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Aiding the Future of India's Farmers and Agriculture

On Critical Policy Issues in India's Agricultural Economy

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Contents

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Promoting Rabi Crop Cultivation in Assam

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Introduction

- During monsoon, heavy rainfall causes extensive damage to summer and Kharif crops. Therefore, thrust now is being shifted to the production of Rabi crops which can be grown in the flood free season. The alternative of Rabi crops is not only an opportunity to enhance production, but also reduces the production losses due to floods. In view of increasing demand for food crops for fast growing population, the State Government has come up with a host of new schemes/activities to bring more area under Rabi crops and to upscale the production to meet the increasing requirements.
- Excessive and untimely rains during Kharif and autumn seasons and the havoc created by river floods have adversely affected the winter and autumn paddy cultivation in the state. Thus, summer rice has emerged as an important alternative cereal crop in the state. In the recent years, with the expansion of new farm technology, particularly in the flood affected areas, the farmers have shown interest in growing summer rice and other Rabi crops like mustard and Rabi pulses.
- The main objectives of the present study are to contemplate the economics of production of Rabi crops by the sample farmers, to study the factors affecting productivity of Rabi crops, to find out the constraints of production of Rabi crops and to suggest policy measures.

Findings

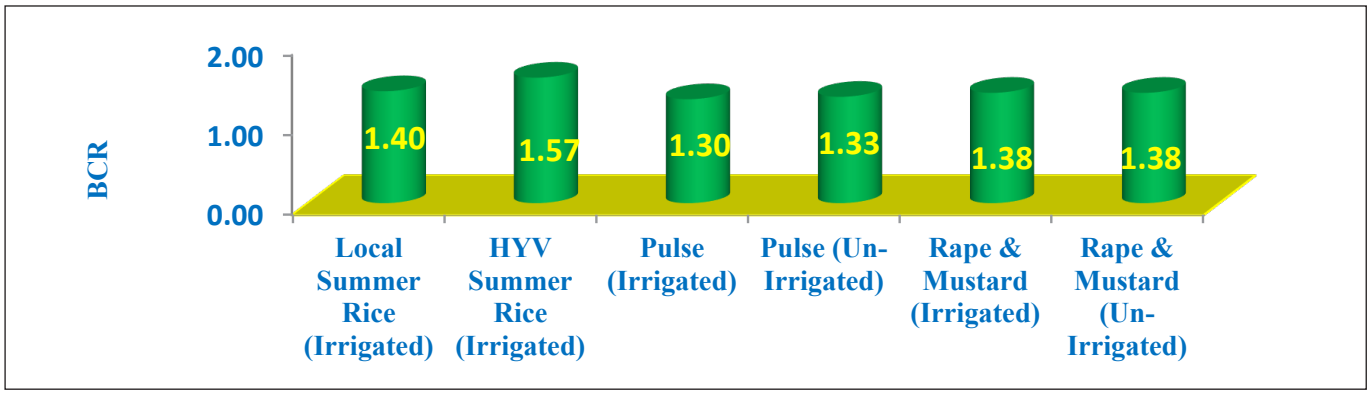
- The study was based on primary data collected in Nagaon district of Assam. The district was purposively selected as most of the Rabi crops are grown extensively in the district. Among the Rabi crops, summer rice, pulses and oilseeds were covered under the study. From the district, two community development blocks and from each block, three villages were selected for field investigation where Rabi crops were extensively grown by the farmers. Then from each selected village, 20 farmers of different farm size groups were selected by following random sampling method. Thus, a total of 120 farmer households were covered under the study.
- Rice was the dominant crop in the cropping system which occupied more than 89.51 percent of the total cropped area. In the sample farmers, Sali paddy covered more than 57.95 percent and summer paddy occupied 36.71 percent of the total area under rice. Total pulses occupied 2.78 percent, rapeseed occupied 2.78 percent and mustard occupied 4.97 percent of the gross cropped area.
- Under irrigated conditions, the productivity of High Yielding Variety (HYV) autumn paddy was 3,430 kg/hectare, productivity of HYV Sali paddy was 3,460 kg/hectare and the productivity of HYV Boro (summer) paddy was found to be 6,061 kg/hectare. On the other hand, the productivity of local autumn paddy under irrigated condition was recorded at 3,253 kg/hectare. Productivity of Local Sali paddy was 3,271 kg/hectare and productivity of local summer paddy was found to be 4,548 kg/hectare.
- The overall Benefit Cost Ratio (BCR) was found at 1.40:1 for local summer paddy, 1.57:1 for HYV summer paddy both under irrigated and un-irrigated conditions, 1.30:1 for pulses under irrigated condition and 1.33:1 under un-irrigated condition and in case of rapeseed & mustard cultivation it was found at 1.38:1 under both irrigated and un-irrigated conditions (Table 1 & Figure 1).

Table 1: Benefit Cost Ratio of the Sample Farmers in Summer Paddy, Pulses and Rapeseed & Mustard Cultivation

Farm Size (Hectares)	Local Summer Rice (Irrigated)	HYV Summer Rice (Irrigated)	Pulse (Irrigated)	Pulse (Un-Irrigated)	Rape & Mustard (Irrigated)	Rape & Mustard (Un-Irrigated)
Below 1 hectare	1.47:1	1.64:1	1.46:1	1:39:1	1.57:1	1.48:1
1 – 2 hectares	1.43:1	1.60:1	1.36:1	1.28:1	1.45:1	1.36:1
2 – 4 hectares	1.38:1	1.55:1	1.29:1	0	1.39:1	1.32:1
4 hectares & above	1.34:1	1.54:1	1.23:1	0	1.27:1	1.26:1
Overall	1.40:1	1.57:1	1.30:1	1.33:1	1.38:1	1.38:1

Source: *AERC Jorhat, Assam.*

Figure 1: Benefit- Cost Ratio of Different Rabi Crops Cultivated by the Sample Farmers



Source: *AERC Jorhat, Assam.*

- It was found that different inputs affect the productivity of summer paddy, rapeseed & mustard and pulses cultivation in the sample households (Table 2). For summer paddy cultivation, no inputs were found to have significant effect on production. For pulses cultivation, fertilizer and irrigation were found to be significant at 5 percent and 1 percent level, respectively. Other variable inputs such as bullock labour, machine labour and plant protection had a positive but insignificant effect on productivity.

Table 2: Factors Affecting Productivity of Rabi Crops

Variables	Summer Paddy		Pulses		Rape & Mustard	
	Marginal Product	t-value	Marginal Product	t-value	Marginal Product	t-value
Constant	34877	4.0901	13641	12.51993	15924	8.4688
Human Labour	-27.64631	-0.6843	-5.34651	-0.42674	-28.64479	-1.6624
Bullock Labour	0.17687	0.2417	0.11111	0.30019	-0.32421	-0.5296
Machine Labour	3.19287	1.2228	1.15151	1.30163	-0.74729	-0.9116
Seed	2.65833	0.9280	-0.51007	-0.39476	2.39348	0.2262
Fertilizer	1.93294	0.7146	-3.45217	-2.41857**	-3.34432	-2.2975**
Plant protection	4.67057	1.2173	3.77144	1.36769	2.52691	0.9125
Irrigation	0.78531	0.3400	7.68663	11.06305*	7.59369	10.1154*
R2	0.03440		0.56016		0.52745	
F-Value	0.56997		20.37668		17.85916	
No. of observation	120		120		120	

Note: *** indicates 5 percent and * indicates 1 percent level of significance*

Source: *AERC Jorhat, Assam.*

- In mustard cultivation, fertilizer and irrigation were found significant at 5 percent and 1 percent level respectively. The other variables like human labour, bullock labour and machine labour had positive but insignificant impact on productivity.
- Under-utilization of new farm technology due to the dominance of marginal and small farm holdings (82 percent) is one of the major factors hindering the Rabi crop cultivation in Assam. Most of sample farmers possessing Shallow Tube Well (STW) do not have the compact minimum area of land required for maximum utilization of the created potential.
- The flow of credit to the farmers is an important criterion to encourage them for intensive cultivation and adoption of new farm technology. But, agricultural credit in Assam per hectare is only 30 percent of the national average and the per capita credit disbursement to farmers in the State is very low, not even Rs. 100. Thus, most of the farmers faced financial problems in their pursuit to crop cultivation.
- The supply of short duration HYV seeds were reported to be very limited in the sample area. The use of HYV seed of paddy was only about 60.91 percent in the state during the study year (2012) as against 71.11 percent in the study area. The supply of improved variety of pulses and mustard seed was nil in the study area. The farmers usually adopted the

traditional variety of seeds whose average yield rate is almost half the yield of improved variety.

- The post-harvest handling of summer rice i.e., drying and milling is a major problem as its harvesting time coincides with high rainfall period. The processing of pulses and oilseeds was also problematic and farmers were forced to sell their produce immediately after harvest due to the lack of storage facilities.
- Absence of adequate extension and training facilities was yet another major constraint faced by the farmers in the cultivation of Rabi crops. But, the sample farmers in the study area reported that they were unaware of the new knowledge and farm practices due to the lack of adequate exposure. In the study area pulses and rapeseed & mustard were susceptible to pests and diseases and the farmers did not have proper knowledge on plant protection measures as well.

Figure 2: Rabi Crops in Assam

Source: *AERC Jorhat, Assam.*

Recommendations

- Consolidation of land holding is required to increase the efficiency of production, as sample farmers have not been able to utilize the full potential of irrigation facility due to scattered holdings.
- Institutional credit in the form of crop loans should be provided on easy terms so that the farmers are not compelled to take loans from the private traders. The government may enforce the banking institutions with required regulations in this regard.
- Due to inadequate extension services and farmer-linked support services, the farmers were not fully aware of government's programmes and policies for agricultural development. Therefore, there should be frequent training programmes of extension officials that would help in improving the economic condition of farmers.
- Inputs like fertilizers, manures, plant protection chemicals, and planting materials should be made available to the farmers as and when they need it. A single window system of input delivery may help the farmers get the required inputs within a short time at a reasonable price.
- Good quality certified seeds should be made available to the farmers at reasonable prices. The Department of Agriculture should popularize short duration crop varieties of all the crops together with judicious application of fertilizers, particularly phosphate fertilizers used in the cultivation of pulses.
- There is a need to strengthen the regulated market systems which can eliminate unhealthy practices and ensure fair prices to the producer. The state government must take effective measures for regulating the marketing of agricultural produce in general and oilseeds and pulses in particular.
- Field demonstration and application of scientific methods at farmers' fields on improved technologies are considered essential to provide technological support to the farmers. Practical field trial and demonstration on intensive cropping with HYV seed, application of soil nutrients, prophylactic measures, and water management would encourage the farmers to take up crop cultivation more seriously. For introduction and popularization of new crop varieties, result oriented field demonstration may be encouraged.

(Cover photo: www.upload.wikimedia.org)

Problems of Inadequate Post-Harvest Infrastructure in Fisheries

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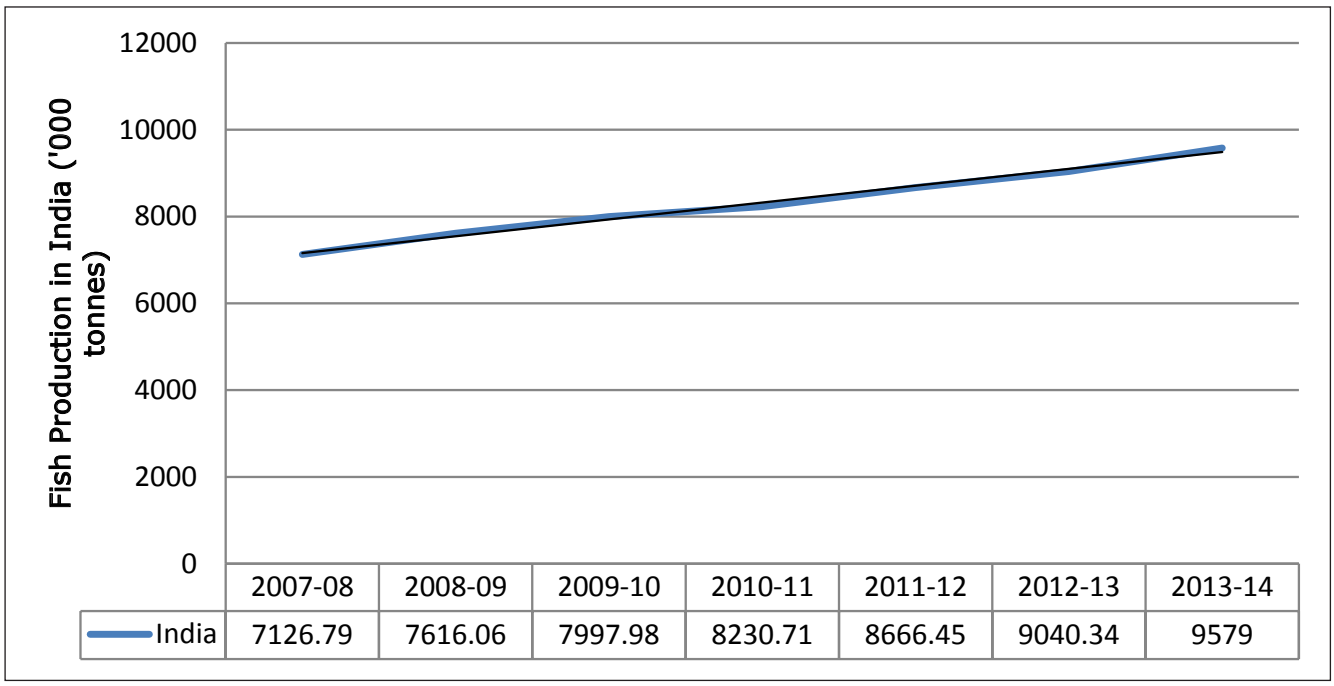
Introduction

- India is one of the major countries in the production of fisheries. The sector contributes around 17 percent to the nation's income generated through exports, however, the contribution of fisheries sector is 1.07 percent to the national Gross Domestic Product (GDP).
- India has marked a steady increase in fish production (Figure 3), matching the higher demand in both domestic and export markets. Even though the demand for fish and fishery products have been increasing, the loss in the post-harvest fisheries has been massive, estimated at around 15 percent due to inadequate post-harvest infrastructure in the country.

Figure 3: Fish Production Trend in India for the Years 2007 to 2014



	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
India	7126.79	7616.06	7997.98	8230.71	8666.45	9040.34	9579

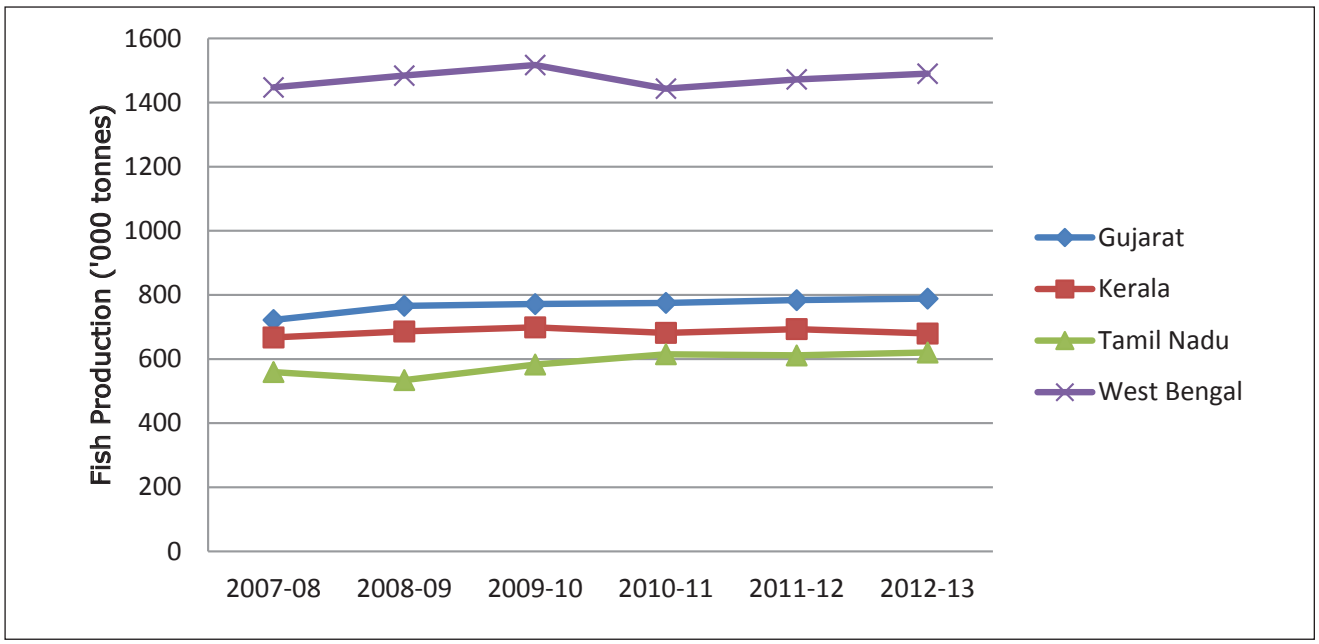
Source: *Open Government Data (OGD) Platform India, (Mapped to Department of Animal Husbandry Dairying & Fisheries (DADF), Government of India)*

- In this context, the study aims to evaluate and assess the post-harvest infrastructure facilities in four major maritime states. Gujarat, Kerala, West Bengal and Tamil Nadu were identified to make an assessment on infrastructural gap at each stage of the activity in order to minimize the post-harvest losses.

Findings

- The fisheries sector has specific characteristics with reference to its harvest and post-harvest handling owing to its highly perishable nature. It therefore, requires infrastructure that takes care of its quality right from its harvest to the eventual consumption.
- Figure 4 shows the trend of fish production in these states. It could be seen that West Bengal is at a much higher position compared to the other three states, with almost double the production for all the years. The states of Gujarat and Kerala seem to be almost in the same line of production, with Gujarat leading the run throughout. Tamil Nadu marks the least production among four, indicating towards its troublesome marine and fisheries sector including the problems in Palk Bay which is the richest marine source of the state. However, all the four states maintain a constant production throughout years, without much volatility.

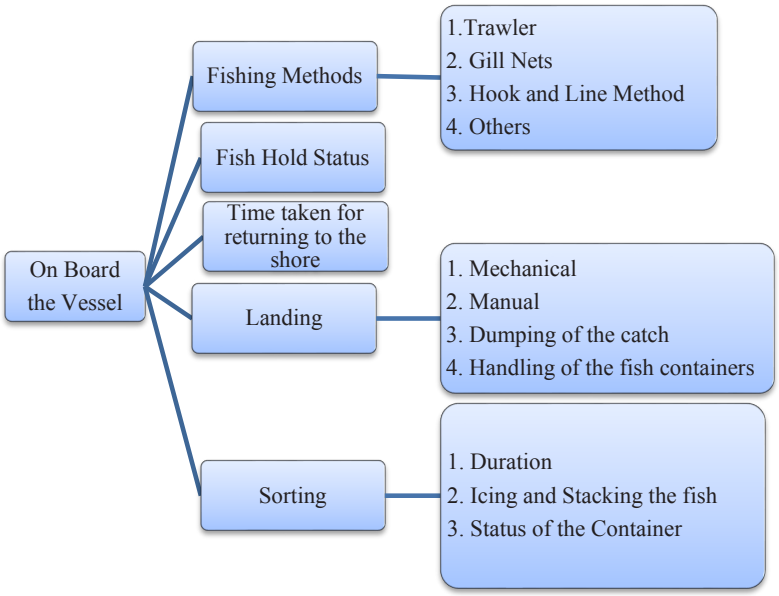
Figure 4: Fish Production in Four Major States for the Years 2007 to 2013



Source: *Open Government Data (OGD) Platform India, (Mapped to Department of Animal Husbandry Dairying & Fisheries (DADF), Government of India)*

- The fisheries sector remains vulnerable to losses, despite a fair amount of share in the national exports, due to multiple reasons. The main reason for the same is poor post-harvest infrastructure facilities. The extent of the inadequacy of post-harvest infrastructure facilities is relatively higher for marine fisheries than that of the inland fisheries and the literature for the loss in marine fisheries is almost non-existent especially with reference to India, majorly because marine fisheries sector is much larger and complicated than the sector of inland fisheries.
- The major areas of post-harvest losses in different stages in fisheries are the fishing methods, landing and sorting of the harvest (Figure 5). For instance, hook and line kind of fishing, dumping of the catch and poor container facilities make the harvest vulnerable to losses. Further, the type of vessel and facilities such as availability of ice, drainage facilities and access to the markets are other key components that influence the post-harvest loss on-shore. Similarly, the nature of retail and wholesale markets for the catch including processing of the catch is crucial in determining the loss off-shore.

Figure 5: Flowchart Representing the Stages in Fisheries Sector



Source: *AERC Chennai, University of Madras*

- It was found that Gujarat, one of the top ranked states in terms of fisheries production with an annual production of 6,96,000 tonnes, lacks proper transport network (insulated transport system) for the distribution of fish produced in the state. In addition, the state lacks basic infrastructure for retail marketing which affects quality of fish holdings and thereby marketing of the same for a profit, thus incurring severe economic losses.
- Kerala, the second major state in fisheries production, is also facing problems due to inadequacy of post-harvest infrastructure facilities. Remarkably, Kerala does not have any constraint in the line of input supply, especially with ice and preservation of the catch. The assistance extended by the Matsyafed (Kerala State Co-operative Federation for Fisheries Development Ltd.) in connection with fisheries marketing in the state has had a positive impact in the reduction of post-harvest losses.
- Tamil Nadu also lacks basic amenities like water supply, availability of ice, cold storage and transportation. The state is in urgent requirement of specific reforms in terms of carrier vessel, transport network and a linkage of fish marketing activities between Tamil Nadu Fisheries Development Corporation (TNFDC) and The Tamil Nadu State Apex Fisheries Cooperative Federation Limited (TAFCOFED), which are not functioning efficiently.
- West Bengal also shows a similar picture with inadequacy of infrastructure in all aspects of the fisheries sector. There is a marked lack of coordination between harbour developments and urbanization policies in the state. The fisheries sector in the state is facing a severe issue of inadequate cold storage facilities, just like Tamil Nadu.

Recommendations

- The existing policy on supply of fresh water to fishing harbours and fish landing centres need to be reviewed in line with the changing scenario of the fishing industry and the environmental guidelines.
- Awareness programmes on sorting and stacking of fish in the containers must be offered by the respective state governments as most of the post-harvest losses occur during this process.
- Fish markets must be subjective to periodical inspection by officials of the Public Health Department and also by the officials of the Fisheries Departments of respective states so that quality standards are maintained in line with the international standards.
- Formulation of effective food policy to improve food security, which is a matter of importance with respect to fish marketing, should be considered.
- Fish marketing system being a complex one with numerous stages in the supply chain, the market mechanism related to cold chain investments must be strengthened with appropriate policy regulation.

Impact of Check Dams in Gujarat: Case of Tarakpur Check Dam

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Introduction

- India is facing major water crisis. The crisis threatens the basic right of drinking water of our citizens and puts the livelihood of millions at risk. The demand for water by a rapidly industrializing economy and urbanizing society comes at a time when the potential for augmenting supply is limited. Further, the climate change has posed fresh challenges due to its impact on the hydrologic cycle. Resilience of ecosystem, therefore, needs to become the central plank of policy.
- In this context, the relative significance of traditional minor irrigation sources for agricultural development in India is well known. Check dams suit Indian conditions, where a large number of seasonal streams completely dry up during summer. The success of such collective traditional water harvesting systems in ensuring sustainable water supply in different parts of the country has gained interest of the central government. Traditional water harvesting systems enhance the water status of a country and contribute to achieving sustainable development. The review of literature also indicates that water harvested by the check dams has increased the income and changed the livelihood mainly due to sustained agriculture.
- Rain water harvesting through check dam in the Khambhat region of South Gujarat is imperative to ensure urgent need to save water for drinking and irrigation purposes. About two kilometres away from the Tarakpur village, the Khar Land Development Board had constructed nearly 34 gates in the past in order to control the salty sea water penetration/ saturation in this area. However, these structures/ gates proved to be ineffective over time, before becoming completely inactive. Consequently, the salty sea water gradually covered all the groundwater area of Pandad village, surrounding villages and other areas of Khambhat.
- Subsequently, the level of salty water table took over groundwater table which affected the prime

source of livelihood, i.e. agriculture activity of all these villages. Some of the villages such as Vadgam, Tarakpur, Pandad, Rohini and Mitali of the Khambhat tehsil of Anand district are located in the remote and interior areas. There was no other source of irrigation for the agriculture in these villages. The rural people of these villages had suffered and the situation had forced them to migrate during the Rabi and summer seasons. Water from the rainfall and drains of irrigation used to runoff and merge with the seas without any use.

- In light of the above, the villagers had demanded to construct the check dam on Navida valley. As per the public demand for check dam for the purpose of drinking water and irrigation from the Khambhat area of Anand district, the check dam was constructed by the Irrigation Department, Petlad in 2009. As suggested by the Irrigation Department, Petlad, the present study was undertaken with an aim to evaluate the change in socio-economic status of the people in the selected villages before and after the construction of check dam.

Findings

- The study is based on both, primary and secondary data. The secondary data was collected from the published sources, irrigation department office and other related websites. The primary data was collected from five villages, viz. Tarakpur, Pandad, Mitali, Vadgam, and Rohini. A total sample of 300 households comprising of 200 beneficiary farmer households, 50 non-beneficiary farmer households and 50 landless agricultural labour and other households were selected. Conscious efforts have also been made to get the views of landless labourers and women. The required data was collected by including the periods before check dam (agriculture year 2008-2009) and after check dam (agriculture year 2012-2013).
- The study results clearly indicated that there were numerous benefits due to the construction of check dam. The significant impact of availability of check dam water could be seen easily on the livelihood of beneficiary households through positive changes in land and livestock holdings, increase in crop yield and level of income and reduction in migration pattern among others.
- The beneficiary households indicated that they received a lot of benefits of the check dam such as ability of storing surface water for use (both during and after the monsoon), availability of water for drinking purposes, increase in the availability of water for irrigation, increase in total crop production and thus income, termination of sea water entry and decrease in the level of soil salinity.
- Besides, it helped to improve land quality with dam water, availability of employment throughout the year was also assured, there was an increase in the wages and hence, migration was reduced especially during the summer season, there was a consistency in milk production due to the availability of green fodder, value of land increased, check dam proved to be effective in restricting soil erosion, there was a reduction in the level of poverty due to an increase in wage/income, sufficiency in the production of food increased, increased savings for future endeavours, improved provision for health care treatment due to an increase in income, improved education opportunities, provided employment opportunities to the local residents, hence improving quality of life. Check dam could also be used for pisciculture, and helped in recharge of ground water in the selected area.
- Besides beneficiary households, agriculture labours also benefited directly due to the construction of check dam. Non-beneficiary households also benefited indirectly due to the check dam.
- Even though there were some negative effects, they could be easily offset by the benefits of the check dam.

Recommendations and Conclusions

- The study strongly indicates the benefits received from the construction of the check dam. The positive benefits of check dam outweigh the few negative impacts. Therefore, it is suggested that small check dams should be built for water conservation at the micro level in order to help the farmers.
- Capacity of the check dam wall could be increased by increasing the height of the check dam. The check dam should be deepened by removing the soil and other materials accumulated at the bottom in order to increase water storage capacity.
- The farmers should be advised on judicious use of water (by the adoption of suitable cropping pattern/ crop variety and salt/water stress tolerant crops) and use of water saving technologies.
- The digging of drain work should be completed on time so that the remaining farmers could avail the benefits. Further, cementing of the drains should be carried out in order to facilitate the water movement.
- In order to ease the maintenance of dam and distribution of water, a regulatory body of villagers on the lines of Participatory Irrigation Management (PIM) such as water users association should be formed with the support of state government.
- In order to deal with the issues of submerging of road due to water of check dam, government should construct the flyover bridges (cemented pipes) to

facilitate the connectivity to field and other nearby villages.

- Before starting the work of check dam at any place, a complete benchmark survey should be conducted to know about the exact impact of check dam on livelihood of villagers.
- Data (such as, depth of water table, soil quality, water quality and area under irrigation) should be collected and maintained by the irrigation department.

Climate Change: Municipal Solid Waste Management Solutions

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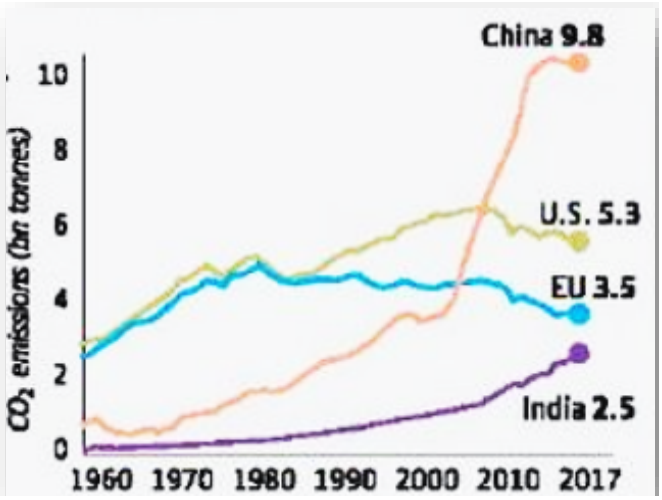
Introduction

- Untreated Municipal Solid Waste (MSW) contributes to global warming risk to the extent of 13 percent. It not only impacts the communities surrounding the waste disposal areas but impacts the world at large. Methane, a GHG, with a global warming potential of 21 times that of carbon dioxide (CO_2), is the principal emission source from the open dump sites. As the third largest man-made source of methane, MSW is a major contributor to climate change and ozone depletion.
- MSW, if not treated and disposed properly poses health risks due to the spread of pathogens, air pollution due to the release of obnoxious gases, soil and water contamination due to leachate percolation, global warming risk due to Greenhouse Gas (GHG) emissions and climate change. Efficient and sustainable MSW management solutions are thus required to reduce the global warming risk.
- India is the fourth highest emitter of carbon dioxide according to the Global Carbon Budget, (Figure 6). One in eight deaths in India are attributed to air pollution according to the Indian Council of Medical Research (ICMR) and the World Health Organisation (WHO) blames pollution for killing the highest number of children aged under five years in India. India's projected carbon emission of 2.6 billion tonnes in 2018 accounts for 7 percent of the global CO_2 levels.
- Municipal Solid Waste affects GHGs and hence air pollution in two ways in India, one, due to waste incineration, unauthorized waste burning and rampant use of unsanitary landfills or dump sites, methane and GHGs get released into air. Two, if properly processed, the Waste-to-energy (WtE) plants that process waste into energy can become alternatives to fossil fuel as energy and reverse the negative externality of GHGs.
- Greenhouse gases cause climate change by warming the earth's atmosphere; these changes are partly due to municipal solid waste. The manufacture, distribution, and use of products as well as management of the resulting waste add to the greenhouse gas emissions.

Figure 6: India Ranks Fourth in Carbon Dioxide Emissions



Source: University of East Anglia, 2018

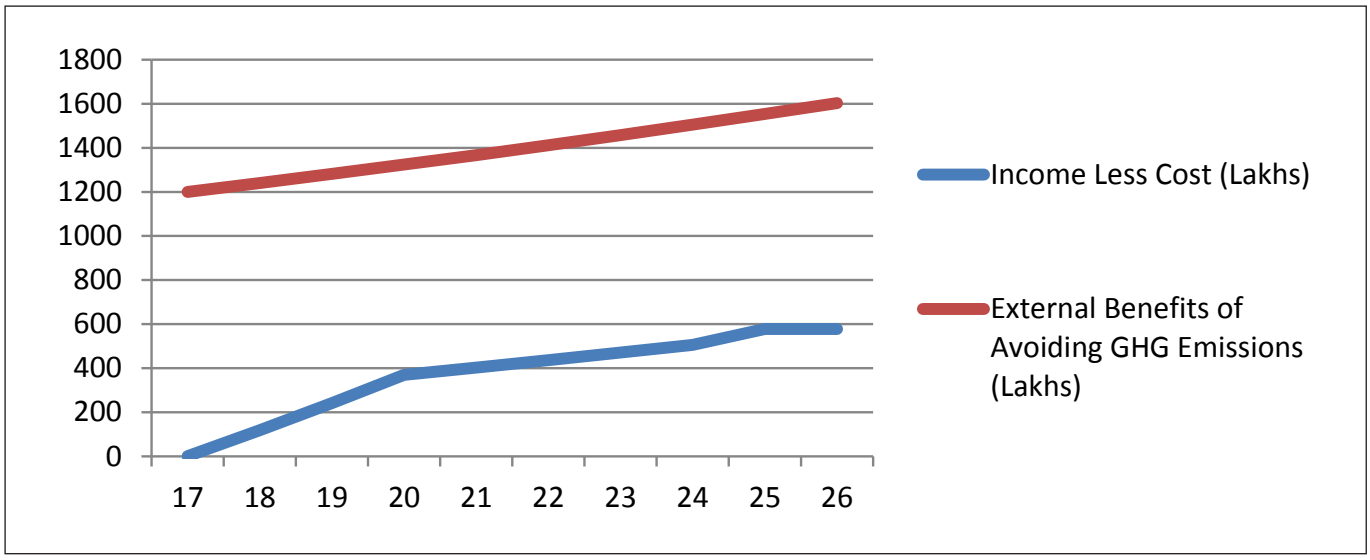
Findings

- Solid Waste Management (SWM) is linked to 12 of the 17 Sustainable Development Goals (SDGs) of the United Nations. By providing affordable solid waste collection services which in turn prevents pollution causing diseases, by eliminating uncontrolled dumping, particularly plastics, oceans remain plastic free. Eliminating uncontrolled dumping and open burning, could be the first stepping-stone to achieving environmentally sound SWM practices. Sound MSWM leads to better health and well-being, and hazardous waste does not find its way into ecosystems.
- SWM technologies can derive renewable energy from (organic) waste. This becomes an alternative to the use of fossil fuels and therefore helps in taking climate action. Due to the augment of an MSWM industry, employment is created and opportunities develop for microenterprises leading to social inclusion. Reuse and recycling substantially reduces waste generation, thereby creating 'green' jobs.
- Water quality is improved by reducing pollution and affordable and clean energy is provided through WtE projects. Sustainable cities are created which ensure

access for all to adequate, safe and affordable basic services. Responsible consumption and production is promoted leading to environmentally sound MSWM. Food waste is reduced through recycling and leads to improved nutrition, and sustainable agriculture is promoted.

- Pollution abatement refers to any measure taken to reduce, control or eliminate pollution from an environment. These measures can be regulatory like laws, behavioural or technological. For example, monitoring air conditioning temperatures to reduce electricity consumption and GHGs would lead to abatement of pollution.
- Abatement by following sound MSWM can be quantified by the amount of GHG emissions avoided. Here we are presenting an Indian sample study which assessed the financial and environmental gains by following sound MSWM under perfect conditions. In this study, financial viability of the sample was assessed, then the GHG emissions avoided due to sound MSWM practices was quantified, the resultant abatement due to the avoidance of GHGs was far above the income earned from the revenues of the by-products.
- Consider the financial gains, that is, income less cost and abatement gains of the sample represented in the graph (Figure 7). The years are measured on the X axis, the net present value of income less cost in lakhs of rupees on the Y axis. The benefits of following sound MSWM result in the avoidance of GHGs (shown as the red line), the area under the curve would signify the monetary value of GHGs avoided, this would reduce the climate change impact of waste.
- The area under the red curve is the abatement of pollution due to the avoidance of GHGs because of proper processing and disposal of waste. While the income less cost graph shows that the MSWM project of the research sample becomes viable in the year 2017, the abatement graph shows external benefits of Rs. 1,200 lakhs (positive externalities) for the same project at the same point in time. The abatement increases parallel to the financial income to reach Rs. 1,600 lakhs by the year 2026, an increase of 33 percent over ten years or a 3 percent increase annually. These benefits through abatement in air pollution due to avoiding GHGs makes for a clear case of inter temporal sustainability of the MSWM plant.

Figure 7: Income and Abatement of a Sample MSWM plant



Source: *Calculated by the Author, AERC, GIPE, Pune.*

- The question that arises is whether India has such MSWM plants and the successful case of Nashik is the answer. The Nashik MSWM plant in Maharashtra has been running successfully after its installation in 2016. Below are the actual site pictures of the integrated solid waste management plant.

Figure 8: 500 Tons/Day Integrated Solid Waste Management Plant for Nashik Municipal Corporation

Source: *AERC, GIPE, Pune.*

- The Nashik Municipal Corporation adopted a Public Private Partnership (PPP) MSWM model for its waste processing. The PPP was a big success as it was able to build the facility and operate it within a year. The compost was found to be of very good quality. With a tie-up with the Rashtriya Chemical Fertiliser (RCF) for selling their compost, mandatory under the Swachh Bharat Mission, the plant has been receiving revenues from its compost. Further, there are tie-ups with local factories for the purpose of providing Refuse Derived Fuel (RDF) fuel.

Recommendations and Conclusions

- Reduction in the generation of waste would help us manage the solid waste better and would be a potent strategy for reducing greenhouse gases.
- Recycling saves energy as making goods from recycled materials typically requires less energy than making goods from virgin materials. Also, less energy is needed to extract, transport, and process raw materials and to manufacture products when people reuse things or when products are made with less material. Thus with lesser demand, fewer fossil fuels are burned and less carbon dioxide is emitted to the atmosphere.
- Diverting certain materials from incinerators through waste prevention and recycling reduces greenhouse gas emissions to the atmosphere, would reduce emissions from incinerators.
- In conclusion, the link of MSW to climate change and to the health of a population has been sufficiently proved in scientific circles. On the global stage and especially on the national front, the importance of sound MSWM to reduce the health risk, the climate change risk and to adhere to the 17 SDGs to be achieved by 2030, the establishment of sound MSWM practices is an absolute must. Sound MSWM plants and practices have been established successfully in India. They need to be replicated across the country for us to fall in step with the UN SDGs.

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