. (2018, December 7). Food and Agriculture organisation (FAO) Council approves India's proposal to observe an International Year of Millets in 2023 . Retrieved from https://pib.gov.in/newsite/PrintRelease.aspx?relid=186206

PIB. (2018, March 22). Government decides to declare Year 2018 as “National Year of Millets.” Retrieved from https://pib.gov.in/newsite/PrintRelease.aspx?relid=177889

Pragatiabhiyan.org. (n.d.). Implementation is everything. Retrieved from http://pragatiabhiyan.org/

Rai, V. (2018, November 30). Why millets are the humble superfood of the Indian diet. *Vogue.in.* Retrieved from https://www.vogue.in/content/why-millets-are-the-humble-superfood-of-the-indian-diet

Suman, S. (n.d.). Indian Agriculture Problems: 7 Major Problems of Indian Agriculture. *Economicdiscussions.net*. Retrieved from http://www.economicsdiscussion.net/agriculture/problems-agriculture/indian-agriculture-problems-7-major-problems-of-indian-agriculture/12859

Sarkariyojana.com. (2019). *Maharashtra Government Schemes List 2019-20.* Retrieved from https://sarkariyojana.com/maharashtra/

Sankaran, M. (2017, July). Status of Ragi Crop: Changing Trends and Growth of its Area, Production and Productivity in India. *EPRA International Journal of Economic and Business Review, Volume - 5, Issue- 7.* Retrieved from https://eprawisdom.com/jpanel/upload/articles/1235pm23.M.Sankaran.pdf

Vkhullar. (2013, May 20). District-wise, season-wise crop production statistics. Retrieved from https://data.gov.in/catalog/district-wise-season-wise-crop-production-statistics

Commercial Pollination Services: Feasibility Analysis

Abstract: *Under the Mango Tree (UTMT) is a social enterprise that promotes beekeeping to increase agricultural productivity, enhance incomes and improve livelihoods of marginal farmers in the least developed districts of Maharashtra Gujarat and Madhya Pradesh. It utilizes the power of market forces to provide poor farmers with a profitable income stream by training them to use bees to diversify their revenue sources and by establishing market access for the honey produced.*

As UTMT has decided to pilot its 'Bees for Poverty Reduction' strategy, the current article assesses the feasibility of Commercial Pollination Services for honey production in Umbergaon, Gujarat and provides information on financial costing of Apiary. The paper is an outcome of Mr. Abhay Singh's and Ms. Rasika Kakde's 'We Care: Civic Engagement' internship with UTMT in February, 2019.

1. Introduction

At the 4th Plenary Meeting of the United Nations on 25th September 2015, the UN declared the 2030 Agenda comprising of 17 Sustainable Development Goals (SDG) as a plan of action for people, planet and prosperity. It recognizes that eradicating poverty in all its forms and dimensions is the greatest global challenge. The goals span the whole range of policy areas, from rural poverty to global hunger, climate resilience and population growth. Nine of the seventeen SDGs are directly or indirectly connected with agriculture, conferring a special multi-dimensional status to agriculture (Michalopoulos, 2016).

Agriculture is crucial in a world that is increasingly challenged by climate change and resource constraints every day. Developing the agriculture sector has a direct impact on SDG 1 i.e. no poverty, SDG 2 i.e. zero hunger, SDG 3 i.e. good health and well-being, SDG 10 i.e. reduced inequality and SDG 12 i.e. responsible consumption and production. As per FAO (2012) and World Bank (2007), agricultural economists and other development specialists generally agree that investing in agriculture is an effective strategy for reducing poverty, inequality and hunger, especially in countries where the sector employs a large share of the population (Lowder, Skoet, Raney, 2016).

One-third of the global population is still employed in agriculture and the majority of these happen to be subsistence farmers. In India, the condition becomes far more acute considering

that close to 44 per cent of the total population is still employed in the agriculture sector. The agricultural land per capita is far less than the global average (FAO, n.d.). According to the NABARD study (2018), "The average farm landholding size of a household was 1.1 hectare (Ha) in 2015-16. Only 13 per cent agricultural households owned landholdings bigger than 2 Ha" (Businessline, 2018). Majority of India's poor are in rain-fed areas or in the eastern Indo-Gangetic plains (World Bank, 2012). Fluctuating climatic conditions, high dependence on rain, affordability issues for irrigation facilities, negligence about agricultural techniques owing to poor literacy, small size of land has led the farmers to poverty. In the given scenario agriculture sector is not in a position to create additional employment opportunities and sustain the livelihood of the rural households. In this context initiating various rural non-farm activities can play an instrumental role in reducing the emerging problems of increasing unemployment and poverty in rural areas. Beekeeping is an environmentally friendly and non-farm business activity that has immense contribution to the economies of society and to a national economy as a whole.

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1.1 Honey Bee Farming and Honey Market:

Globally, 84 per cent of commercially grown crops are pollinated. As cited by Modernag.org (2018), the market capitalization of honey bees Apis Mellifera is $20 billion. Honey bee pollination makes fruits, nuts and vegetables more accessible to consumers. The byproduct honey is used commercially for food, skin creams, anti-aging lotions and medical wound dressings. Beeswax and pollens also have commercial value.

In India, Honey bee farming was traditionally practiced in the hilly regions. The vocation requires low investment, fewer efforts and no prior skills. Uttar Pradesh, Jammu & Kashmir, Punjab, southern Rajasthan, Gujarat, Maharashtra and Tamil Nadu have micro-enterprises in beekeeping in India (Farming Guide, n.d.). Beekeeping employs more than 2.5 lakh farmers in the country, a

number that is increasing continuously" (Alam, 2016). Besides beekeeping also generates employment opportunities by building a beekeeping ecosystem that consists of carpenters (manufacturing bee boxes, honey extractors and other equipment), master trainers (training farmers for beekeeping) and various women self-help groups (working to make swarm bags, bee veils and other related aspects).

Due to the increase in health consciousness, consumers are shifting to natural and healthy alternatives and hence there is a demand for honey in the market. In 2018, the honey market in India was worth INR 15,579 million. Based on projections it is expected that the market will reach a value of INR 28,057 million by 2024 (Imarcgroup.com, n.d.). According to CSE "India ranks seventh in honey production, with around 65,000 metric tons of honey every year. Owing to the high-quality honey being produced, there is growth potential in the export market as well" (Alam, 2016).

Government of India has developed the National Bee Board (NBB) under the Ministry of Agriculture & Farmers Welfare, Department of Agriculture Cooperation & Farmers Welfare. The purpose of NBB is to develop the vocation by promoting scientific beekeeping in India. Thus, raising the productivity of crops through pollination and increase honey production for growing the income of the Beekeepers/Farmers (Nbb.gov.in., n.d.). The Khadi & Village Industries Commission (KVIC) has also designed various interventions to develop the beekeeping industry. It has designed training programs for Beekeepers/Farmers ranging from five-day training to six months' 'Diploma in Beekeeping' (Kvic.org.in, n.d.).

Beekeeping also generates employment opportunities by building a beekeeping ecosystem that consists of carpenters (manufacturing bee boxes, honey extractors and other equipment), master trainers (training farmers for beekeeping) and various women self-help groups.

1.2 Scenario in Gujarat:

Beekeeping is being practiced in Gujarat for more than two decades. Based on the availability of floral sources, Gujarat is categorized under medium potential states for developing the Beekeeping industry. Compared to the hilly states Gujarat has a smaller number of beekeepers and colonies in the state (Kvic.org.in, n.d.). To enhance the Beekeeping business in Gujarat, KVIC distributed 1750 honeybee boxes among 175 tribals in Valsad district under the 'Honey Mission'. It was aspired that apart from production of 30,000 kg of honey through these boxes, it will also improvise the flora and fauna of the area due to cross-pollination. KVIC had aimed to distribute 7000 bee boxes to farmers across Gujarat to support the call for 'Sweet Revolution' by the Prime Minister in December 2016 (PTI, 2018).

Under the Mango Tree, a Mumbai based hybrid social enterprise is also working on agricultural yield enhancement via beekeeping as an alternate occupation for the farmers in Umbergaon, located in the Valsad district of Gujarat.

2. About Under The Mango Tree (UTMT)

UTMT, also known as UTMT Society is a hybrid social enterprise based in Mumbai. The enterprise was registered in 2009 under the Societies Registration Act, 1860. It provides bee-keeping training, subsidized equipment, entrepreneurial training and market access to enhance income and improve livelihoods of marginal farmers in India. Currently, the organization operates across 129 villages in the 13 districts of Maharashtra, Gujarat and Madhya Pradesh by engaging progressive farmers as Master Trainers (UTMT, n.d.).

3. Project Focus

UTMT with support from corporate donors has designed 'Bees for Poverty Reduction' strategy by engaging farmers in their farms to support diversification of livelihoods, boost quality agricultural yield, and increase incomes. To attain this UTMT provides village-

UTMT with support from corporate donors has designed 'Bees for Poverty Reduction' strategy by engaging farmers in their farms to support diversification of livelihoods, boost quality agricultural yield, and increase incomes.

level, farmer-friendly training for over a year which incorporates a) basic information about honey bees and pollination, b) finding and capturing bee colonies from nature, c) protecting bee colonies from pests and seasonal changes, d) honey extraction and e) bee box division. Farmers were usually trained in batches of 25 to 40 trainees per batch. This enables farmers to learn about bee management experientially. To scale up the training efforts, local cadre of "Master Trainers", are intensively engaged.

To engage a large number of marginal farmers and landless labourers in beekeeping and thereby increasing the honey production, UTMT would require naturally formed beehives as well as financial resources. UTMT team was clear that the former need could be satisfied by setting up its own Apiary.

In the above context, it proposed to set up 'Commercial Pollination Services' in its target intervention areas. The organization conceived a business idea where beekeepers provided their bee boxes to crop growers i.e. farmers on a rental basis. The crop grower could benefit through pollination resulting in increased yield and better-quality crops and the beekeepers too earn revenue for providing their services. As all the stakeholders engaged with beekeeping are benefitted, the team felt that this idea is viable as well as financially feasible.

To roll out the proposed business idea, the We Care interns were required to work on the following objectives:

- To assess the feasibility of Commercial Pollination Services in Umbergaon, Gujarat amongst the commercial farmers.
- To conduct a competitor analysis for Commercial Pollination Services in rural areas of Maharashtra.
- To study the alternative models practiced by Apiarists in the western regions of India.

UTMT conceived a business idea where beekeepers provided their bee boxes to crop growers / farmers on a rental basis. The crop grower could benefit through pollination resulting in increased yield and better-quality crops and the beekeepers too earn revenue for providing their services.

4. Methodology

To assess the feasibility of Commercial Pollination Services in Umbergaon, it was decided to conduct primary research in the form of field visits to Umbergaon. Specific data pertaining to: a) the nuances of beekeeping, b) local flora, c) climatic conditions and d) the subsequent challenges faced at the grass-root level were gathered. Using an interview guide, unstructured interviews were conducted with 20 farmers including one telephonic interview. As part of the ongoing baseline survey, farmer interviews were conducted by dividing them into two experimental groups; target group and control group. Target group consisted of villages where UTMT had trained farmers for beekeeping as well as other farmers who had their fields close to the trained farmers. The control group consisted of farmers where UTMT had not initiated its training operations. The bifurcation was vital to assess the effect of beekeeping activities on the agricultural yield in Umbergaon.

Based on examining the opportunities and challenges faced by the farmers concerning beekeeping, secondary literature was reviewed to scrutinize the economic viability of the beekeeping business.

Data pertaining to government initiatives for promoting beekeeping was collated through websites such as the National Bee Board (NBB), Mission for Integrated Development of Horticulture (MIDH), Rashtriya Krishi Vikas Yojana (RKVY) and Khadi & Village Industries Commission (KVIC). This was followed by detailed interactions with the UTMT team to develop an approximation of the various costs involved in running an Apiary in Umbergaon.

To attain the objective of exploring the demand, conducting a competitor analysis and studying alternative models practiced for Commercial Pollination Services, secondary research was performed to gather precise data pertaining to: a) commercial crops that require cross-pollination and b) existing players providing Commercial Pollination Services. The research was aided by accessing the data available on Government websites such as Ministry of Agriculture and Farmers Welfare and content available on the internet about existing players through newspaper articles. Based on the leads identified, existing players in the beekeeping industry were contacted and data was gathered via telephonic interviews.

Four entrepreneurs engaged in honey business in rural Maharashtra were tele-interviewed to gather data on the following points: a) business model practiced, b) bee species used, c) number of bee boxes owned d) operational expanse, e) seasonality involved in operations, f) bee species used and g) price points. Detailed interactions were carried out with Atar Singh

Kaintura based out of Dehradun, an Apiarist with a post-graduation degree in Bee Science from the University of Pune, practicing honey extraction and beekeeping commercially in Uttarakhand.

Studying existing businesses in beekeeping provided necessary insights of the seasonality involved in the crops targeted for pollination services and the rearing of bees. This was extremely vital for planning the feasibility of the overall business idea.

Data was analyzed using content analysis technique and eventually transformed into a model which supported the development of financial projections for an Apiary business.

We Care Intern Conducting Baseline Survey at Umbergaon

5. Findings and Analysis

5.1. Commercial Pollination

Pollination is the process of transfer of pollen grains from the anthers of one flower to the stigma of another flower or the same flower. Pollination occurs because of the pollination agents like wind, water, insects, animals, and so on. All species of bees are pollinators providing a pollination service for farmers and growers. Beekeepers add significantly to this pollinator population and so offer a valuable service to farmers helping to enhance local food security and yield. An Apiary is a location where beehives are kept and reared. Typically, the number of bee colonies in an Apiary ranges from 20 to 50 per acre depending upon the flora and local climate. On an average, every bee colony produces close to 14 kg honey annually; it primarily depends on the bee species, season as well as the available flora.

5.2. Assessing Feasibility:

Feasibility of livelihood enterprises was calculated based on factors such as availability of skills with people (human capital); the available natural resources (natural capital); required physical infrastructure and finances (physical and financial capital) and the norms, belief systems and relationship among people (social capital). Further discussion in this regard is elucidated below:

Feasibility of livelihood enterprises was calculated based on factors such as availability of skills with people (human capital); the available natural resources (natural capital); required physical infrastructure and finances (physical and financial capital) and the norms, belief systems and relationship among people (social capital).

5.2.1 Human Capital:

The farmers in Umbergaon were mostly literate and had received primary education. They were also acquainted with beekeeping due to earlier efforts by government to increase education regarding secondary sources of income for farmers. The area had about 200 farmers who were trained in beekeeping by UTMT and close to 70 per cent of the trained farmers were actively pursuing beekeeping. Each farmer owned two bee boxes on average taking the total count of bee boxes to 350 in the area. Umbergaon had a total of eight Master Trainers who were the most active and passionate among the farmers that received training from UTMT. However, lack of in-depth knowledge about the subject resulted in a high rate of absconding among the beehives in the region.

5.2.2. Natural Capital:

It was observed that in Umbergaon, commercial agriculture is practiced primarily through cultivating chikoo. Apart from chikoo, farmers for their sustenance grew vegetables like bottle guard, brinjal and chillies. Large scale cultivation of commercial crops is extremely important for commercial pollination as it provides the bees with conducive flora typically having high nectar and pollen grains to sustain. However, poor flora in the region acted as a hindrance. Additionally, as the farmers used chemical fertilizers and pesticides it was extremely harmful to the bees as they escaped the beehives. To mitigate the problems of lack of healthy flora, UTMT practiced free seeds distribution of crops and vegetables suitable for beekeeping. Unfortunately, these seeds were consumed by the livestock in the farms and thereby

defeated the purpose of seeds distribution. The beehives too were frequently attacked by pests which forced the bees to abscond. It was observed that as the mercury levels in Umbergaon were high, they were not very apt for beekeeping. Hence farmers needed to consider constructing shades and making adequate provision of supplying water, in and around the hive to keep the temperature in check. These finer nuances required a well-trained and seasoned beekeeper.

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5.2.3. Physical Capital:

Beekeeping is generally practiced by farmers growing commercial crops at large scale. On the contrary, majority of the farmers in Umbergaon were marginal farmers. They were not considered as an appropriate target group for providing commercial pollination services. Commercial agriculture in Umbergaon was restricted to the cultivation of chikoo and hence UTMT decided to undertake a six-month long pilot project in September 2018 to gauge the effectiveness of bee pollination on chikoo trees. As the findings of the study were not determined during the internship period it was not possible to conclude the effectiveness of bee pollination on chikoo trees.

5.2.4. Social Capital:

The field interactions revealed that the farmers in Umbergaon were not willing to set up commercial pollination services due to: a) lack of awareness about the importance of pollination, b) longer turnaround time for experiencing the benefits, c) continuous capacity building efforts and d) reluctance to shift from use of chemical to organic fertilizers.

5.2.5 Financial Capital:

Majority of the farmers in Umbergaon undertook subsistence farming. Small number of these farmers sold crops commercially. Due to the lack of market opportunities for selling the crops commercially, they were unable to make an investment in renting and maintenance of bee boxes.

5.3 Baseline Study:

The annual baseline survey conducted by UTMT in February 2019 had indicated an increase in agricultural yield of about 10 to 30 per cent in villages where beekeeping was practiced. The secondary data on beekeeping collated by UTMT also indicated that beekeeping aided in increasing agricultural productivity. It is in this context UTMT proposed to set up commercial pollination services through a controlled Apiary. As the team was willing to implement the conceived idea, a financial modeling exercise was carried out. The details of which are elucidated in the following paragraphs.

A Farmer at Umbergaon with a Bee Box

5.4. Financial Modeling:

5.4.1. Cost Centre Assessment:

Based on the study of government websites promoting beekeeping and interactions with farmers, economic and operational viability of setting up an Apiary in Umbergaon was assessed. Table 1 represents the detailed analysis of the various cost centers involved in running an Apiary.

Besides the cost centers listed in table 1, approximation was done for the various operational attributes which are crucial to measuring the feasibility of an Apiary as listed in Table 2.

Table 1
Apiary: Cost Centers

S.N.	Cost Category	Cost Headers
1	Equipment	Bee Box: Box to house beehive
2		Bee colony: Initial cost to transfer bees to natural colony
3		Bee Box Stand and Shade: To protect the bee box
4		Bee Veil & Swarm bag: Equipment worn by the beekeeper
5		Hand Gloves: Equipment worn by the beekeeper
6		Extractors: Equipment used to extract honey from a bee hive.
7		Wax sheet: Used for speeding up the process of hive creation.
8		Sugar: For feeding honey bees incase the flora is not suitable.
9		Smoker and other tools: Used by a beekeeper
10		Farm Equipment: For cultivat ing flowering plants
11	Staff	Technical Assistant: Expert trainer employed by UTMT
12		Apiary Maintenance Staff: Local person appointed by UTMT to look after the Apiary on a daily basis (farming, beekeeping)
13		Administration Staff: UTMT personnel to supervise the Apiary operations.
14	Logistics	Travel Expenses (Staff): Field visits of beneficiary farmers/customers
15		Bee Box Relocation Expenses: To relocate a bee box to client location. (Usually borne by the customer.)
16	Assets	Rented/Owned Land – By UTMT for setting up Apiary
17	Others	Bee Flora: Seeds of flora suitable for beekeeping.
18		Fertilizers: For maintaining bee flora that is cultivated.

Table 2
Apiary: Operational Attributes

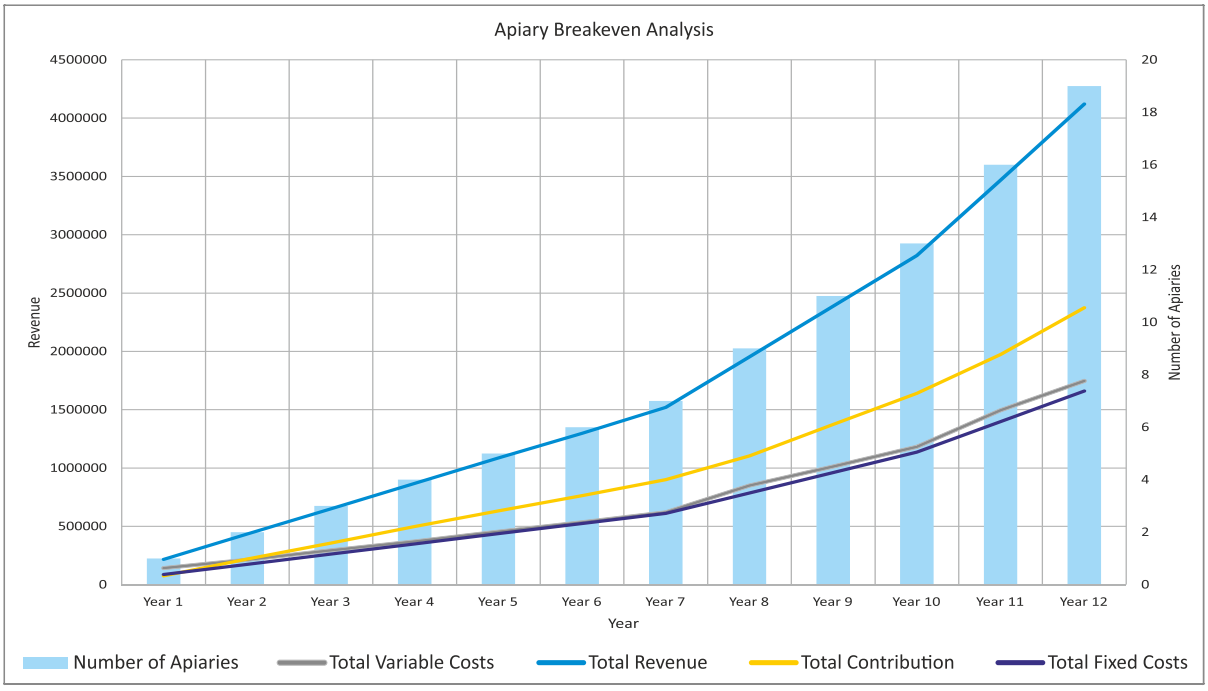
S.N.	Attribute
1	Division rate for bee colonies
2	Abscond rate for bee colonies
3	Proportion of bee boxes sold
4	Proportion of bee boxes lent for pollination services
5	Minimum proportion of colonies to be retained in the Apiary
6	Honey production per bee colony (kg)
7	Selling price of honey per kg (INR)
8	Rate of pollination services per month per box (INR)
9	Number of months for pollination services per year
10	Equipment service life (years)
11	Number of bee colonies per acre of Apiary
12	Selling Price per bee box (INR)

5.4.2. Financial Model:

After identifying the cost centers and operational attributes, a financial model was created to project a lucid idea about the feasibility of running an Apiary. Figure 1 represents the financial projections of the costs involved and revenue earned over the period of 12 years. The variables (i.e. cost centers and operational attributes) are considered based on the statistics applicable to Umbergaon.

Figure 1 indicates yearly projections which vary according to the number of apiaries operational in that year. Thus, for year one hypothetically a single Apiary having 20 bee colonies can have a total revenue of approximately INR 2,00,000/-. If the ecosystem works well by the twelfth year there can be 19 operational apiaries yielding a total revenue of INR 41,00,000/-.

Figure 1
Apiary: Financial Model



5.5 Competitor Analysis and Alternate Models:

Competitor analysis is a strategic technique used to evaluate competitors. It also aids in predicting unique features and weaknesses of the competitors. For the study, four competitors providing commercial pollination services based in rural areas of Maharashtra were studied.

Competitor analysis indicated the importance of a) apiary location, b) pricing of bee boxes and c) choice of approach. It also indicated a potential demand and the growing familiarity of beekeeping and pollination. The distinctive features of the competitors are presented in Table 3.

The competitor analysis assisted in understanding the nature of business of each of the four organizations. The prices of bee-boxes ranged between INR 5500 to 3500. Some competitors offered complimentary training and discounts to their buyers. The competitors also offered bee-boxes at rent, which gave an option to the bee-keepers to try out beekeeping occupation with a small capital. While some competitors operated only in Maharashtra, others offered their services to other states too. Competitors gave value-added services like training, equipment supply and honey extraction among others.

The analysis indicates that UTMT can position itself into an existing market that is rapidly maturing owing to the greater awareness among farmers. With an existing capability to offer beekeeping training to farmers, UTMT can also position itself as a one-stop-shop for all beekeeping requirements by including renting/selling of bee boxes as well as sale of equipments.

Table 3
Competitor Analysis

Competitor	1	2	3	4
Location	Pune	Latur	Dhule	Satara
Year of Inception	2014	Information not available	Information not available	Information not available
Nature of Business	Bee box renting, selling, training	Bee box renting, selling, training, equipment and machinery supply, honey extraction and sales	Individually operated, bee box renting in 45km radius, selling, honey sales. Seasonal business – September to December	Individually operated, bee box selling, honey sales
Geographic Scope of Business	Maharashtra, Goa, Gujarat, Orissa, Chattisgarh	Information not available	Maharashtra	Maharashtra
Bee Species	Apis Mellifera	Apis Mellifera	Apis Cerana	Apis Cerana
No. of Bees / Bee Boxes	Owns 4000 bee boxes	Breeds 1500 bee boxes annually	Owns 80 bee boxes	Owns 50 bee boxes
Pricing	Sell · Rs. 5500 per bee box + Free training · Training: Rs 10,000 per person (Conducted in Katraj & Rajgurunagar) · One-year guarantee Rent · Upto 10 boxes (Rs. 2000 per bee box per month) · >10 boxes (Rs. 1600 per bee box per month) · Free one way transportation of bee boxes	Sell · Rs 4500 per bee box Rent · Rs 1000-1200 per bee box for pollination (transportation extra) · Free residential training for first-time buyers	Sell · Rs. 3500 per bee box Rent · Rs. 700 per bee box per month · Rs. 3500 per bee box in case it is stolen · Rs. 1200 per bee box in case bees abscond	Sell Rs. 4000 per bee box
Discounts / Incentives if any	20 per cent discount for orders of 10 boxes or more	None	None	None
Type of Customers	Agrarian consumers, Government	Agrarian consumers, Government	Agrarian consumers	Agrarian consumers
Highlights	Published a 42-article series in Agrowon Newspaper	1000+ farms pollinated annually	NA	NA
Partnership	None	Tie-ups with companies for cross pollination in onion seeds	None	None
Ownership of Brand	No	Gauri Natural Food company under the brand “Real Honey”	No	Own brand “Forest Honey” and an FB page

6. Discussion

UTMT Society aims to enhance agricultural income of farmers by training them in beekeeping and creating a supportive ecosystem of livelihoods. As beekeeping increases pollination cover and yield for the entire community, it increases rural incomes and improves livelihoods. Currently, the organization provides training and initial handholding support to farmers in the states of Gujarat, Maharashtra and Madhya Pradesh. Due to its economic viability, interns proposed a business model for commercial pollination services to ensure financial sustainability for UTMT as well as provide a secondary income to farmers. Moreover, being a social enterprise, UTMT's expansion will assist in accomplishing a few sustainable development goals (SDG). Pollination aids in reducing the requirement of synthetic inputs and the absence of it will require to pursue more intensive and less environmentally sustainable practices making it difficult to attain sustainable production practices (SDG 12). Additionally, as pollination aids in enhancing farming productivity, it can assist in achieving food security thus reducing the gap towards attaining zero hunger (SDG 2). The tiny honey bees aid in sustaining the agricultural economy by utilizing fewer natural resources. Commercial pollination services shall aid in providing a supplementary income to farmers thus pulling them out of the poverty trap and raising their standard of living (SDG 1).

Conventionally, UTMT Society was solely involved in the capacity building of marginal farmers in beekeeping to increase their agricultural productivity. For this purpose, they provided the farmers with bee boxes at subsidized prices. The business proposition of providing commercial pollination services was the result of UTMT's ambition to have a steady source of income to support its operations and expansion plans. It would provide UTMT with an owned asset in the form of an Apiary where they could rent, sell or use the bee boxes for other purposes. Owning the asset (Apiary) would place the operational and administrative control with UTMT, thus controlling costs. However, for the

The business proposition of providing commercial pollination services was the result of UTMT's ambition to have a steady source of income to support its operations and expansion plans. It would provide UTMT with an owned asset in the form of an Apiary where they could rent, sell or use the bee boxes for other purposes.

venture to be profitable, UTMT faces a challenge of controlling costs while increasing revenue. The revenue is a function of the number of bee boxes sold or rented which depends on the rate at which the bee boxes multiply. With favourable climatic conditions and an abundance of flora, the bee boxes divide at a faster rate, thus increasing the revenue.

The beekeeping activity would also provide honey which will provide a supplementary source of revenue to the organization. In the scenario of increased awareness about the health benefits of honey, the demand for honey in India is growing. As per the latest data from the National Bee Board total national honey production reported in 2017 - 2018 was 1.05 lakh metric tonnes (MTs), compared to the 35,000 metric tonnes in 2005-2006. In the last 12 years, honey exports increased by 207 per cent in India making it a favourable opportunity for UTMT (Marar, 2019). As cited earlier, the market is further projected to reach a value of INR 28,057 million by 2024, at a CAGR of 10.2 per cent during 2019-2024 (Imarcgroup.com, n.d.). This indicates that the proposition of venturing into Commercial Pollination Services shall be financially rewarding for UTMT.

Being a natural product, UTMT also needs to consider other challenges to beekeeping in the area of natural habitat and technical knowhow. External threats such as the spread of disease among honey bees, loss of habitat, climate change resulting in unfavourable climatic conditions may affect the rate of multiplication of bees. Indiscriminate use of pesticides by farmers leads to the destruction of bee colonies posing a major threat to installing bee boxes in farms. Additionally, it is important to have technical knowledge for efficient management of colonies for high honey yields and extraction of superior quality honey.

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7. Conclusion & Recommendations

Based on the above discussion, it can be concluded that although beekeeping is a lucrative business opportunity for commercial

farmers it has certain challenges attached. As pollination aids in yield enhancement in a self-sustaining way, it serves a key role in the global economy. Pollination is the highest agricultural contributor to yields worldwide with an estimated global crop value of $235-$577 billion a year. The value delivered by honey bee colonies extends well beyond their actual price (Modernag.org, 2018). Honey, the by-product of pollination also accounts for huge market value. Besides, when bees are employed on a farm for pollination they eliminate the need for hazardous chemical fertilizers and pesticides, resulting in decreased costs and preserved soil quality. An increase in the use of nitrogen fertilizers, changing weather conditions and land overuse is causing soil degradation and erosion. Bee pollination is the answer to these chronic issues and also contributes in the direction of food security as the absence of pollinators would result in a decline in production for more than 39 different crops globally (Modernag.org, 2018).

To enable UTMT to venture into Commercial Pollination Services, it is proposed that it should have its own Apiary. The financial projections factor in various attributes of the location of an Apiary (division rate of bees, availability of flora and so on). Based on the analysis of the projections, it is observed that the Apiary would yield more profits from the sale of bee boxes compared to the revenue generated from commercial pollination. This, again, is a function of the ability of the bee boxes to divide, honey generated and the rates associated with the sale of bee boxes and pollination service. The pricing of the bee colonies in the Apiary should recover the annual cost of maintaining and rearing a bee colony.

UTMT should also offer a range of naturally flavoured honey at reasonable prices to capture the huge customer base available within the country and in international markets. Further, to enhance the revenue from beekeeping, UTMT should explore the possibility of extracting other by products of apiculture such as beeswax, pollen, a natural vegetarian protein source, propolis, bee venom and royal jelly. After attaining maturity in the business, the organization can expand to cover these products which are at a nascent stage in India and have a great scope for exports.

References

Alam, T. (2016, April 19). Entrepreneurs get the sweet taste of success with beekeeping and honey production. Yourstory.com. Retrieved from http://webcache.googleusercontent.com/search?q=cache:M20rarx6970J:https://yourstory.com/2016/04/honey-beekeeping-startups&hl=en&gl=in&strip=1&vwsrc=0

Businessline. (2018, August 17). Average farm landholding size shrinks to 1.1 ha. *Businessline.* Retrieved from https://www.thehindubusinessline.com/economy/agri-business/average-farm-landholding-size-shrinks-to-11-ha/article24719240.ece

Farming Guide. (n.d.). How To Start Commercial Honey Bee Farming Business In India. Retrieved from https://agrifarmingtips.com/how-to-start-commercial-honey-bee-farming-business-in-india/

FAO. (n.d.). India at a glance. Retrieved from http://www.fao.org/india/fao-in-india/india-at-a-glance/en/

Imarcgroup.com. (n.d.). Indian Honey Market: Industry Trends, Share, Size, Growth, Opportunity and Forecast 2019-2024. Retrieved from https://www.imarcgroup.com/indian-honey-market

Kvic.org.in. (n.d.). Bee Keeping Industry. Retrieved from http://www.kvic.org.in/kvicres/beekeeping.php

Lowder, S., Skoet, J. & Raney, T. (2016). The Number, Size and Distribution of Smallholder Farms and Family Farms Worldwide. https://doi.org/10.1016/j.worlddev.2015.10.041

Marar, A. (2019, May 20). A sweet success story: In 12 years, India's honey production grows by 200%, exports by 207%. *The Indian Express.* Retrieved from https://indianexpress.com/article/cities/pune/a-sweet-success-story-in-12-years-indias-honey-production-grows-by-200-exports-by-207-5736611/

Modernag.org. (2018, April 27). The Beeconomy: Economics and Insect Pollination. Retrieved from https://modernag.org/biodiversity/beeconomy-economic-value-pollination/

Michalopoulos, S. (2016, April 18). Agriculture holds key to UN Sustainable Development Goals. Retrieved from https://www.euractiv.com/section/agriculture-food/news/agriculture-holds-key-to-un-sustainable-development-goals/

NBB.gov.in. (n.d.). About National Bee Board. Retrieved from https://nbb.gov.in/aboutus.htm

PTI. (2018, September 23). KVIC distributes bee boxes to tribals in Gujarat's Valsad district. *Business Standard.* Retrieved from https://www.business-standard.com/article/pti-stories/kvic-distributes-bee-boxes-to-tribals-in-gujarat-s-valsad-district-118092300362_1.html

UTMT. (n.d.). Under The Mango Tree. Retrieved from https://utmt.in/social-impact/

World Bank. (2012, May). India: Issues and Priorities for Agriculture. Retrieved from http://web.worldbank.org/archive/website01291/WEB/0__CO-12.HTM

Driving Change through Technology: Case of Shikhar Yuva Manch

Abstract: *Shikhar Yuva Manch (SYM), an NGO located in Bilaspur, Chattisgarh works towards the upliftment of tribal and marginalized communities based in remote districts. The current article describes the aspirations of SYM to incorporate technology for monitoring its project performance, raise funds and increase its social media presence. It depicts the process of change management and the staff resistance associated with the same. A few recommendations in the areas of creating a learning environment to facilitate technology transfer in grass-root organizations are proposed. The author articulates that NGOs like SYM should collaborate with NASSCOM and BigTech to digitalize their documentation for promoting transparency and stakeholder accountability. This article is an outcome of Mr. Abhijit Sinha's 'We Care: Civic Engagement' internship with Shikhar Yuva Manch in February 2019.*

1. Introduction

Chhattisgarh is a state in central India with a population of 2.55 Crores and an area of 137,898 sq. km. (IBEF, 2018). Blessed with mineral resources like coal, iron ore, bauxite, dolomite and limestone, the state always has emerged as one of the popular investment destinations in India. Agriculture and allied activities form the base of the state's economy and provide a livelihood to 80 per cent of the rural population. The tertiary sector, however, constitutes 37 per cent to the state economy. Chhattisgarh has evolved as an emerging state economy in the country, with an average literacy rate of 64.7 per cent and per capita GSDP[1] of 1594.95 USD (IBEF, 2018).

About 76.76 per cent of the population in Chhattisgarh live in rural areas (Chhattisgarh Environment Conservation Board, 2015). Tribals constitute about one-third of the state's population as it was created in 2000 for tribals, by tribals and of tribals (Agarwal, 2018). Scheduled castes (SC) and scheduled tribes (ST) form 43.4 per cent of the population and live mostly in dense forests in the north and south of Chhattisgarh. Audhelia, Bagri, Bahna, Balahi castes constitute 94.6 per cent of the SC population while Gond, Kawar, Oraon, Halba, Bhattra tribes form the majority of STs (Census, 2011 & Social justice.nic.in, 2017).

1 GSDP: Gross State Domestic Product

The growth rate of Chhattisgarh has been better than Madhya Pradesh. Due to the establishment of water, forest and land rights of tribals, some people have been benefitted but the same has not been able to trickle down to the last mile (Agarwal, 2018 & Saxena, 2018).

Due to their peculiar way of living, the tribal population face challenges such as poor literacy rates, high levels of malnutrition, health issues due to communicable diseases, lack of healthcare infrastructure, lack of livelihood opportunities, excessive dependence on land and forest produce, land issues collectively leading to poverty (Menon, 2019). Saxena (2018) highlights that "In the past 18 years, there has been no major investment in biotechnology, information technology or the banking sector in Chhattisgarh". The investment in the education sector has been low. The state does not have even a single university that falls in the category I or II of the University Grants Commission (UGC) forcing the youth to move to other states for better prospects (Saxena, 2018). Additionally, a big percentage of the tribal population has been displaced. They are forced to work as labourers in the cities resulting in their economic and cultural downfall (Agarwal, 2018).

A big percentage of the tribal population has been displaced. They are forced to work as labourers in the cities resulting in their economic and cultural downfall.

The state government has collaborated with Chhattisgarh Tribal Development Programme to promote processes of awareness generation, legal literacy, social analysis and mobilization for self-selecting group formation among disadvantaged women and marginalized groups. The central government has also introduced schemes in the area of vocational training for tribals, schemes for grant-in-aid to voluntary organizations working for the welfare of Scheduled Tribes, schemes for scholarship provision for completing school education and higher education and so on. In spite of the range of schemes designed for the development of tribal population, its percolation, implementation and benefits cannot be assured (PIB, 2018). As a result, NGOs across the country and particularly in Chhattisgarh have a major role to play

in the upliftment of tribals. Organizations such as SRUTI, Rasta, Samarthan, Pradan and so on are working towards tribal development across the country. Shikhar Yuva Manch, an NGO located in Bilaspur is one such organization working for the underprivileged, with a special focus on SCs and STs.

2. About Shikhar Yuva Manch (SYM):

SYM was founded in 1997 by Mr. Bhupesh Vaishnov and Mr. Dhananjay Anupam, members of the youth group working together to bring a social change. The organization primarily focusses on the holistic development of tribals and marginalized communities and advocates the cause of quality education at different levels of state administration (Shikhar Yuva Manch, n.d.).

SYM operates on the belief that people's power is influential because it acts as a catalyst and enables people to achieve their goals to bring about behavioural change in the community. It does this through the capacity building of SHGs and CBOs. It mainstreams the school dropouts and out of school children by sensitizing officials involved in education management. It strengthens the farming processes through water and soil conservation. Through its rights-based approach, it creates awareness about various government welfare schemes (Shikhar Yuva Manch, n.d.). To promote alternate livelihoods of tribals the organization provides the raw material for vermicomposting, back yard gardening, mushroom cultivation, facilitates the building of check dams, installment of sprinklers, and solar-powered water pumps.

Mungeli Cluster Office: SYM

Drip Irrigation, Solar Powered Water Pump and Sprinkler System Installation Facilitated by SYM

Wall Paintings in Village – Girl Child Education

Beneficiaries of SYM in Bharuaguda Village, Mungeli District

Mini Science Laboratory Facilitated by SYM at Mungeli District

3. Project Focus

Vermicomposting is one of the ongoing projects at SYM. It provides alternative livelihood support to marginalized farmers. The field staff faced constraints in data collation, managing inventory of material and tasks required for the activity. The existing method lacked a single format to collect the data. There were inconsistencies with the data as it was not collected at the right time and in an appropriate manner. As a result, it was difficult to comprehend the data while preparing the summary of the process.

Process of vermicomposting being gradual, there is a need to keep track of the amount of raw material added, date of release of earthworms, date of mixture tilted and other related tasks. The organization felt that technology-based systematic data tracking would ensure productivity, efficiency and quality of the project.

Shikhar Yuva Manch felt that technology-based systematic data tracking would ensure productivity, efficiency and quality of the project.

To attract funding and volunteer support the organization also wished to enhance its visibility through social media as well as register itself on a few crowdfunding websites.

In this context, the We Care intern was requested:

a) To develop an effective data tracking system for the vermicompost project.
b) To develop social media presence of the organization for attracting funds and volunteers.
c) To collate information on crowdfunding portals and register the organization for Ketto.org.

4. Methodology

To attain the objective of developing effective data tracking system for the vermicomposting project, initially, a literature review was carried out to understand the process of vermicomposting by accessing the project reports for vermicomposting available at the organization. Discussions with the mentor also facilitated developing a basic understanding of the steps involved in vermicomposting.

To understand the process of vermicomposting and identifying the loopholes of data management, a field study was carried out at five field locations where SYM had initiated a vermicomposting project.

Interviews were conducted with a) beneficiaries of the vermicomposting project i.e. farmers/beneficiaries and b) site-level project coordinators. Two separate interview guides were designed, first for the farmers and second for coordinators. Interview guide designed for the farmer-focused on data pertaining to a) date of receiving inputs for vermicomposting from SYM, b) produce from the previous batch of vermicomposting, c) current status, d) frequency and mode of communication to report status, e) expected date of output, f) challenges faced before intervention of SYM and g) benefits due to intervention of SYM. Five farmers at three sites were interviewed.

Interview guide for the site level project coordinators focused on data pertaining to- a) number of beneficiaries, b) type of data collected from beneficiaries, c) period of data collection, d) mode of communication used to convey the data to the project heads, e) challenges faced in existing system of data collection and f) proposed solutions.

Based on the data gathered, the loopholes in the current data tracking system were identified and an alternative effective tracking system was designed. A few recommendations were offered to strengthen the system for better results.

To increase the social media presence, existing social media handles of SYM were studied, new registrations were done and recommendations were made to update the same with interesting content.

To attract crowdfunding, available crowdfunding sites on the public domain were studied. Data was gathered pertaining to: a) essential information required to register and b) the benefits of registering. The data gathered was used to register on Ketto.org.

5. Findings

5.1. Process of Vermicomposting:

Vermicomposting is an eco-friendly recycling process through which compost or mixed manure of organic origin is prepared by using various species of worms, leeches, and earthworms. To prepare compost, a concrete tank or ground pit is used. The size of the tank depends upon the availability of raw materials. As a first step, all the biomass including dried leaves and other biodegradable wastes collected from fields and kitchen are collected and left under the sun for about 8 to 12 days. The biomass can be chopped to a smaller size using a cutter. The chopped

biomass is layered in the tank above a two to three inches' layer of soil or sand. Cow dung slurry is sprinkled on the layer for quick decomposition. Similarly, layers of chopped biomass and partially decomposed cow dung are alternatively created in the tank up to the depth of 0.5 to 1ft. To this, the earthworm species are released and the compost mixture is covered with dry straw or gunny bags. A roof is created above the tank to protect the compost from rainwater and direct sunshine. Water is sprinkled on the compost at regular intervals to maintain moisture and avoid overheating. At the end of 24 days, around 4000 to 5000 new worms are produced and the entire raw material is converted into compost (Byju, 2019).

Vermicompost Tank at Mungeli District

Vermicompost Sample

5.2. Vermicomposting Project by SYM:

During the field visits, farmers informed that SYM provided the farmers with rock phosphate (known as Jhabua) and earthworms (1000 - 1200 earthworms per quintal of waste material). SYM also extended financial assistance for constructing the ground pit/tank with a dimension of 20 ft. length, 3 ft. width and 2 ft. height. The process of composting required about 3 months to achieve the final output.

Each site coordinator supervised five farmers. The farmers updated the status of compost at fixed time intervals to site coordinators through phone calls or during weekly/fortnightly field visits by the coordinators. The visits are conducted to assess the status, check the ongoing process of vermicomposting and if required advise the farmers to improve the vermicomposting process.

Shikhar Yuva Manch provided the farmers with rock phosphate (Jhabua), earthworms and financial assistance for constructing the ground pit/tank for vermicomposting.

Vermicomposting is a gradual process. It requires the collection of data at various intervals on the amount of raw material added, date of introducing earthworms to the pit, date of tilting the mixture upside down and so on. Site coordinators supervised multiple farmers. They did not follow a standard format for tracking the progress made by the farmers in vermicomposting. Hence, it was difficult to measure the outcomes and impact of the support provided.

After observing the current practices, the following modes of data management were suggested:

1) Updating data manually in a handbook during site visits
2) Communication over mobile phone
3) Usage of Google Forms for collating data

After deliberating on the above alternatives the convener of SYM and project coordinators felt that introducing Google Forms would be the best alternative as it was possible to create the forms in Hindi. As all the site coordinators used a smartphone for

communication, they could easily update the data every week. The Google Form gave the user the flexibility to customize the indicators and to receive data in the desired format. The data captured in the Google Form could be exported to Microsoft excel. The data gathered could assist in generating insights into the progress of the vermicomposting process.

The Google Form was created based on data points such as the date of constructing the vermicomposting tank, date of adding raw material and earthworms to the tank, date of extracting output, the quantity of output extracted and usage.

The Google Form was created based on data points such as the date of constructing the vermicomposting tank, date of adding raw material and earthworms to the tank, date of extracting output, the quantity of output extracted and usage.

It was decided to conduct a pilot test by creating a Google Form to gather basic data with regards to Vermicomposting from the site coordinators. Post circulation of the Google Form among the site coordinators, various challenges were identified. First and foremost, many site coordinators did not have an email account created in their name to access the Google form. They were not clear about the details to be mentioned in the form. They assumed that SYM created the process to track their individual performance. Thus, resistance in accepting the form was observed. The coordinators refrained from sharing the actual data and rather provided aspirational data.

Additionally, along with site coordinators, the beneficiaries were also requested to fill the form to verify the data given by the site coordinators. However, most of them could not fill-up the form due to their ignorance about using an email or filling up an online form.

To overcome these barriers, a knowledge transfer session was conducted by the intern. The primary objective of the session was to address the queries concerning the Google Form and ensuring the importance of the intended objective of formulating the process among site coordinators. Their support was solicited in enabling the project beneficiaries to understand the importance of submitting the data through Google Form.

5.3. Social media:

In today's internet age, social media has been one of the highly used medium for an organization to reach its target audience. With the number of internet users increasing rapidly in India and expected to reach 627 million in 2019, NGOs are also leveraging the benefit of social media for the following purposes (MissionBox, 2019):

- Opportunities to connect with supporters by responding to questions and comments or joining in new conversations.
- To increase awareness of the organization, which may support fundraising efforts.
- To publicize information about various initiatives taken by the organization.

To increase its visibility and reach SYM already had a presence on social media websites such as Facebook and YouTube with the name – 'Shikhar Yuva Manch'. The Facebook page was created 3 years ago and the YouTube channel was created eight years ago. However, the content on both social media accounts was not updated for two years. This impacted the organization's web outreach.

Accordingly, the intern updated the content of the Facebook page and YouTube channel with pictures and videos of the latest organizational initiatives and inserting keywords for making it more relevant when a page search was done for SYM. Besides, the intern also created an Instagram account for the organization to increase SYM visibility. The organization website was updated with links to social media pages and photo gallery highlighting the latest initiatives by the organization. The organization was advised on using social media analytics to map the visibility, upload posts about organizational achievements to improve visibility and keep the stakeholders updated about its activities via newsletters. Capacities were developed of two staff members of SYM to keep the social media platforms live and engaging.

Shikhar Yuva Manch was advised on using social media analytics to map the visibility, upload posts about organizational achievements to improve visibility and keep the stakeholders updated about its activities via newsletters.

5.4. Crowdfunding:

Crowdfunding is the practice of raising money via small amounts of capital from a large number of individuals to finance a new venture or a project (Investopedia, 2019). The funds are largely collected via the internet. Crowdfunding assists in connecting donors and receivers. Donors willing to support initiatives taken by various NGOs can search for crowdfunding campaigns by location or type of work done on crowdfunding websites. Most of the crowdfunding projects have set timeframes for when the money can be raised and disclose specific monetary goals. With the advancement of technology, crowdfunding is mostly executed through a specific portal. It also gives visibility to NGOs and increases the credibility of the organization once they are registered on prominent crowdfunding websites. To help SYM, for raising funds through crowdfunding the portals of Ketto, Milaap, ImpactGuru, Wishberry, and BitGiving were studied.

A brief comparative analysis of prominent crowdfunding portals is listed in Table 1.

Table 1
Comparison of Major Crowdfunding Websites in India

Website Name	Payout	Dedicated Dashboard	Monthly Visitors	Service Charges (%)
Ketto.org	Anytime	Yes	2.4 Million	5
Milaap.org	Anytime	No	2.2 Million	13.5
ImpactGuru.com	Anytime	No	460 thousand	12
Wishberry.in	After 15 days	No	96 thousand	10
BitGiving.com	N/A	No	61 thousand	6-8

Source: Topcrowdfunding.com

Online portal Ketto.org was selected to raise funds for SYM as it had the maximum number of monthly visitors. Additionally, the platform provided a dedicated dashboard to each initiative for managing all activities such as details of the initiative, updates, list of donors, direct links to connect with social media and so on. If the initiative offers a tax benefit, Ketto.org has the feature to tag the fundraiser event with a badge. It provides hands-on assistance and dedicated

account managers for each campaign. Ketto.org is the only player providing a cash-on-delivery option (Thomas, 2016). It has a lower service charge as compared to other platforms, provides advertising support and a 24/7 help center to manage funds, campaigns, donor queries, organizational queries and other common queries. It also protects fraudulent transactions.

Smokeless Stove Procured by SYM

SYM wanted to raise funds for providing smokeless stoves to 1000 beneficiaries living in Chichesara and Chatan villages in Mungeli District. The organization had observed that the traditional stoves (*chulhas*) used for cooking posed a potential health hazard for women. To address this issue, SYM had piloted the provision of smokeless stoves in 2018 to 500 households. The initiative received a positive response as it saved the time and effort for collection of firewood, reduced the health hazards and the food cooked on smokeless stove tasted well. It also reduced the environmental impact created due to the consumption of firewood and smoke emission. The procurement cost per unit of the smokeless stove was INR 2000. As the organization had to raise INR 20,00,000/- to provide stoves to 1000 beneficiaries it opted to create a campaign on Ketto.org.

6. Discussion

SYM is a professionally managed NGO which primarily focusses on the holistic development of tribals and marginalized communities. The organization promotes a variety of alternate

livelihoods through promotion of various local trades like vermicomposting, back yard gardening, mushroom cultivation, facilitates the building of check dams, instalment of sprinklers, and solar-powered water pumps.

It was observed that the staff of SYM which worked with commitment and passion in remote areas, faced problems in systematically carrying out monitoring and evaluation as they would handle multiple projects. The top management of SYM was keen to digitize the monitoring and evaluation system as it would enable them to track and map the progress of the projects as well as the beneficiaries in a systematic manner. Incorporating technology for monitoring and evaluation (M & E) opens up the possibilities of real-time feedback, accurate data collection, and quantifying results. It also aids in reducing cost, time and effort. This would further assist in developing appropriate visibility and garnering donor support.

Incorporating technology for monitoring and evaluation opens up the possibilities of real-time feedback, accurate data collection, and quantifying results. It also aids in reducing cost, time and effort. This would assist in developing appropriate visibility and garnering donor support.

Accordingly, after consideration of various alternatives offered by the intern for designing basic technology-enabled system for monitoring and evaluation, the management of SYM, decided to adopt 'Google Form' for its Vermicompost project as users such as staff/beneficiaries had Android phones. The management felt that the usage of Google forms to track data on vermicomposting offers the opportunity to save the cost of creating paper forms, time and effort spent in data entry and minimize errors by increasing accuracy. The quality of the data gathered is also richer and draws better insights, as it is updated from the location of the activity being carried out with the opportunity to capture images and videos showcasing the progress. As the time for data entry is available online, the task of data analysis can be done faster to generate findings. The findings aid in taking management decisions and develop strategies.

The implementation of the 'Google Form' for tracking data in a remote part of India has various learnings in Change Management. To shift from the traditional form of technology to

digital technology requires a couple of enabling factors. Foremost among these is the educational level of the users, learning attitude, their comfort level with accepting basic technology. In the euphoria of launching the basic digital system, sufficient attention was not paid to develop technology supportive attitudes of the staff/users. Neither was their level of current usage of technology verified. It is important to explain to each user, the rationale and benefits of using technology.

It is often seen that access to data tracking technology in an NGO is often delegated to a small central team. Due to excess workload the staff logs in inaccurate data. Not realizing the further impact of their action. They are not aware of the field realities and other related issues. Hence, there is a need to develop a learning culture in the organization to bring behavioural change among the team. They need to know that besides operations management technology can be used for fundraising and improving SYM's visibility globally.

To shift from the traditional form of technology to digital technology requires a couple of enabling factors. Foremost among these is the educational level of the users, learning attitude, their comfort level with accepting basic technology.

NGOs like SYM seem to be behind the curve in adopting data visualizations and hence they are missing out on huge opportunities to scale up. If SYM wishes to be among the top NGOs of the country, then along with its social impact, its information management system on social impact and financial health also needs to be strengthened.

7. Conclusion & Recommendations

It can be concluded that in the contemporary scenario which is data-driven, technology inclusion in grassroot level organizations is a must. Non-profit organizations like SYM working in remote areas can technically enable themselves and leverage technology to improve the organization's visibility globally and garner resources for scaling up their social impact. Shifting from manual monitoring to the digital M & E system, there is a need to create an enabling environment and make investments in developing staff capacities to facilitate behavioural change. This can be attained by conducting training and refresher courses for NGO staff. The users

need to be inspired either through demonstration visits or sharing success stories of other organizations that have had effective results through adaptation of technology. The behavioural change should be brought in by encouraging users to use their smartphones for easing out their regular chores like bill payments, accessing agricultural information using relevant apps, using YouTube and so on.

NGOs like SYM are bound by their mission. To attain desired outcomes, they need to be supported by the right revenue and expense models. As an organization's goals, strategy, and operating context shifts over a period of time, a dashboard allows NGOs to monitor both the effectiveness of their operational model concerning the organization's financial health and the social impact created through their products/services. As dashboards provide information in a simple and graphical format that can assist the NGO management and staff to see at a glance whether and where the organization is on the path it has laid out for itself. Most importantly dashboards promote transparency with funders and other stakeholders which enables the NGOs to develop credibility. To get technology assistance SYM and other NGOs can partner with NASSCOM Bigtech Foundation and utilize products offered to manage accounts, ensuring availability of inputs, manage human resource and drive promotional events of the organization.

As NGOs need to scale up their reach and impact there is a need to raise funds by deploying technology tools. It is recommended that fundraising platforms like Impact App be explored. The platform has unique features that benefit each stakeholder associated with it.
Technology inclusion in information management in remote areas calls for creating an infrastructure to facilitate internet connectivity. In this context Government of India's initiative on National Optical Fibre Network (NOFN) for creating a broadband revolution in rural areas should be accelerated without which technology inclusion in grass-root NGOs will only remain as an aspiration.

References

Agarwal, N. (2018, June 25). Chhattisgarh battles high poverty levels as the creation of state 'for tribals' does little to benefit the community. Retrieved from https://www.firstpost.com/india/chhattisgarh-battles-high-poverty-levels-as-creation-of-state-for-tribals-does-little-to-benefit-community-4590351.html

Byju. (2019). Vermicomposting. Retrieved from https://byjus.com/biology/vermicomposting/

Census of India. (2011). Primary Census Abstract for Scheduled Castes, 2011 – Chhattisgarh.

Retrieved from https://data.gov.in/resources/primary-census-abstract-scheduled-castes-2011-chhattisgarh

Chhattisgarh Environment Conservation Board. (2015). Demography. Retrieved from http://chtenvis.nic.in/Demography.html

IBEF. (2018, December). Chattisgarh – the Mineral Basket. Retrieved from https://www.ibef.org/download/chhattisgarh-dec-2018.pdf

Menon, S. (2019, March 30). Tribal Malnutrition In Chhattisgarh And How It Can Be Overcome. Retrieved from https://www.outlookindia.com/website/story/tribal-malnutrition-in-chhattisgarh-and-how-it-can-be-overcome/327811

MissionBox. (2019). Why Social Media Matters to Nonprofits. Retrieved from https://www.missionbox.com/article/118/why-social-media-matters-to-nonprofits

PIB. (2018, July 23). Schemes launched by Ministry of Tribal Affairs for the welfare of Scheduled Tribes. Retrieved from http://pib.nic.in/newsite/PrintRelease.aspx?relid=180875

Saxena, A. (2018, November, 20). Opinion. Youth, tribals' issues key to Chhattisgarh development Retrieved from https://www.livemint.com/Opinion/tqapRUhsQWKK9bRRI2bVmJ/Opinion--Youth-tribals-issues-key-to-Chhattisgarh-develop.html

Shikhar Yuva Manch. (n.d.). About Shikhar Yuva Manch. Retrieved from http://www.shikharym.org/about-us.html

Socialjustice.nic.in. (2017). Chattisgarh. Retrieved from http://socialjustice.nic.in/writereaddata/UploadFile/Scan-0024636052301394607618.jpg

Topcrowdfunding.com. (n.d.). Top Fundraising & Crowdfunding Online Platforms. Retrieved from https://topcrowdfundingindia.com/

Thomas, A. (2016, June 30). Crowdfunding a great tool for entrepreneurs to create buzz around their startups: Varun Sheth, Ketto. Economc Times. Retrieved from //economictimes.indiatimes.com/articleshow/52984106.cms?from=mdr&utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

Situational Analysis of the Yanadi Tribe in Nellore

Abstract: *In Andhra Pradesh as per Census 2011, 6.6 percent of the total population belong to 34 different Scheduled Tribes, one of which is Yanadi tribe who still live in utter poverty. The current paper briefly describes the interventions undertaken by the Association for Rural Development (ARD) for empowering Yanadi tribes since 2001 and maps the tribe's present-day social status in the targeted villages of Nellore District. The research reveals that in the absence of sustainable livelihood options, the tribe frequently migrates in search of jobs which subsequently impacts the education of their children. The paper indicates the subjugated status of Yanadis and the emotional abuse faced by them. In addressing the gaps, the article provides recommendations to the existing measures undertaken by ARD in areas of skill development, capacity building and development of mental health support centers. This paper is an outcome of MBA student Ms. Tanuja N's 'We Care: Civic Engagement' internship with the Association for Rural Development in February 2019.*

1. Introduction

1.1 Tribals in India:

As per the Census 2011, Tribals account for 8.6 per cent (10.45 crore) of the nation's total population and 11.3 per cent of total rural population. There are around 700 Scheduled Tribes (ST) notified under Article 342 of the Constitution of India spread over different states and union territories. Based on the Census 2011, sex ratio in the tribal community is 990 which is relatively higher than the national average of 943. The literacy rate for STs in India has improved from 47.1 per cent in 2001 to 59 per cent in 2011 (Ministry of Tribal Affairs, 2017-18). The fifth Annual Employment-Unemployment Survey (2015-16), conducted by the Ministry of Labour & Employment, estimated that the Worker Population Ratio (WPR) was the highest under ST category with 54.2 per cent and 47.8 per cent for Other Backward Class (OBC) category (Ministry of Tribal Affairs, n.d.). Odisha has the largest number of communities (62) listed as scheduled tribes in India (Censusindia.gov.in, n.d.).

In contemporary India the bond between the tribes and forests has been threatened due to various policies and programmes of the Government, exploitation by merchants, local government personnel and due to various industrial activities like mining, timber wood cutting, construction of dams and so on. This has deteriorated the natural environment, depleted biodiversity and has crippled the life of tribes in general and their dependence on the local ecological base. Tribals are vulnerable segments who are frequently subjected to eviction from their ancestral habitations consequentially leading to loss of identity, landlessness, decapitalization and loss of traditional knowledge.

In India, major tribal population is found in Lakshawdeep, Mizoram, Nagaland, Meghalaya and Auranachal Pradesh. However, Andhra Pradesh among other states like Bihar, Chhattisgarh, Madhya Pradesh, and Odhisa has the maximum ST population in the below poverty line category (Ministry of Tribal Affairs, n.d.).

1.2 Tribals in Andhra Pradesh:

As per Census 2011, 6.6 per cent of the total population of Andhra Pradesh belongs to Scheduled Tribe who live across eight districts. The state comprises of 34 different tribes such as Andh, Chenchu, Gondu, Kamara, Kondhs, Nayaks, Pardhans, Yanadi and so on (Aptribes.gov.in, n.d.). The tribals face loss of control over natural resources due to land ownership issues. Due to their nomadic lifestyle, belief systems and unavailability of educational institutions in remote locations they lack education. As cited by the Ministry of Tribal Affairs (2017-18, pp28) in India during 2015-16 the Gross Enrolment Rate (GER) among 6 to 10 years old 106.7 The figures declined among higher age groups highlighting dropouts. Due to the acquisition of land for mining and industrial development the tribals have been displaced. This has resulted in loss of their culture, primitive lifestyle and identity. They fair low on health indicators such as infant and maternal mortality due to malnutrition and inappropriate health facilities. These factors have led to economic and technological backwardness among the tribals (Sinha, n.d). As per the Ministry of Tribal Affairs Annual Report (2017-18, pp33), 24.1 per cent in rural areas and 12.1 per cent in urban areas comprised of population below poverty line (BPL) in 2011-12.

Due to the acquisition of land for mining and industrial development the tribals have been displaced. This has resulted in loss of their culture, primitive lifestyle and identity. They fair low on health indicators such as infant and maternal mortality.

1.2 Yanadi Community

The term 'Yanadi' means 'Orphan'. They are also referred to as chenchu's/Anadis. Yanadis' form the second largest group and they constitute approximately 19 per cent of the total tribal population of the Andhra Pradesh (Murray & Wadavi, 2011). There are approximately three million Yanadis spread across

Nellore, Chittoor and Prakasam districts of Andhra Pradesh.

Among the many Pre-Dravidian tribals in Southern India, Yanadis are one of the tribes, whose origins are difficult to trace. They were found living in utter poverty in the pre-Dravidian period. A clan of the Yanadi's traditionally worked as slaves for the elite. Families of Yanadis were employed by the elite as one labour unit to perform duties of farm labour and domestic help. In return, they earned leftover food and wages for one person against the services of the entire family. Even after 72 years of independence, they are in bondage living in most vulnerable conditions (Paul, 2018).

With the invasion of the Dravidians, Yanadis lost their identity, their language and their race got mixed with the people who subdued them, to such an extent that they forgot their special traits. Being nomadic, around 50-60 per cent of the Yanadi community live in huts. They establish their dwellings near streams and canals on the outskirts of villages. Traditionally, they had in-depth knowledge about the medicinal value of trees and herbs which is used till date to cure minor ailments. In the past the community comprised of skilled hunters, however due to deforestation, they are now able to hunt only rats and snakes in villages. In contemporary period majority of the Yanadis have become agricultural and fishing workers earning less than INR 5000/- per month. Being economically backward 60 per cent of them are homeless and live in makeshift huts resulting in distress. Majority of their homes do not have access to electricity. Very few of them have toilets constructed in their homes (Paul, 2018 & Vijayasree & Sarada, 2018).

In contemporary period majority of the Yanadis have become agricultural and fishing workers earning less than INR 5000/- per month. Being economically backward 60 per cent of them are homeless and live in makeshift huts resulting in distress. Majority of their homes do not have access to electricity. Very few of them have toilets constructed in their homes.

Yanadi Tribal in Nellore

The tribe faces issues relating to accessibility to land & entitlements, lack of transport & health care, lack of drinking water and poor sanitation. Inspite of having an average literacy rate of 67 per cent in Andhra Pradesh, only 14 per cent of the Yanadis are literate. High school dropout rate is prominent due to child labor and early marriages. The matrimonial practices among Yanadi's are fragile and remarriages are common in the tribe. Consequentially, children of Yanadis' are neglected and left to their fate (Paul, 2018).

In order to respond to their low standard of living and the associated social issues, the Integrated Tribal Development Agency (ITDA) for Yanadis was established in 2002. Both central and state governments have introduced various schemes for the education of children and youth. To promote school education schemes such as Eklavya Model Residential School (EMRS), mid day meals, organization of state-level games/tournaments and recruitment of teachers have been introduced. Various scholarship support schemes like pre and post-matric scholarship, NTR Vidyonnati Scheme and Ambedkar Overseas Vidya Nidhi' scheme are offered to enable the youth to pursue higher studies at national and international institutions and prepare them for competitive careers.

Yanadis are still deprived of the many basic government entitlements. Thus to address the issues of the tribals, NGOs like the Association of Rural Development (ARD) are making significant efforts.

2. About ARD

Association for Rural Development (ARD)was registered in 2001 under the Societies Registration Act, 1860 with the objective of uplifting street children who lived on railway platforms and bus stations. After the devastating tsunami of 2004, at the request of Action Aid, ARD expanded its range of services to the highly marginalized fisherfolk and Yanadi community of 20 blocks of Nellore District in 2011. Since then it has developed interventions in the areas of empowering the communities to access their rights over land, water, forests and public welfare schemes. It advocates restoring the rights of women and children with the government. It facilitates the education and protection of children and makes an effort to provide livelihood support opportunities. Currently ARD works on a diverse range of social issues like livelihood generation and women empowerment, bonded labour rehabilitation and child labour rescue.

3. Project Focus

The deploring conditions of the tribals compelled ARD to intervene to bring a change in the living conditions of Yanadi community. To address the issues of the tribe it has formed Yanadi Samakhya for strengthening Yanadi community at state level. The organization plays an advocacy role and lobbies for policy changes.

The deploring conditions of the tribals compelled Association for Rural Development to intervene to bring a change in the living conditions of Yanadi community.

The We Care intern was requested to examine the perception of Yanadi community towards ARD's community development approach and study the current issues of Yanadis residing in Duggarajupatnam, Cheemalapadu, Buchireddypalem, Indukurpet, Yellasiri, Pambali, Vellam, Alluru.

The objectives of the study were as follows:

- To study the school attendance of children belonging to Yanadi community residing in the target intervention villages.
- To specifically identify the reasons for school dropouts in the target intervention villages.

- To study the impact of interventions undertaken by ARD in the target intervention villages.
- To assess the current status of Yanadi community in the target intervention villages.

4. Methodology

To attain the above objectives secondary data was studied with the help of available literature at ARD. Newspaper articles spanning from 2005 having information about the Yanadi Tribe were given to the intern for getting an overview of the issues that the tribe is struggling with. Further clarity was obtained about the tribe's lifestyle via interaction with the organization mentor Mr. Shaik Basheer. He encouraged the intern to conduct group discussions, both formal and informal, with the staff of ARD to gain more information about the lifestyle and social status of the Yanadi Tribe. The staff of ARD shared their experiences of working with the Yanadi Tribe and the intricate details about the tribe's lifestyle observed over the years. Discussion with the staff of ARD helped the intern in understanding the social status of the Yandi community over the past years from 2005.

To understand the current scenario pertaining to specific problems identified by ARD team it was proposed to undertake a micro-exploratory study. The organization mentor requested the intern to personally visit the following villages: a) Alluru, b) Buchireddypalem, c) Cheemalapadu, d) Duggarajupatnam, e) Pambali, f) Indukurpet, g) Vellam, and h) Yellasiri.

It was decided to gather data using one to one unstructured interviews with a sample comprising of 80 school-going children, 20 Primary school teachers and 25 parents of dropouts covering 8 schools. 70 village residents from Yanadi tribe were also interviewed. The data collected based on following data points: a) attendance pattern, b) reasons for drop out from school c) occupational status of the Yanadi tribe d) impact of ARD's interventions on the tribe, and e) current status of the target intervention villages.

Additionally, in each village listed above, the intern was requested to observe some key issues faced by the Yanadi tribe and some special traits of Yandi specific to a particular village. The issues are listed in the Table 1.

Table 1
Village and Specific issue

S.N.	Village	Issue focused/ Trait observed
1	Alluru	Livelihood
2	Buchireddypalem	Bonded Labor
3	Cheemalapadu	Adaptation
4	Duggarajupatnam	Livelihood
5	Indukurpet	Organic Farming
6	Pambali	Water crisis and Transportation
7	Vellam	Livelihood
8	Yellasiri	Livelihood

5. Findings

5.1. Yanadi Tribe: Attendance Pattern:

The intern during the field visits observed that each school had six to ten boys and up to three girls. All the students seemed to be active in sports. They engaged themselves in games such as Kabaddi, Cricket and Carom. In all the eight villages, girls pursued education up to standard nine, whereas the boys pursued education sometimes up to post-secondary school level. The enabling factors of school attendance are dedicated teachers, proximity, and mid day meal. In this context, one of the teachers of the primary school shared, *"I personally get the children to school. There are children of different standards studying here. I teach them all. It would have been better if there was one more teacher appointed in the school. Individually, it is difficult to follow up with each child. There have been days when, if I did not conduct home visits children would not attend school"*. Children living in the vicinity of the school were comparatively regular in attending school. A teacher at Cheemalapadu expressed, *"Commutation to school at times is problematic, as the tribe lives near the canals and outskirts of villages. During monsoon due to water clogging, none of them dared to venture out of their homes. Extended monsoons had an impact on school attendance as the students would often forget the importance of regularity which was instilled in them with great efforts"*.

Mid Day Meal, a government-supported scheme played an important role in facilitating school attendance. One of the parents during the interview said, *"We force our child to go school so that we can be assured she is safe when we are at work. We work as daily wage workers and do not have the assurance of finding work every day. If we had to satisfy the hunger of our family only through our wages, we would be left starving for most of the days. Through the mid day meal programme my daughter gets to eat something. Hence we insist her to attend school every day."*

Children at Duggarajupatnam School

It was observed by the intern that among the eight villages covered under the study, Pambali was the only village where the students and parents seemed to have little faith in the importance of education. This was observed due to certain instances that occurred in the history of Pambali village. The villagers had seen strong educated women activists like Tupakla Munemma who fought for their land and livelihood rights and played a prominent role in the reach of title deeds of lands to the tribe. She represented the tribe in several political meetings as well. Additionally, in the past, two members of the tribe had acquired bank jobs which uplifted the standard of living of their families. Such success stories motivated the residents to send their children to school and ensure their attendance.

Author with Children of Yanadi Tribe in Indukurpeta

5.2. Reasons for Dropout:

While few parents felt school was a safe place to leave their children when they go for work, others were anxious about their girl child engaging in promiscuous relationships if she would continue education. For instance, in Pambali, a girl who studied till standard nine and later dropped out shared, *"I am over-educated according to the norms of our community. My parents are concerned about my safety as I have attained puberty. I am not sure if I want to study further. I don't want to go anywhere outside my village for further studies. My cousin who is staying with me has also pursued education till standard nine. I think we have gained enough education".* The girl was very keen on getting married as she did not have the motivation to study further. She was completely unaware of the importance of education. When asked persistently about any safety problems she was facing at school, she shared that the teachers took great care of them and there was never a problem at the school. Her parents did not force her to work. They just wanted her to be safe at home.

Factors such as complacency of parents, lack of awareness about importance of education, irregular migration patterns and teacher-student ratio at school have resulted in school dropouts.

Lack of teachers in each school also contributed to the poor attendance pattern and dropout. Each school was manned by one teacher and each class comprised of a mixed batch of children from different age groups and educational levels. As a result, the teachers were not able to attend to each child individually. As the dropout rate increased, teachers were relocated to other schools by the education department.

Due to the lack of employment opportunities, the families were compelled to relocate in search of livelihood. Irregular migration hampered regularity in school leading to dropouts.

It can be concluded from the observations and field interactions that factors such as complacency of parents, lack of awareness about importance of education, irregular migration patterns and teacher-student ratio at school have resulted in school dropouts.

5.3 Impact of Interventions by ARD

5.3.1. Educational Empowerment:

ARD was involved in spreading awareness about the 'Badi Bata programme' - a special enrolment drive to increase the admission of students in government schools since 2005. The programme is an initiative by the Government of India. The state government at the beginning of the academic year organizes a three-day event to ensure 100 per cent enrolment in schools from the given region. It is also designed to ensure prevention of child labour, provision of quality education and promotion of other basic facilities at schools to provide good learning environment (India Today, 2019).

ARD supported the Badi Bata programme by conducting campaigns to ensure school enrolment every year in May and June. The organization provided school uniforms, books, stationery and play material to encourage as well as motivate children to attend school. Through these campaigns the organization facilitated enrolment of 4257 children in schools and 743 children in residential hostels. Due to its commitment to the cause and expertise in the area of tribal development, ARD also received government grants of INR 15 crore for the establishment of three Gurukul Paatasalas (also referred as Andhra Pradesh Residential Schools) especially for girls from Chandrasekharapuram, Gudur, Venkatachalam and one Yanadi training centre. Additionally, it facilitated provision of basic utilities like school bags, stationery, storybooks, trunk boxes, tumblers, plates, glasses, shoes, solar lights, carriage boxes, water bottles, playing material to 1500 children to smoothen the transition to residential schools.

The 'Badi Bata programme' is a special enrolment drive to increase the admission of students in government schools and providing good learning environment.

ARD also formulated 'Children Clubs' in 72 villages with 1292 children. Through these clubs, ARD's social workers met the children once a month and discussed the issues faced at school. To enable healthy discussions during the club meetings games were used as a tool for discussion. The inputs from these meetings were given to the School Management Committees and Mandal Education Officer as feedback for enhancing the current educational procedures.

Discussion with Yanadi Tribe at Alluru

5.3.2. Political Empowerment of Women:

To politically empower women, ARD worked directly with 24,327 women in 20 Mandals. It had conducted 1816 women meetings in 270 villages to discuss diverse issues ranging from health to receiving pensions in case of widows. The organization identified 619 families headed individually by women and succeeded in gaining pension for 427 widows. It facilitated Antyodaya Anna Yojana (AAY) cards for 567 members. The AAY scheme focussed on the poorest of the poor families through the provision of food grains at the rate of INR 2 per kg for wheat and INR 3 per kg for rice. It was launched by the Government of India in 2000 (PIB, 2013). Additionally, with the assistance of ARD, 724 women in 23 villages received 1350 title deeds comprising of 1057.63 acre land. Due to the irresponsible behaviour by alcoholic husbands, the transfer of title deeds in the name of women members in the family assisted in gaining stability and better management of households. It impacted the overall social status of women in the community.

5.3.3. Prioritizing Women's Health:

It was observed that the women's health was highly compromised due to lack of awareness about pre & ante-natal care, ignorance of health facilities and balanced nutrition. To improve the health scenario, ARD had conducted training programmes through primary health centers (PHC) for tribal women about ante-natal and post-natal care. The efforts made a positive impact as ARD was successful in routing 728 pregnant women and 364 lactating women towards utilizing the Anganwadi for receiving nutritional supplements. This improvised women's health considerably.

Group Meeting with Women at Pambali

5.3.4. Economic Empowerment of Women:

For overall holistic development and sustainability, it was necessary to economically empower women. To address the issue, 30 women cooperatives were formed comprising of 293 members in 2013-14 by ARD. Through its advocacy and support, Department of Fisheries, Government of Andhra Pradesh sanctioned INR 4 lakhs and provided iceboxes at 50 per cent subsidy to 11 Matsya Mitra Groups of Alluru Fisherwomen Cooperative Society. The funds facilitated in developing a micro business of fisheries.

5.3.5. Livelihood Generation:

5.3.5.1. Horticulture based Livelihood:

The Yanadi tribe faced an economic crisis due to dearth of jobs and skills apart from their inherent skills. To address this issue ARD introduced horticulture as a source of livelihood for the tribe. Its awareness programme on using horticulture for livelihood generation benefitted 64 households across 12 villages. The organization also provided awareness on using bio-fertilizers, NADEP compost[1] and importance of managing finances to 1864 farmers (men-1134, women-730). This enhanced their economic productivity.

1 NADEP is a method of organic composting using organic materials including dead plant material such as crop residues, weeds, forest litter and kitchen waste. It is an efficient way of converting all kinds of biomass into high-value fertilizer that serves as a good alternative to farmyard manure, especially for crop-growing households without livestock (Kumavat, Tomar, Kumar, Sahu, 2018).

Yanadi Farmer Engaged in Manure Preparation

5.3.5.2. Forming Fisher Folk Co-operative Societies:

ARD assisted in registration of 34 tribal fisher folk cooperative societies comprising of 2173 members. This benefitted the fisher community in gaining fishing rights over 8986.38 acres of land. Through the fisher folk cooperative structure, the 34 registered societies received INR 30.49 lakhs worth fish seed from the government free of cost.

5.4 Yanadi Tribe: Current Status

5.4.1. Dependency on ARD:

Due to ARD's interventions and the positive impact created, the organization was successful in establishing trust among the tribe. However, it was observed that the targeted community became over-dependent on the organization. In Buchireddypalem, the colony of bonded labour lived in deplorable conditions. ARD fought for their rights and released them from the shackles of the landlords who had kept them captive for years. As the group did not have a shelter or a legal identity, ARD decided to look after the necessities of the tribe until they received their lands issued to them by the government. Upon construction of houses, they were issued ration cards entitling them with a legal identity and the freedom to enjoy the benefits of low-cost ration and so on. Inspite of this, the tribe failed to make any efforts to further shape their future. They became dependent on government benefits and utilized their skill of cultivating vegetables in the backyard of their homes only to satisfy personal needs. In one of the interviews with them, a local woman respondent said, *"We are very grateful to ARD.*

If they had not come to our rescue, we would not have been surviving today. They have done everything for us. Now we are waiting that they will provide us jobs and give us extra monetary benefits to lead a better life." On further probing about trying to find a job by herself she confessed, *"We all have been exploited in all kinds of jobs where we were employed earlier. Now we cannot trust anyone except ARD".* A respondent from Alluru revealed that, *"We are fishermen and were earlier engaged as Matsya Mitra Groups. ARD had helped us in the past to approach the local authorities and collectorate for reporting our problems to the officials. Now our groups have become defunct. We are looking forward to the organization to help us escalate the issues to higher officials and support us with monetary relief funds".* Thus there is an increased dependency observed on ARD.

A local woman respondent said, "We are very grateful to ARD. If they had not come to our rescue, we would not have been surviving today. They have done everything for us. Now we are waiting that they will provide us jobs and give us extra monetary benefits to lead a better life."

5.4.2. Lack of Livelihood Opportunities:

Though the tribe had excellent farming skills and capability of undertaking manual labour, they were not able to find employment opportunities offering regular income. As a result, the tribe migrated often in search of jobs. Pambali village had a unique situation - the tribe living in the area had ownership of agricultural lands, the soil was very fertile but the village was plagued with water crisis as it had access to water once in three days. Majority of the water was consumed by the affluent families as the poor could not afford to buy water tankers and fulfill their day-to-day necessities. One of the residents of the tribe said: *"There is everything in this village except water and transportation. There are cement roads inside the village but the main road which connects the village to the outside world is wrecked. We have our homes and our agricultural lands, but we do not have water for irrigation over here. We cannot leave Pambali as everything that belongs to us is here. We are stuck and hope that one day someone will fix the water and transportation problem. If the water issue is fixed, we don't have to go anywhere else to find work, we can cultivate and earn in our fields. For now, there is no other livelihood opportunity except farming".*

6. Discussion

Yanadi's are a large tribe in Andhra Pradesh with a majority of them concentrated in the Nellore district. They have preserved their culture by continuing a traditional lifestyle and clothing. They are a closely-knit group with fewer interactions with other ethnic groups or official bodies in the region. Their inherent skills of building huts are exceptional along with good knowledge about the medicinal properties of herbs which can aid in the natural healing of various illnesses. They are highly skilled in cultivating vegetables in small spaces available in their backyard or around their homes. Being subsistence farmers they make optimal utilization of resources to harvest their produce and fulfill all their nutritional requirements

It was interesting to note that most of the Yandi men are supportive of their spouses. They enjoy economic equality. There are women headed families who enjoy decision making power and have freedom of choice to work. Women were found to have progressive thinking and toiled hard for the betterment of the family. The tribe presents a picture of a tolerant, gender-cooperative, gender-nondiscriminatory, and humane society. Today, where atrocities on women in India have become a matter of rising concern, it is heartening to see that the Yanadis are much ahead of time. Against this backdrop, it can be concluded that the Yanadi culture provides a source of inspiration for women's movement in the mainstream.

Yanadi tribe presents a picture of a tolerant, gender-cooperative, gender-nondiscriminatory, and humane society. It is heartening to see that the Yanadis are much ahead of time. Yanadi culture provides a source of inspiration for women's movement in the mainstream.

To uplift Yanadis, facilities of residential schools, skill development programmes, economic support schemes with bank linkages, 100 per cent subsidy on agriculture service connections, were introduced by ITDA. In spite of introducing these schemes towards the upliftment of the tribals, the government has not been successful in gaining trust of the tribes. The tribes have had bitter experiences of humiliation with the system possibly due to the rigid behaviour of the authorities. The tribe has faced alienation in various forms. For instance, field

interactions revealed that the complaints lodged by the tribal communities against non tribals were not registered by police. Such incidents have added to their mental woes. As the tribe has faced immense atrocities in the past, they have become timid, skeptical and ignorant about a civilized future. Being bonded for years has left them in emotional distress impacting the holistic development of Yanadis.

Education levels being low, majority of the Yanadis are not financially literate posing a major risk of falling prey to frauds. Significant portions of the benefits offered by government schemes designed for the tribals are linked to bank accounts. As they are not able to manage their bank accounts themselves, educated locals in the community have taken advantage of their ignorance. Thus, there is a need to develop a mechanism to ensure the end reach of financial literacy.

As the tribe has faced immense atrocities in the past, they have become timid, skeptical and ignorant about a civilized future. Being bonded for years has left them in emotional distress impacting the holistic development of Yanadis.

Even today, Yanadis do not hold a high value for education. There is a huge drop out observed due to various reasons like migration, low value for education, poor access and availability of schools in the vicinity and so on. It was observed that Yanadi parents prefer to utilize the school premises as a stop-gap-arrangement for leaving children during working hours considering it as a safe place with access to a nutritious meal. Although the tribe appreciates the efforts of teachers, they do not believe in the strength of education and ignore the academic progress of children. In this context, motivating parents to send children to schools and providing quality education to them is an area of concern.

Field discussions revealed that the interventions by ARD helped the tribe in releasing themselves from the clutches of bonded labour. ARD has liaised with the local and state government and has helped them to procure permanent homes and ration cards. Tremendous efforts undertaken by the organization has enabled the tribe to avail the benefits of the tribal development laws,

educational programmes like ashram schools, alternate schools, hostels, residential schools, scholarships, coaching for competitive exams and so on (Ravinder, 2014).

ARD is seen as a service provider by the tribe. They consider ARD as their government. The trust developed by ARD staff enables Yanadis to share their concerns with them. Consequentially, they have developed a dependency on ARD for their upliftment. As ARD too has its limitation in terms of staff capacity it may not be in a position to cater to all the requirements of the tribe at all times. For instance, the field interactions revealed that in the near future Yanadis expect ARD to create livelihood/employment opportunities. Whether ARD will be able to provide these will depend upon the availability of resources, capacities of the tribe and market opportunities. In the years ahead to substantially empower the Yanadi tribe, ARD will have to bring a substantial change in its approach. While they should continue to provide services, they should also develop capacities of the Yanadi to be self-sufficient and take care of their rights. For this, ARD also needs to revisit its vision and mission and then design its future action plan.

7. Conclusion & Recommendations:

It can be concluded from the above discussion that that owing to the years of atrocities faced by the Yanadis, it is difficult to bring behavioral change in them. ARD has invested substantial efforts in uplifting the life of Yanadi. Yet, a lot more needs to be attained if they have to survive in the modern world. This can be achieved only by economically, socially and psychologically empowering Yanadis and developing their confidence level.

For economic empowerment, local as well as state government along with NGOs like ARD and corporates should create opportunities for skill development. For instance, farming being one of their inherent skills, ARD is experimenting to implement organic farming in Indukurpet by building the tribe's capacities. Interface meetings between Yanadis along with government officials and CSR executives should be scheduled at regular intervals to sensitize the officials and facilitate their interaction. This will assist in designing alternative livelihood support activities and develop other interventions. Thereby, ARD will ensure attaining SDG 8 for facilitating access to decent work. Efforts could be made by ARD to facilitate coverage of more Yanadi households under Public Distribution System (PDS). These efforts over a period of time will help the local administration to address issues of poverty, malnutrition and hunger (SDG 1 & SDG 2).

By creating livelihood opportunities and bank accounts for the tribe the organization can work

towards achieving SDG 8 ensuring access to decent work and equal pay for equal work.

As high level of emotional distress is observed in the community there is a need to provide support centers in villages offering mental health services. Appointment of appropriate mental health professionals at Primary Health Centers is a must. Similarly, efforts should be made to reduce maternal mortality rate. These efforts will help in ensuring good health and well-being and thereby achieving targets related to SDG 3.

Customized initiatives for the enrollment and retention of children such as the 'Badi Bata – enrollment drive' should be designed and implemented effectively during the academic year ensuring enrollment and retention. ARD should work with the education board to ensure pupil teacher ratio less than/equal to 30. This will aid in providing individualized attention to children. Regular meetings with parents will result in influencing their attitude towards education. Awareness building sessions with the tribe to shift children to residential schools may ensure better learning outcomes and reduced dropouts at secondary level. These initiatives by ARD shall facilitate access to quality education and ensuring the attainment of SDG 4.

References

Aptribes.gov.in. (n.d.). List of Scheduled Tribes of Andhra Pradesh. The Scheduled Castes and Scheduled Tribes Orders (Amendment) Act, 2002. Retrieved from http://www.aptribes.gov.in/pdfs/table1.pdf

Censusindia.gov.in. (n.d.). Scheduled castes and scheduled tribes. Retrieved from http://censusindia.gov.in/Census_And_You/scheduled_castes_and_sceduled_tribes.aspx

India Today. (2019, June 12). Andhra schools conducts Rajanna Badibata program from today as schools reopen after summer holidays. Retrieved from https://www.indiatoday.in/education-today/news/story/andhra-schools-conducts-rajanna-badibata-program-from-today-as-schools-reopen-after-summer-holidays-1547344-2019-06-12

Kumawat, N., Tomar, I., Kumar, R. & Sahu, Y. (2018). Preparation of NADEP Compost for Sustaining Farming Community. *Popular Kheti. 5. 56-60.* Retrieved from https://www.researchgate.net/publication/323144563_Preparation_of_NADEP_Compost_for_Sustaining_Farming_Community

Ministry of Tribal Affairs. (2017-18). Annual Report 2017-18. Ministry of Tribal Affairs. Retrieved fromhttps://tribal.nic.in/writereaddata/AnnualReport/AR2017-18.pdf

Murray, E & Wadavi, B. (2011). Socio-economic status of plain area tribes of Andhra Pradesh and their access to Microfinance. 10.13140/2.1.1023.3125.

Paul, S. (2018, August 18). How the Yanadi, an Oppressed Indigenous People in India, are Reclaiming Their Rights One Village At a Time. *IPS News.* Retrieved from http://www.ipsnews.net/2018/08/yanadi-oppressed-indigenous-people-india-reclaiming-rights-one-village-time/

PIB. (2013, April 26). Antyodaya Anna Yojana. Retrieved from https://pib.gov.in/newsite/mbErel.aspx?relid=95141

Ravinder, D. (2014). Tribal Development Programmes in Andhra Pradesh – An Overview. *The Dawn Journal. Vol. 3, No. 1.* Retrieved from https://thedawnjournal.in/wp-content/uploads/2013/12/12-Dr.-Donthi-Ravinder.pdf

Sinha, D. (n.d.). Six Main Problems Faced by the Indian Tribes. Retrieved from http://www.yourarticlelibrary.com/tribes/six-main-problems-faced-by-the-indian-tribes/42401

Vijayasree, B. (Dr.), Sarada, D. (Dr.). (2018). Lifestyle of the yanadi tribe and food habits in the socio-cultural and economic contexts. *Journal of Pharmacognosy and Photochemistry 2018; 7(5): 3207-3211.* Retrieved from http://www.phytojournal.com/archives/2018/vol7issue5/PartBB/7-5-541-673.pdf

Salt Farming: From Ocean to Cube

Abstract: *Salt pan farmers of the Agaria community in Gujarat work in the remote and arid Little Rann of Kutch. They work in harsh conditions to satisfy our need for salt. SETU Abhiyan, a Charitable Trust based in Kutch works towards the upliftment of the Agaria community via 'NAMAC' a registered salt worker's producer company. NAMAC ensures better incomes for the salt-producing community via an alternative marketing system.*

The current paper highlights the workplace hazards faced by salt pan farmers / workers and explains the salt manufacturing process. To enhance the income earned by Agarias, SETU Abhiyan is contemplating to venture into retail salt market. To beat the existing competition in the retail segment, as a product differentiator, the author proposes to position salt in the form of cubes. The paper discusses the feasibility of the proposed idea and recommends a few suggestions to the NGO to strengthen its position in the salt market. The paper is an outcome of Mr. Manan Thacker's 'We Care: Civic Engagement' internship with SETU Abhiyan in February, 2019.

1. Introduction

1.1 The Salt Industry:

The global annual production of salt is nearly 230 million metric tons (MT) (Saltcomindia, n.d.). Global salt consumption is expected to grow at 1.9 percent annually through 2020 to 335 million MT which is valued at $14.1 billion. Steady gains in the Asia/Pacific, Africa/Middle East regions and North America will support market growth. The average price for salt across the world is forecast to rise at 2 per cent per year in 2020, rebounding from the low of 2015 base (Freedonia, 2016).

India is the third-largest salt producing country in the world, next to the US and China. After Independence in 1947, salt was imported from the United Kingdom to meet its domestic requirement. It has not only achieved self-sufficiency in the production of salt to meet its domestic requirement but is also in the position of exporting surplus salt to foreign countries. The major salt-producing states of India are Gujarat, Tamil Nadu and Rajasthan. (Saltcomindia, n.d.). Majorly based on use, there are two types of salt. 'Industrial' and 'Edible'. Industrial salt is used in multiple ways including detergents, textile fibers, paper and glass. As per WHO, with a population of 1.3 billion, an Indian consumes an average estimated amount of 10.98 grams of salt per day.

1.2 Salt Production in Gujarat:

Gujarat contributes 76.7 per cent of the total salt production in the country. The salt production in the state is carried out in Little Rann of Kutch (LRK). Salt pan workers known as 'Agarias' mostly belong to nomadic and de-notified tribes are engaged in production of salt (Sao, 2018). There are six salt zones in the area comprising of 8000 to 10000 families of Agarias (Chandra, 2017). As of January 2019, approximately 500 salt pan workers were working in Adesar salt zone (a small border village in Kutch) and Maliya-Miyana salt zone (a small village in Saurashtra region). LRK is a piece of land formed due to withdrawal of sea water over a long period and hence the region remains submerged under the water collected from the sea tide and westward flowing rivers till the end of August or mid-September. As the land dries up, the Agarias of the LRK undertake salt production using 'solar evaporation method' from September to April. At the onset of the season in September, Agarias scout for suitable locations to create saltpans spanning over 10 acres of land each. They predominantly select the same land which they had used for harvesting salt in the previous years. Except for the Maliya tribe, the rest of the salt workers shift at the site with their families to create temporary mud houses close to their fields. Working everyday under the fierce sun from October to June, Agarias grow salt in square-shaped salt pans. The production averages to 12-15 tons every 15 days from each of the salt pans. The raw salt is sent to salt companies and chemical factories across the country. The Agarias earn a paltry sum of INR 60/- per ton and the market price of industrial salt is INR 4000/- per ton while domestic salt sells for INR 5500/- per ton (Mukherjee, 2016).

Salt pan workers known as 'Agarias' mostly belong to nomadic and de-notified tribes are engaged in production of salt. As of January 2019, approximately 500 salt pan workers were working in Adesar salt zone and Maliya-Miyana salt zone.

1.3. Life of Agarias:

Being in an unorganized sector, the salt workers work for extended hours in scorching heat mostly without personal protective equipment. They work barefoot exposing their feet to the highly-saturated brine in the salt pans leading to cuts and bruises. Their feet are prone to blisters when the salt hardens

Salt Fields at the Little Rann of Kutch

(Chandra, 2017). Consequentially, Agarias suffer from skin lesions, severe eye problems, tuberculosis and have abnormally thin legs, which become stiff with years of exposure to high concentration of salt (Pal, 2016). The living conditions of these salt pan workers are very poor as they lack basic amenities such as drinking water, shelter, education opportunities, health-care facilities and sanitation facilities. These workers face severe problems like high infant and child mortality rates, low life expectancies and face multi-level exploitation. They are also devoid of any mode of transportation as the roads are poorly constructed.

Salt farming, as a profession, is being passed on from generations to generations there by diminishing growth and developmental opportunities (Sao, 2018).

Living Conditions in the Little Rann of Kutch

To uplift the conditions of the salt workers and to ensure fair price for their hard work various NGOs have made efforts by working with salt workers, middlemen, corporations procuring salt and others. SETU Abhiyan is one such organization that works with the salt pan workers in Kutch that has the highest salt production of the country.

2. About SETU Abhiyan

'Kutch Nav Nirman Abhiyan' is a district network of organizations which was institutionalized in response to the 2001 Kutch Earthquake. To provide relief and rehabilitation services to the region various cluster level information centres- 'SETUs' were formed to bridge the information gaps and coordination efforts. Subsequently in March 2014, the conglomeration of SETUs known as SETU Abhiyan was registered as a separate legal entity under Societies Act, 1860 and Charitable Trust Act, 1950 (Setuabhiyan.org, n.d.). Since 2004, SETU has focused on strengthening local governance through various innovations. On a rural level SETU Abhiyan has a spread of over five blocks in Kutch district of Gujarat covering over 300 villages and 171 Gram Panchayats and on an urban level it works with two municipalities i.e. Bhuj and Rapar in the district (Setuabhiyan.org, n.d.).

NAMAC works with 100 small salt producing units in Maliya and Adesar regions, consisting of nearly 200 salt farmers. It facilitates access to institutionalized credit and helps them to deploy technology to reduce production costs.

2.1. NAMAC:

NAMAC was set up in 2012 as '*Adesar Vistar Khet Utpadan Producer Co.*' It was created with a motive to work on the objective of bringing social and economic empowerment to the salt producing community. NAMAC is fully owned by small salt producers. Currently NAMAC works with 100 small salt producing units in Maliya and Adesar regions, consisting of nearly 200 salt farmers. The organization facilitates access to institutionalized credit and helps them to deploy technology to reduce production costs. It has developed an alternative marketing system that ensures better incomes for the salt producing community (Setuabhiyan.org, n.d.).

In 2018, NAMAC evolved the idea of foraying into the retail market by developing a business model where the raw salt that is produced by the farmers could be converted to finished goods and can be directly delivered to end customers. This would provide more economic opportunities and returns to the farmers/workers (Setuabhiyan.org, n.d.).

3. Project Focus

To promote livelihood of saltpan farmers and work towards their development, NAMAC consistently made efforts to eliminate the middlemen from the supply chain of salt. It worked towards ensuring maximum benefit to farmers for their hard work. NAMAC partnered with donors and provided credit loans to saltpan farmers for meeting the salt farming and production expenditure. NAMAC has both an intermediary and market linkage model to promote the marketing of salt produced by the farmers. In the former model, it connects the farmers with the traders. In the later model, it purchases salt directly from the farmers and sells it to the traders.

Due to unforeseen weather conditions, NAMAC incurred a huge loss in 2017. Most of the salt got washed away due to heavy rainfall. Thus the members of the organization decided to explore new avenues in the area of salt business to aid NAMAC's sustainability. The organization had a dilemma of either continuing to work with the B2B model or switch to a retail model. Moving to a retail model would imply being responsible for processing the raw salt, packaging, marketing and selling the salt.

3.1. Entering the Retail Market:

Salt as a retail good contributes to around 35 per cent of the salt produced in India while rest 65 per cent goes for the industrial use (Krishnamachari, 2016). Though majority of the market was occupied by industrial salt, the weather conditions did put much pressure on the market prices and made the market quite dynamic, hence the risks were quite high when it came to providing loans to the farmers. NAMAC had incurred a huge loss in 2017 and investing again in the same business was unlikely. Hence, NAMAC proposed to venture in the retail market. Though entering the retail market had lower environmental risks, it had high competitive risk due to the presence of many prominent players like Tata, Saffola, and Ashirvad in the edible salt segment. So the organization needed to design an appropriate strategy to enter in the retail market.

Before venturing in the retail market NAMAC needed to assess the pre-requisites of entering the retail market in terms of understanding the entire salt processing procedure. For salt to be considered as safe and viable for edible use, the process of salt manufacturing and salt itself had to meet certain standards. The organization was willing to work towards organic production and processing of salt. For salt to be qualified as organic it had to be certified with a Non-GMO (Genetically modified organisms) or GMO-free certification.

In above context the We Care intern was requested to:

- To understand the salt manufacturing process.
- To study the Non-GMO certification process and its associated benefits.
- To study the manufacturing process of edible/table salt.
- To explore business avenues to sell salt in a retail market by removing the middlemen.

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4. Methodology

To study the non-GMO certification process and the manufacturing process of organic salt initially, secondary research was undertaken. Data pertaining to a) salt industry in india, b) salt manufacturing process c) non-GMO certification process, d) non-GMO product categorization e) benefits of organic salt processing and f) size of organic salt industry in Indian and international market. Data was gathered through websites such as Agricultural and Processed Food Products Export Development Authority (APEDA) India and Krishi Jagran.

A micro-exploratory study was undertaken in Adesar and Maliya-Miyana to examine the salt manufacturing process, the process of conversion of industrial salt to edible salt, supply chain of salt, and challenges faced by the salt workers.

Interview guide was designed to collect specific data pertaining to steps involved in salt manufacturing and producing edible salt (See Table 1). Data was gathered by interviewing salt workers and

Mr. Mahesh from Central Salt and Marine Chemicals Research Institute (CSMCRI).

Table 1

Respondents & Data Points

Respondent	Sample Size	Data Points
Salt Workers (Agarias)	20	Age, family size, income, working hours
Officials from CSMCRI	1	Market scope of edible salt and industrial salt, salt cleaning, salt quality in Adesar, challenges related to manufacturing and processing raw salt.

5. Findings

5.1 Salt Manufacturing Process:

The information about the salt manufacturing process was solicited through interviews of salt farmers and organization staff. Background secondary research was also carried out to understand the process in detail.

In LRK the salt production methodology used is 'solar evaporation method'. The inland salt is produced using sub-soil brine, while marine salt is produced using either sub-soil or seawater. Two varieties i.e. "*Vadaagaru"*and "*Karkatch*" can be produced. *Vadaagaru* is prepared under inland salt production and Karkatch is prepared under the marine salt production. The saline brine of 15 to 20 degree Celsius obtained from the seawater or sub-soil is exposed to fractional crystallization using solar energy. During the process of extraction of brine, the temperature increases from 15-20 to 25 degree Celsius. When brine reaches 25-degree Celsius, 'Sodium Chloride' or salt precipitates in the form of crystals are formed. At present, major quantity of *Vadaagaru* is produced in Adesar and major quantity of *Karkatch* is produced in Maliya-Miyana. The entire process of production and harvest is carried out by the Agarias. The process of harvesting the crop happens between September to April.

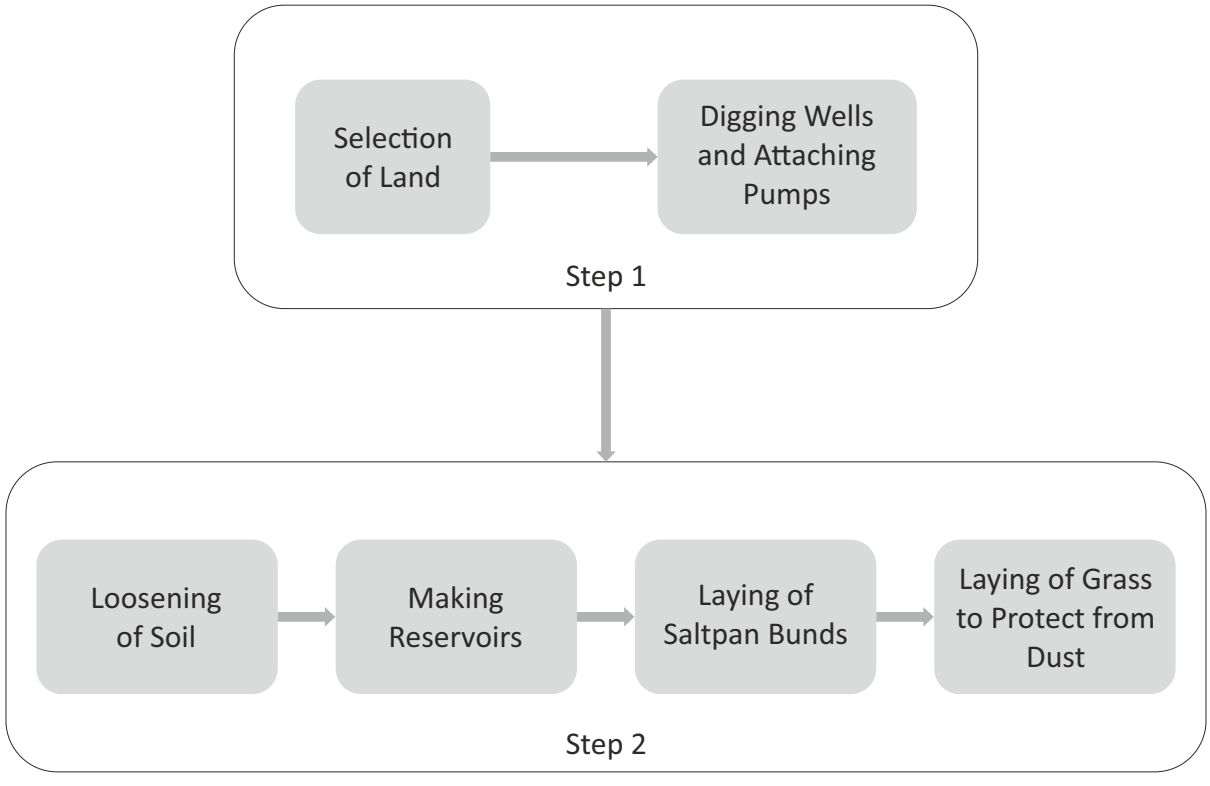
5.1.1. Stage-1: Pre-production

The entire pre-production stage is labor intensive, where every member of the family has to participate. The labor in pre-production stage for inland salt production is higher than the marine salt production as they have to remove the mud and prepare the saltpan washed by the water during monsoon. The pre-production process for salt production in inland comprises of two steps:

i. Digging of well and installation of pump.
ii. Preparation of salt pan and condensers.

The selection of site and installation of pumps are done solely by the male members. The site selection is done using experiential and knowledge. On an average each well yields 7,000 to 16,000 liters of water in a day. The detailed stage one of the salt manufacturing process has been explained in the Figure 1.

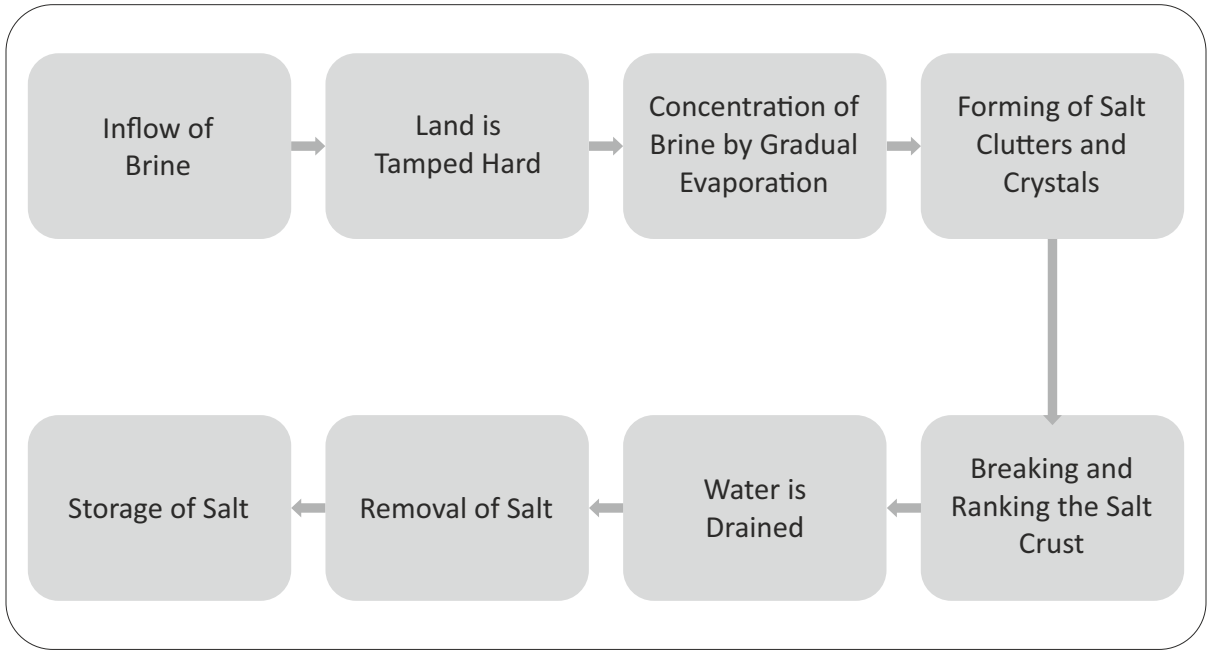
Figure 1
Salt Manufacturing Process – Stage 1



The second step comprises of land preparation for laying salt pans and condensers at the sites, which involves digging up the land near the pump, clearing plots and loosening the soil mainly by hiring tractors and laborers. Once land is ready for laying saltpan, the reservoir cum condensers, locally known as '*Gamdus*' are made by bonding the land. Usually, for a site of 10 acres, typically 8 to 10 *Gamdus* are made adjacent to one another. Subsequently, a saltpan with similar bunds is prepared near the network of Gamdus, which serves as a crystallizer and is locally known as '*Paatas*'. Later on a channel is laid to connect the entire work, *Pump-Gamdu-Paatas*. The entire network is prepared in 10-15 days during the process of preparation of the site, simultaneously arrangements are made for the grass which is locally called *'Zipta'* which is used for keeping on the inside of the saltpan to keep the water free from dust and also for developing initial crystals. The *Zipta* are either collected from the desert or purchased. Initially about one tractor load of grass is required for 10 acres of plot. This grass is kept on the bunds and inside the pan.

5.1.2. Stage-2: Production Stage

Figure 2
Salt Manufacturing Process – Stage 2



As described in Figure 2, once the *Gamdus* and *Paatas* are made, small quantity of brine is let into the *Paatas* and the bed is puddled and tamped to make it hard. The tamping is done several times till the bed is hard and almost impermeable. The entire process from selection of sites, installing pumps to the hardening of the saltpan bed lasts for 40 to 45 days. After completion of this operation the saltpan is ready for preparation of salt, which is a tedious and time-consuming operation requiring close monitoring by the Agarias. The pumped brine is led by gravity through the channels to the *Gamdus*.

The first *Gamdu* is filled up and the brine is allowed to concentrate by gradual evaporation. Brine flows from one *Gamdu* to another, through small inlets that ensures slow movement of brine. Thus, each *Gamdu* possesses brine of different concentration. The process of filling up all the *Gamdus* takes about a month. During this process of filling up *Gamdus* the pump sets are run for 24 hours daily. For production of *Vadaagaru* type of salt, the *Paatas* are first filled to a depth of about 4-5 inches for evaporation and deposition of salt. For the first salt clusters to form, the Agarias immerse *Zipta* grass stems, which are known differently in different areas, in the saltpan.

Brine Extraction using Solar Pumps

Process of Salt Harvesting

The salt clusters are formed around the stem. Brine of slightly lower concentration is charged into the pans to keep the density 25 to 26 BC (Brine Concentration) and the level of 6 inches of brine is maintained in the pan. The first salt crystals appear after about 15 days of feeding the 24 BC brine. After another 10 days, the crust formed is broken up and raked by a wooden rake,

called '*Dantal*' to prevent the formation of flakes of salt and to obtain the large grained crystals. When the salt is under formation every alternate day it is raked employing wooden rake and on the next day smoothened by '*Pavdi*' to prevent conglomeration of salt crystals. This process goes on for about 45 days after which the supply of brine is stopped and the density of water is allowed to increase up to 30 BC. The bittern or mother liquor is drained out into open spaces of vacant *Gamdus*. Once again the *Paatas* is filled with water and *Dantal* and *Pavdi* operation similar to production of *Vadaagaru* salt is continued.

This process of producing salt over salt layer helps keeping the salt crystal clean and white that helps gaining higher market price. The production of *Karkatch* type of salt is faster than *Vadaagaru*. It simply requires charging 2 to 3-inch depth of 24 BC water in the *Paatas* and maintaining the water level by adding new water to Paatas. The process of *Dantal* and *Pavdi* is continued for first 45 days after that the water supply is stopped and density is allowed to increase up to 28 BC. Once it reaches 28 BC the water is drained out of *Paatas* and fresh water of 24 BC is charged up to level of 1 inch above the salt layer. The salt is collected in the water by creating salt raw parallel to the length of the *Paatas*. The salt is removed after the water is drained out. Once again the process is repeated with 24 BC water. The small crystal sizes of *Karkatch* type ease the Iodization process. The last stage in the production process is that of collection and storage of salt and at this stage the labor is used intensively.

5.2 Non-GMO Certification and its Advantages:

The Non-GMO certification in India is provided by an organization called 'The SGS Group[1]'. It audits the overall supply chain and verifies the quality management systems in place from the producer to the consumer. Selling food/ feed that is non-genetically modified (non-GMO) places the burden of proof on the supply chain. The Non-GMO Supply Chain Standard helps organizations, irrespective of type or size, to supply verifiably non-GMO product. The scope of certification can extend from a single actor in the supply chain to a few or even the whole production process (Sgsgroup.in, n.d.).

Right from the seed, through the growing process and harvesting, transportation, collection, storing and processing to the market channel, the organization offers independent certification of the quality management systems. Certification also includes the verification of legal requirements relating to the labelling and traceability of GMOs (Sgsgroup.in, n.d.).

Based on EU regulations concerning non-GMO, including Directive 2001/18/EC and

1 SGS is a multinational company headquartered in Geneva, Switzerland which provides inspection, verification, testing and certification services globally (Sgs.com, n.d.).

regulations 1829/2003 and 1830/2003, the standard can be applied to all processes in the supply chain: a) Seed supply b) Farming c) Trading and d) Processing. It also includes the services to the supply chain like: a) Storage b) Transport c) Sampling and d) Analysis. Operators achieving certification are subject to annual surveillance audits to ensure that compliance is maintained. The Non-GMO supply chain certification does not replace compliance with national and international regulations (Sgsgroup.in, n.d.).

The global non-GMO foods market is expected to grow by 16.23 per cent between 2017-2023. Non-GMO certification has multiple benefits for an organization in area of marketing such as increased opportunities for market share and market differentiation. It also creates access to global non-GMO markets. It aids in comprehensive risk management and being compliant with emerging retail, industry and government requirements.

To be certified as organic a food product requires to be organic in nature or a living compound. As salt is a rock and does not grow, it is inorganic. Therefore, it does not qualify to be certified as organic.

5.3 Non-GMO Salt:

Salt is a rock. Rocks have no genetic material and as such, they cannot be genetically modified. Though it is possible to include dextrose, a product that can be genetically modified, with salt, major salt companies do not use it. Hence, salt itself as a product cannot be certified as a Non-GMO product (Realsalt.com, n.d.).

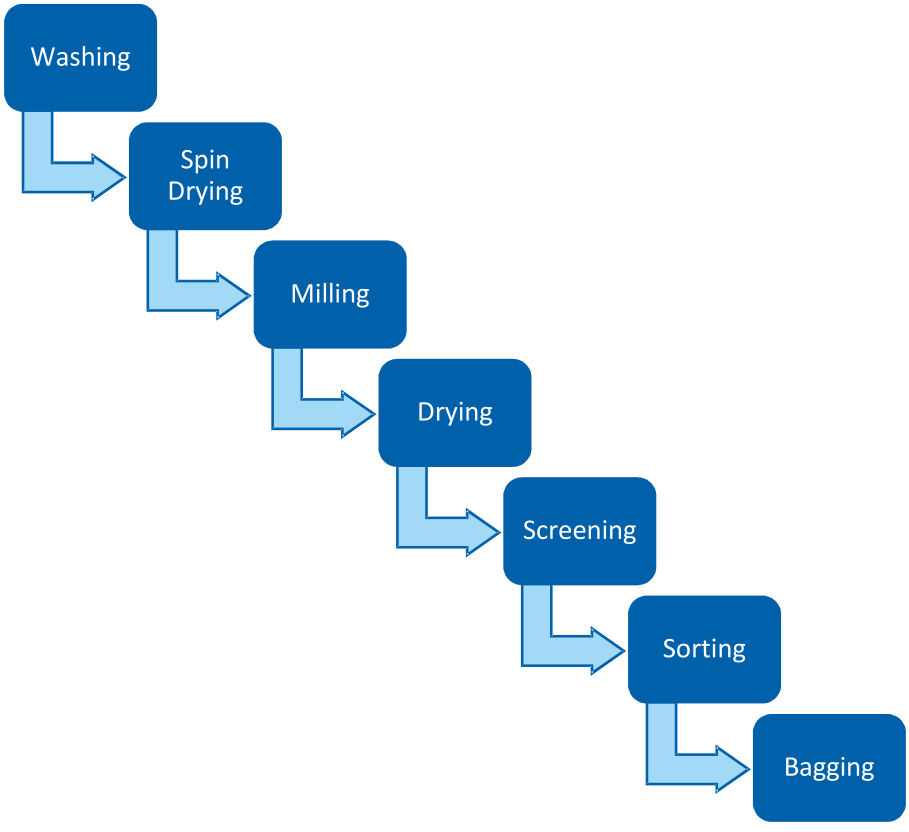
5.4. Edible Salt:

To be certified as organic a food product requires to be organic in nature or a living compound. As salt is a rock and does not grow, it is inorganic. Therefore, it does not qualify to be certified as organic. As raw salt harvested by the Agarias was not suitable for consumption, it cannot be sold in the retail market. To be edible, there is a need for cleaning and iodizing salt which is subsequently explained:

5.4.1. Salt Cleaning:

The process of cleaning salt comprises of multiple steps as shown in Figure 3.

Figure 3
Salt Cleaning Process



During the process of washing, salt is separated from all the impure particles. In this stage, salt loses certain chlorides that precipitate in salt processing. This is followed by the spin-drying using the centrifugal force of hydro extractors which separates water and the salt falls with a very low relative humidity. Salt is then dried using rotating or fluid bed type dryers to reduce the humidity of the salt from about four per cent to about 0.2 per cent. Post drying salt is milled to considerably reduce its grain size and to produce table salt for household use and industrial applications. Subsequently, salt undergoes a screening process using vibrating screens to grade different grain size ranges coming from the milling and drying stages. Four types of salt are categorized based on grain size coarse dried salt, medium dried salt, fine dried salt and powder. Each of them is stored separately to be later bagged or packed.

Due to the presence of residue of rock, the processed salt still contains certain impurities affecting its market value. Thus, colour sorting machines are used to eliminate impurities. Through automatic bagging machines that have an output of 800 bags/hour, the salt is packed based on specific configurations for coarse salt, washed salt, whole coarse salt, coarse dried, medium dried and fine dried types of salt.

5.4.2. Iodizing Salt:

Iodized salt is considered as a kind of table salt mixed with various salts of iodine. Four inorganic compounds can be used to iodize salt, potassium iodate, potassium iodide, sodium iodate and sodium iodide. Edible salt can be iodized by spraying it with a potassium iodate or potassium iodide solution. Dextrose is added to it as a stabilizer to prevent potassium iodide from oxidizing and evaporating. Agents like calcium silicate are added to table salt to prevent clumping. Iodized salt is packed in airtight bags of either high-density polyethylene (HDPE) or polypropylene (PP) (laminated or non-laminated) or LDPE-lined jute bags (Grade 1803 DW jute bags lined with 150-gauge polyethylene sheet). Iodized salt has to be stored in dry, ventilated and hygienic conditions (Saltcomindia.gov.in).

5.5. Product Modification: Salt Cubes

As discussed in the earlier sections, 65 per cent of the salt produced in India is utilized for industrial use and the rest is used for retail purposes. Tata Salt, Captain Cook, i-Shakthi, Aashirvaad, Annapurna, Surya and Nirma Shudh are some of the established and affordable brands catering to the edible salt demand in India. However, the current production of 5 million tons of iodized salt is unable to meet the total requirement of 6 million tons of edible salt in the country. Thus, the Indian retail salt industry is facing the challenge of fulfilling the edible salt demand of the country.

Considering the demand for iodized salt, SETU Abhiyan aspired to explore the retail segment to ensure fair price for the Agarias by eliminating middlemen and securing better income to the producers.

Considering the demand for iodized salt, SETU Abhiyan aspired to explore the retail segment to ensure fair price for the Agarias by eliminating middlemen and securing better income to the producers.

In the above context the intern observed that, in the millennial age, most of the younger population moves away from home for higher education or jobs. While living independently a few of them make arrangements to access nutritious cooked food while others cook for themselves. As currently, salt is available in

powder form, young people may not be adequately trained to use the right quantity and this may affect their health. To overcome this problem 'Salt cubes' with fixed grams of salt can be produced and introduced in the market. It can aid the users to have a clear idea on the number of cubes required per portion of food or per person. The proposed product modification can be adopted by SETU to enter into the retail market.

6. Discussion:

SETU Abhiyan was set up in order to work towards the economic development of people residing in the region of Kutch. Under project NAMAC, the organization works towards the development and livelihood of the local community Aagrias (saltpan workers) working in the Little Rann of Kutch. To uplift them, SETU Abhiyan procured raw salt directly from the farmers at a fixed rate by eliminating middlemen and sold it to the industry. In order to uplift the conditions of the farmers by earning profits, Setu Abhiyan decided to venture in the retail market by manufacturing edible salt.

For introducing salt in the retail segment in the form of salt cubes as proposed by the intern promises to be a differentiator. The unique selling proposition of using measured amount of salt in recipes can be used for branding and communicating the offering. SETU Abhiyan can be a first mover in this segment as based on the identified problem, the product provides the solution of convenience.

Though the proposed product modification is innovative, to implement the same, SETU Abhiyan will have to make huge investments in terms of finance, efforts and time. Setting up a robust distribution channel will require networking. Already established brands can enter the category with similar products and can leverage their expertise and strong distribution channel to take over the market. Product penetration in the market will have to compete with the existing practices of using powder salt. Changing consumer behaviour cycles in terms of usage of salt will impact the sustainability of business. In this context, before entering the retail segment, SETU Abhiyan will need to consider the above challenges.

7. Conclusion & Recommendations

It can be concluded from the above discussion that the Agarias have remained backward due to low income, lack of identity and negligible awareness about their rights. Being an unorganized sector, salt pan workers are highly exploited. They have to work for extended hours, in extreme weather conditions, they lack safety, have poor access to drinking water, shelter, sanitation and basic amenities. In the absence of other occupational skills, Agarias are forced to work for

extremely low wages offered by the corporations.

For enabling economic stability and upholding humane living standards, SETU Abhiyan proposes to intervene in the retail market of salt. The elimination of middlemen from the value chain will help workers to get better incomes and thereby address issues of extreme poverty (SDG1). To produce consistent quantity of salt, SETU Abhiyan can also venture into contract farming with the Agaria community. This will ensure SETU Abhiyan to maintain the quality of salt by providing regular knowledge inputs. A small salt processing unit can be set up to handle the processes of salt cleaning, iodization and packaging. To reduce the initial investment and speed up the cleaning and iodization process, it could even consider setting up a mobile processing unit.

SETU Abhiyan will have to park a huge capital for entering into retail market, which could pose a major financial risk. To address this SETU will have to appoint a dedicated team to work on the promotion of the product. For marketing its product, it can begin with the exclusive distribution of its product to a fixed target group such as hostels or corporate offices. To aid product penetration among consumers it should organize kiosks at locations frequented by millennials. Quick recipes can be displayed at the kiosks for hands-on application of the salt cubes. It could organize cooking competitions to promote the concept and come up with recipe videos on social media for relatability and ease in product acceptance.

References

Chandra, K., K. (2017, March 1). The salt farmers of wild ass country. *The Hindu.* Retrieved from https://www.thehindu.com/society/history-and-culture/the-salt-farmers-of-wild-ass-country/article17361838.ece

Freedonia. (2016). *World Salt*. Retrieved from https://www.freedoniagroup.com/World-Salt.html

Krishnamachari, SV. (2016, November) A look at salt production in India. *International Business Times.* Retrieved from https://www.ibtimes.co.in/look-salt-production-india-699720

Mukherjee, S. (2016, October) The salt farmers of the Rann of Kutch. *The Diplomat.* Retrieved from https://thediplomat.com/2016/10/the-salt-farmers-of-the-rann-of-kutch/

Pal, S. (2016, November 2). Worth their Salt: A Fascinating Glimpse into the World of the Hardworking Salt Farmers of Kutch. *The Better India*. Retrieved from https://www.thebetterindia.com/73603/agariyas-salt-farmers-rann-of-kutch/

Realsalt.com. (n.d.). Why Isn't Real Salt Organic? Retrieved from https://realsalt.com/why-isnt-real-salt-organic/

Saltcomindia. (n.d.). *Salt Industry in India.* Retrieved from http://saltcomindia.gov.in/industry_india.html?tp=Salt

Saltcomindia.gov.in. (n.d.). National Iodine Deficiency Disorders Control Program (NIDDCP). Retrieved from http://saltcomindia.gov.in/NIDCCP_Process.html

Sao, P. (2018). *Feasibility of Solar Pumps*. Unpublished Manuscript

Setuabhiyan.org. (n.d.). Genesis. Retrieved from http://setuabhiyan.org/genesis/

Setuabhiyan.org. (n.d.). NAMAC Small Salt Producers' Company. Retrieved from http://setuabhiyan.org/saltpan-workers/

Sgsgroup.in. (n.d). Non-GMO Certification. Retrieved from https://www.sgsgroup.in/en-gb/agriculture-food/food/food-certification/non-gmo-certification

Epilogue
The Way Ahead

As discussed in Section I of the anthology one-quarter of rural India's population is below the official poverty line. Sustainable rural development is vital to the economic, social and environmental viability of the nation. The agricultural sector is an important foundation of rural development, generating strong linkages to other economic sectors. Agriculture and allied industry as per Census 2011 engages 54.6 per cent of the Indian population. The literature reviewed indicates that 85 per cent of the farm holdings are small and marginal, and are economically challenged. The agriculture industry which supports a large section of the rural economy remains unorganized and fragmented. Consequentially, human and economic development of marginalized populations in rural and tribal areas who are excluded from the mainstream are hindered by the vicious circle of underdevelopment. The welfare of this gigantic size of India's population is dependent on designing a robust inclusive and equitable growth strategy.

The government's declaration of doubling farmer incomes is a welcome attempt to transform the sector. Hence, there is a demand for alternate ways in scaling up the operations by adopting new technology and commercial business models. The articles in the anthology suggest that to facilitate small farmer's productivity and boost rural economy there is a need to provide aggregator services in a couple of areas like farm inputs, mechanization, credit facilities, logistics, market support and so on. Farmers also need details on agri-business companies providing specialized services and possessing an interest in contract farming and, processing opportunities. Efforts should be made to educate farmers and rural residents on engaging in supplementary income opportunities. For instance, there is a huge demand for honey, rural residents can be trained by NGOs and businesses in managing apiaries and earn extra income.

Farmers' income can be enhanced only when agriculture is treated as an agri-business. Basic elements of agri-business include upgrading technical knowledge, developing skills in costing, accounting, financial management, cautious resource management, supply chain management, labour management and so on. To disseminate such learnings to farmers it is necessary to revisit the status of knowledge and capacity of extension officials who then can spearhead this change. Managerial and technical competence of farmers and extension professionals needs to be enhanced through relevant capacity building. B-Schools and Engineering Schools across the country along with agricultural universities and agribusinesses

can play a larger role in developing appropriate modules for developing capacities of extension professionals and farmers. B-Schools can also accelerate the scaling up of the number of Farmer Producing Organizations(FPOs) and Farmer Producer Companies(FPCs) in various parts of the country to consistently update them with technical knowledge and market inputs. This will improve their bargaining strength in the glocal market. B-Schools and Schools of Technology having incubators should promote start-ups which address issues of the rural economy. This will promote innovation and compassion among the new generation to make a significant contribution to the country.

Population growth, changing appetites and rising food demand is fueling growth in the food and agriculture sector. To encash this opportunity government through its Bharat Nirman scheme should scale up development of rural infrastructure especially, develop irrigation facilities, facilitate access to energy, construct roads, telecom services, set up special economic zones, food parks and economic clusters. This will help in creating significant job opportunities and also facilitate business growth.

There is a need for skilled personnel to manage the entire agribusiness value chain, logistic, hospitality and other businesses in rural and tribal areas. To sustain these businesses there is a need for skilled manpower. Hence, there is a need to promote quality education and demand-based vocational training in local areas. With the support of NGOs like Tech Mahindra Foundation and corporates, local educational institutions and Industrial training institutes (ITI) can be strengthened. CSR funds can be deployed to fund such vocational courses. These initiatives will prevent migration and create economic sustainability in the local regions.

The success of sustainable rural and tribal economy depends on, inter alia, developing and implementing comprehensive strategies for dealing with climate change, drought, desertification and natural disaster. Hence, the government should avoid alleviating rural crisis through loan waivers or doles.

To bring transformation among the rural residents, policymakers need to understand the mechanisms through which rural and tribal poverty can be addressed. The development paradigm has been evolving from an almost exclusive focus on physical capital. There is an urgent need to consider the social dimensions of development, in particular, the role of social capital. Formal social capital refers to formally defined patterns of behaviour, norms of exchange, networks and institutions. Formal social capital needs to be supported by informal social capital which comprises of kinship, informal networks between individuals, families and

groups. Hence, to bring cultural transformation in the rural areas and facilitate inclusive growth higher educational institutions, NGOs, as well as CSR departments of corporations, will have to understand the importance and role of informal social capital in enabling the target audience to shift from being fatalist and be optimistic in carving their future by developing scientific and logical temperament.

To conclude investing in the rural economy in general and agricultural sector in particular, will not only address issues of hunger and malnutrition (SDG 2), but also other challenges including poverty (SDG1); access to water (SDG 6); energy use (SDG 7); climate change (SDG 13); and sustainable production & consumption (SDG 12).

About the Jasani Centre for Social Entrepreneurship and Sustainability Management

The Jasani Centre for Social Entrepreneurship and Sustainability Management, NMIMS, has been established to execute social commitments of NMIMS University. The centre addresses social concerns through its comprehensive academic, training, research, and field interventions. Its interventions include contributions to the professional development of executives working for the social sector, capacity building for the resource poor and social entrepreneurship development. The centre supports a variety of curricular, extracurricular and career programs to provide MBA students as well as corporate executives with the tools and opportunities to engage effectively with the social sector. The centre offers a uniquely architectured MBA programme in Social Entrepreneurship which aims at developing a new generation of change makers/leaders who can create global social impact by combining passion of a social mission along with a business-like discipline, innovation, and determination.

As a catalyst and innovator, the centre's mission is to create a new generation of business leaders and social entrepreneurs who are knowledgeable about and are committed to create a sustainable society. The centre's objectives serve as a bridge between academia, the corporate world and the civil society organizations. The research, as well as the teaching strengths combined with the experiential learning approach and guiding principles of the centre, connect sustainability focused knowledge and research to students, businesses and the civil society organizations. The centre has increasingly been involved in research and providing consultancy in areas of management of social enterprises, CSR, micro-enterprise management, disaster management, impact assessment and conducting social audits.

SVKM'S
Narsee Monjee Institute of Management Studies
Deemed to be UNIVERSITY
V.L. Mehta Road, Vile Parle (W), Mumbai - 400 056. India.
T: (022) 42355555 | W: **www.nmims.edu**

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