

Agriculture For Sustainability with Socio-Climatic Protection with Quality Livelihood

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Abstract

Paribesh Unnayan Parishad (PUPA), an NGO with its registered office in Kolkata, operates mainly in Sagar Island, the biggest estuarian island in the Sunderbans delta. The island is located in the South 24 Parganas district of West Bengal and is some 100 km away from Kolkata. The island offers rich bio-diversity and is particularly known for its unique mangroves. The frontline activity of PUPA is EDUCATION, environmental education, and sets its Vision of ‘Environment for Development’ and strives to achieve the same through its Mission of ‘Environmental Conservation’. "Learning should be started from the very early age", keeping this in mind, members of PUPA dedicated to uplift the quality of life and livelihood of poor, vulnerable and downtrodden people of the Sagar Island and other coastal areas of Sundarbans, and have given top priority on the support for the quality education (science education) of the children including their skill development. tolerate climatic vagaries, but the seeds are not available as per demand. Collective & Inclusive Farming: Considering the involvement of women groups, especially when women are the producers (farming activity), the advantage is access to food in the hands of those who need it (are food insecure). The proposed project villages (five in number, out of total 42 in the island) are selected in northern-most & backward areas of Sagar Island. Total families in these villages are 1307 [SC families 496 (38%)] with a total population of 6379, of which SC population is 2460.

Keywords

Cost Benefit Sharing Model, Linkages with SDGs, Mission LiFE, Sagar Island, quality education

1. Introduction

Paribesh Unnayan Parishad (PUPA), a registered, non-profit NGO, is working at present primarily at Sundarbans, particularly at SAGAR ISLAND, a climate-sensitive zone, where life is always under stress & uncertainty. The island is located in the South 24 Parganas district of West Bengal and is some 100 km away from Kolkata. The frontline activity of PUPA is EDUCATION, environmental education, and sets its Vision of ‘Environment for Development’ and strives to achieve the same through its Mission of ‘Environmental Conservation’. "Learning should be started from the very early age", keeping this in mind, members of PUPA dedicated to uplift the quality of life and livelihood of poor, vulnerable and downtrodden people of the Sagar Island and other coastal areas of Sundarbans, and have given top priority on the support for the quality education (science education) of the children including their skill development. EDUCATIONAL SUPPORT SYSTEM involving Children along with their Parents for learning together at Community level, designed for SELF RELIANCE and SURVIVAL. This is an in-situ learning system runs at village/hamlet level Folk Schools, which incorporates play-way methods of nature-based learning leading to natural farming for achieving sustainability. Our children need a new type of education, not available in the present formal Schooling System, to face the new challenges in the context of Climate change. Darwin once said “It is not the strongest of the species that survive, nor the most intelligent, but the ones most responsive to change”.

1.1 Objectives

Hon'ble Prime Minister Shri Narendra Modi introduces Mission LiFE to the world at the 26th UN Climate Change Conference of the Parties (COP26) in Glasgow. maintain a healthy livelihood reducing bioaccumulation, biomagnification, and health risks .promote no use of chemicals in fields with increasing coordination of sustainability with culture and nature .

Linkages with SDGs: Goal 1: No Poverty, Goal 2: Zero Hunger, Goal 3: Good Health and Well-being, Goal 4: Quality Education, Goal 5: Gender Equality, Goal 8: Decent Work and Economic Growth, Goal 9: Industry, Innovation and Infrastructure, Goal 10: Reduced Inequality, Goal 11: Sustainable Cities and Communities, Goal 12: Responsible Consumption and Production, Goal 13: Climate Action, Goal 14: Life Below Water, Goal 15: Life on Land, Goal 17: Partnerships to achieve the Goal, Goal 4: Quality Education, Goal 8: Decent work and Economic growth, Goal 10: reduced inequalities, Goal 11: Sustainable cities and communities.

Key activities of PUPA: 1] paddy production, 2] mangrove protection and plantation, 3] livestock production,4]milkproduction,5] fisheries, 6] culture of mycorrhiza and application with business mode, 7]production of SAGARSONA in business mode, 8]folk varieties of rice (with vitalities) propagation and maintaining rare seed banks, 9] economic development of rural side families, 10] minimize health issues.11]bio compost and biopesticide propagational training and awareness program's to farmers and local students who are 1st generation learners.12]try to produce biogas to mitigate nonrenewable energy consumptions.13]maintain PMs' LiFE PROJECT in daily lifestyle with Mahatma Gandhi's GRAM SWARAJ YOGANA.14] maintaining a cyclical way that cow dung , livestock and fisheries debris to prepare mycorrhiza and SAGARSONA, a bio compost and to culture nematodes (EPN) and on the other hand ecofriendly agricultural wastes also act as fodder of cow ,poultry farm and fish meal production.15] open a new way of job , 16] leads economic developments, 17] promotes sustainable livelihood 18] reduce gender bias ness, 19]Schooling for backward class's children, 20] economic growth of below poverty line people.

In short, the model of 'Smart Education', may be called 'Lifelong Learning' which has three pillars:

- 1) education for livelihood,
- 2) education for living a vibrant life, and
- 3) education throughout life.

In addition to immediate objectives, some long-term objectives are included.

1. To Impart education to the children which will make them 'smart' to deal with their surroundings; as this type of education is often not available in the mainstream educational institutions (schools, etc.).
2. To provide them such education & training which is very relevant for their daily life situation?
3. To impart Science-based training on the traditional & improved methods (a mix) of cultivation, particularly organic farming in tandem with the local ecology.
4. To educate the children in such a way that includes knowledge about local climate, biodiversity, rural culture and sports (traditional) as also traditional health and hygiene tips.
5. To enthuse the children in learning how the quality of the soil can be restored and improved for sustainable crop yield; with an aim to supply safe and nutritious food for all and in particular the poor and the underprivileged.
6. Also, to train for psychologically tuned to change the food habits in keeping with the changing climate and local availability of natural resources including the surrounding biodiversity.
7. The children also have to be prepared for finding New Avenues of Earnings related to different local production and services including their marketing.

Finally, all out efforts are to be taken to revive Conventional wisdom for enhancing immunity through available agricultural produce, such as Turmeric, Neem, Brinjal, sajina, etc., and avoiding any kind of Chini (sugar), rather depending on gur (tal & Khejur). Locally available fishes (live), Preferably use coconut oil body massage. At least Ten households must adhere to this type of food habit for a year. Let us see what kind of sufferings are associated or excluded with this prescription (LONG TERM OBJECTIVES).

2. Literature Review

Mycorrhiza is the symbiotic, omnipresent association among plants and fungi principally belonging to the order Glomales under "symbiomycota". Sagarsona is a biofertilizer made by low-cost way. Mycorrhizosphere connotation also strains consideration for their prodigious standing for rhizosphere bio-community. Mycorrhiza is a decent bio

compost due to presence of glomalin and also make a favourable environment to grow other fungi, bacteria, helpful invertebrates and plant also. They originate to take possession of rhizosphere region of almost 70 to 80% of plants athwart the globe. These cooperative associations are acknowledged to deliberate several possessions and impacts on the plants. Actually, they also help to grow some nematophagous fungus that kill those plant parasitic nematodes. Thus, it also helps to reduce harmful nematodes and also act as biofertilizer. But in coastal side mycorrhiza cannot survive, in those places predatory nematodes become useful to eradicate those plant parasitic nematodes. Nematodes are pseudocoelomate, soft bodied, mostly microscopic, acelomate, transparent looking invertebrates, fit to the phylum Nematoda and are one of the maximum copious assemblies in the soil and litter, having a noteworthy role in decisive the microbial societies in mud. Some of them are inhabiting in the soil and suck the sap from the root of plant. They actually nothing but Plant Parasitic nematodes (PPN), the hidden enemy.

They destroy plant body parts, mainly roots and as a result of this, root knots are formed, severe injuries lead to crop destructions, mainly in flowering period, destruction maximum. Some nematodes are also found in soil, which are carnivore in nature and mainly depends on plant parasitic nematodes. So, they are helpful for regulating those parasites biologically without using any harmful chemicals and pesticides. Some nematodes are also persisted which are termed as entomopathogenic nematodes. They parasitized and kill different types of insects as well as different types of crop's pests. They are efficiently used as biocontrol agents against a large number of insect pest of agriculture as they have no adverse effect on humans, animals, birds, fishes or to the environment. So, it is an excellent alternative for chemical insecticides and efficient sustainable eco-friendly method. But it is not so well known in India. Our staple food is rice, which come from paddy. Many people's primary profession is agriculture. Study reveals, 80-90% loss in paddy cultivation occur due to presence PEST.

Recent studies reveal that harvest losses in agriculture triggered by plant parasitic nematodes and other pests are estimated to hike soon as a consequence of weather change and reaping systems intensification. So, uses of mycorrhiza in field must open a new era of sustainable agriculture (Guha et al.2023b). The findings of predatory nematodes are significant for the protections of mangroves (Guha and Gantait 2023) as well as agriculture also, because they are the consumer of other destructive nematodes like PPN and fungivore nematodes. It is helpful for maintaining the top-down effect of their food chains as well as the below soil ecosystems. The use of beneficial microorganisms is one of the alternative management strategies to have protective measures against pathogens. The use of nematicides, though causes bioaccumulations and biomagnifications, is being inadequate, given the swelling apprehension for human health as well as the atmosphere. So, the uses of mycorrhiza and predatory nematodes led to their prohibition in application. Rest of all, implementation of entomopathogenic nematodes to control house pest as well as pest of agriculture helpful for all. It reduces the usage of chemical pesticides which causes health hazards as well as air, water, soil pollution including bioaccumulation and biomagnification.

The United Nations' 2030 Development Agenda is a set of internationally settled upon goals that deliver an inclusive policy to chaperon policy and deed toward sustainable development. As such, many of the thematic extents of the SDGs (e.g., health, education, economic development) are sturdily associated to each other complete manifold marks and these communications and multifaceted interlinkages prerequisite to be painstaking to accomplish the 2030 Agenda. The regularity of Spartan cyclonic tempests in the Bay of Bengal amplified. The total loss of mangrove area due to coastal corrosion also increased. Mangroves are a large source of carbon sink of nature. So, loss of mangroves threatened us about cyclones and losses of carbon sequestration also. This deficiency of freshwater shared with the escalation in sea level is supposed to be contributively to the worsening of the well-being of the mangrove forest via snowballing brininess. Salinization has noteworthy contrary belongings on the Sundarbans' mangrove timberland: Augmented salinity and anoxicity hinder nutrient cycling and reassure nutrient-poor soil, detrimental the Sundari trees, slowing forest progress, and plummeting yield and biodiversity. Our successful experimental outcome can open a new era of agricultural benefits and protecting methods of mangroves. Thus, we can promote SDG1, 2, 3, 13 and 15. As major component of the diets of many people of India and other worldwide, the enrichment of rice cultivation can contribute toward the SDG2, which is "End hunger, achieve food security and improve nutrition and promote Sustainable agriculture". Mycorrhizal interventions and usage of entomopathogenic nematodes (EPN) with simultaneously reducing bioaccumulations and biomagnifications, due to their biofertilizer with bionematicidal activities, (Guha et al. 2023) promotes SDG3. So, by culturing this eco-friendly bio-control sustainable measure "Good Health and Well-Being", SDG3, will also be promoted with new source of employments. Poverty can be irradicate to achieve SDG 1, i.e. "No Poverty" by opening a new way of entrepreneurship as well as employment by culturing mycorrhiza. Other organisms that play important role in ecosystem and Nature of soil are also protected from excess use of chemical pesticides. Identifications of predatory nematodes can lead culture procedures with

opening a new era of experiments which become beneficial for agriculture as well as to maintain mangroves (Guha & Gantait, 2023). Only mangroves can protect Sundarbans from cyclones and soil erosions with protecting natural carbon sinks. So, SDG13, the climate protection and SDG15, the life on land protection can be endorsed. Thus, by 2030, our country can obtain economic development with a healthy nature by these means.

The area is prone to cyclone and flood, which are experienced by the people every year causing damages to houses and all other infrastructures, particularly agricultural fields. Farmers realized now the importance of traditional varieties of paddy, which have the capacity to tolerate climatic vagaries, but the seeds are not available as per demand. **Collective & Inclusive Farming:** Considering the involvement of women groups, especially when women are the producers (farming activity), the advantage is access to food in the hands of those who need it (are food insecure). Most of the groups of women, are expected to start with small areas for cultivation initially, have increased their production by taking up more fallow land, rejuvenating it and cultivating it. It is expected that the women would be engagedly in collective farming and also inspire other women to follow them. We involved the children group of the Folk schools in very small-scale farming (MADA CHAS) to make the activities INCLUSIVE.

3. Methods

Geographical coverage area of proposed project (villages/blocks/districts):

Target Area: Sagar Island (latitude 21° 37' 21" N to 21° 52' 28" N and 88° 02' 17" E to 88° 10' 25" E)

Total area: 230.98 Sq. km.)

No. of Villages: 42

Total Population: 0.20 million

Average Annual Temp.: Varies between 35 degree C and 18 degree C (average)

Caste: SC 26.5 % with 37% literacy rate (more than 71% families living below poverty line)

Economy: Agriculture (mono crop), betel vine & fishery

Soil type: Clayey loam soil

Climate: Humid, climate vulnerable to different types of environmental hazards. (Floods, water stagnancy, droughts, cyclone, tidal surge, river erosion, salinity, extreme temperature and low light intensity etc.)

Problem: weather hazards (tropical cyclones, floods with saline water, coastal erosion, etc.), saline nature and erosion of soil, lack of irrigation facilities, unproductive land, mono-cropping, lack of freshwater, etc. Sagar Island, the biggest island in Sundarbans delta, is protected from saline sea/riverine water by embankment around the Island. Agricultural lands near the embankment are more saline than the land away from the embankment. This is a natural phenomenon. Presently, establishment of brackish water fishery in agricultural land is very common at Sagar Island. Agricultural lands situated near the fisheries are becoming saline due to percolation of brackish water from fisheries. So as a whole, soil salinity is a big problem in agriculture at Sagar Island due to natural as well as anthropogenic activities. The area is prone to cyclone and recently faced the unprecedented cyclone Bulbul in 2019, 'Amphaan' in 2020 and YAAS in 2021 and so on.

Paribesh Unnayan Parishad (PUPA), an NGO with its registered office in Kolkata, operates mainly in Sagar Island, the biggest estuarine island in the Sundarbans delta. The island is located in the South 24 Parganas district of West Bengal and is some 100 km away from Kolkata. The island offers rich biodiversity and is particularly known for its unique mangroves. Another special attraction of the island is its famous century-old „Kapil Muni Ashram“, a holy shrine of the Hindus (the largest religion of India). The ashram (i.e., temple) is located near the confluence of the river “Ganga” with the Bay of Bengal and is visited by the devotees and the tourists from across the world throughout the year. However, the biggest religious-cum-cultural festival is held every year on the last day of the winter month of “Pous” (as per Bengali Callender) which falls around mid-January. This annual congregation is known as “Ganga Sagar Mela” and attracts a million people every year. The island thus holds out tremendous tourist potential (throughout the year) in the domains of nature and socio-cultural besides the traditional vocation of agriculture and allied activities for most of its people. (Here lies the importance of proper education for the islanders)

The community of climate change scientists and their numerous publications at the international domain have identified the Bengal coast (Sundarbans) as highly vulnerable to climate change induced water resources adversities (e.g., sea level rise, water logging, floods, cyclones, saline water intrusion, etc.).

The vulnerabilities due to climate change are likely to aggravate more in the future. These catastrophic events significantly hinder the agriculture production systems, economic and social development of the country firstly, through damaging the crops, livestock, fisheries and agro-forestry, natural resources, establishments and infrastructures and secondly, pulling back the on-going developments, business and trade at local, regional and even global levels. Coastal areas are mostly inhabited by the poor and disadvantaged groups. Usually, coastal belt is flooded from May/June to November/December.

Salinity also restricts agriculture in the coastal areas. In the Coastal Zone, crops are lost due to water stagnancy/standing flood water or saline tidal surge during July/August-November/December (5-6 months) in wet seasons. On the other hand, during winter salinity is also a major threat to agriculture. During summer season, due to lack of irrigation availability, farmers cannot produce crops in their lands.

The island lacks seamless road connectivity from Picture: Sagar Island (Strom prone area), Sundarbans Kolkata leading to its geographical isolation. Ecologically the island lies below the sea level as in Holland. The ecological features render Sagardwip vulnerable to frequent natural calamities like recurrent cyclones (viz. Aila, Bulbul, Aam Phan, YAAS, etc. in recent times) and also tidal waves. The latest blow came in the form of the “Cyclone Yaas” during May, 2021 within exactly a year of the devastating Aam Phan of the year 2020. „Yaas“ was crueller in its impact as it hit the island on a „full moon“ day and was thus accompanied by huge tidal waves almost like „Tsunami“ and probably did not spare any village of the island. The agricultural fields were inundated with gushing saline water thus preventing cultivation for at least a year. Further a huge number of mud houses were washed out, making a large number of families homeless. They include the children also who will lose on their education as well. The children feel totally upset as they are apprehensive of their future life and livelihood being severely compromised. Such worries occur to all and particularly the children and the youth as such devastations of varying scales take place almost every year.

About PUPA

PUPA is a non-profit making organization involved in economic and environmental developmental activities in the Sagar and some neighboring islands of the Indian Sundarbans area. We are actively engaged in promotion of education among poor and drop-out students, organic farming by promoting vermicomposting and other organic manures, like Mycorrhiza-SAGAR SONA and conservation of agricultural biodiversity. We have conserved more than 140 varieties of indigenous paddy seeds of which nearly 15 are salt-tolerant varieties. These seeds are distributed among farmers for cultivation (sometimes in small plots to conserve the variety) but the salt tolerant varieties are in high demand among the coastal farmers because after cyclones or intrusion of saline sea water other varieties fail to grow in these saline lands. We also provide training in Vermicomposting, organic farming, kitchen garden, tailoring, food-processing and so on and try to provide small financial help to community members (primarily women) to set up their own business. The frontline activity of PUPA is EDUCATION, environmental education, and sets its Vision of “*Environment for Development*” and strives to achieve the same through its Mission of “*Environmental Conservation* “. "Learning should be started from the very early age", keeping this in mind, members of PUPA dedicated to uplift the quality of life and livelihood of poor, vulnerable and downtrodden people of the Sagar Island and other coastal areas of Sundarbans, and have given top priority on the support for the quality education (science education) of the children including their skill development.

Organization has a long experience in the field of environmental education, early childhood alternative education, Biodiversity Conservation, Livelihood improvement activities. It has carried out NEEPS & NEAC programmed (Govt. of India), EOSE (MHRD) , WWF-funded project, State Pollution Control Board (Awareness) NABARD (Farmers' Club),), State Environment Department (ICZMP), Central DST (SC & ST projects), UNDP (Small Grants), CEE supported project for awareness, & Environment Education, PBR & Biodiversity Conservation Park (WBBB), Science Camp (State DST), Mentoring support was given to the teachers and students for implementing project-based science learning and encouraged them in National Children Science Congress (NCSC), Regional Science & Technology Congress (State DST) and other local competitions, etc. Earthian Paryavarav Mitra Sustainability Education Programmed (2018 to 2022) through CEE, Ahmedabad, on School-based Sustainability Education Programme, involving more than 100 Schools from W.B.

Initially, ten villages of Sagar Island are selected for Farmers' mobilisation programme. They will be informed about the objectives & necessity of the cultivation of traditional paddy cultivation and SEED BANK establishment for community distribution, and also as a source of additional income. Next year, PUPA may involve the farmers of Kumirmari Island (Gosaba Block) and Masjidbari Block (Basanti Block)

Training on selection of paddy seeds suitable for the land (after soil salinity testing), bio-farming (using organic manures, bio-fertilizer (IMO) and bio-repellents) will be given to the willing and interested farmers. Traditional seed varieties including salt-tolerant ones will be supplied from the community Seed Bank of PUPA and also by purchase from other islands of Sundarbans (Kumirmari & other islands, Gosaba Block). Seeds will be distributed amongst the Farmers on condition of returning double the quantity received in the next year to the respective **Community Seed Bank**. Farmers receive seeds on loan from the community seed bank, provided they agree to obey all the terms and conditions of the loan.

The above **sharing model** will enable us to reach a larger number of farmers in subsequent years, making the project **self-sustaining**. The traditional varieties will enable farmers to cope with environmental stress (Climatic) by following integrated farming system where several varieties adapted to the local range of environmental conditions. At the same time, **Seed Banks** facilitate farmers' access to local markets and allow farmers to have more choice over what they grow. Seed Banks enable rural villagers to become less dependent on high-yielding varieties and on expensive inputs such as chemical fertilizers and pesticides. Emphasis will be given on **participatory approach & community ownerships & Village Institution Building** by involving the beneficiaries as participants from the very beginning to develop the work plans, for building rapport and community trust PUPA approached local SHG members at Mahendraganjje Village, Sagar Island and another Group at Sibnagar Abad, Namklhana, for preparing Mycorrhiza-SAGAR SONA and considering a business by selling the end product to local farmers. Local Block office was also involved for supporting the group by providing initial support. Mr. Tapas Kumar Mitra, Jt. BDO, Sagar Block visited the field for feasibility study, and also considered it as an innovative business.

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The business model we follow may be described as *Cost Benefit Sharing Model*. In this model the beneficiaries must share a portion of the cost while the remaining part shall be provided by our organization. Loans are given to community members who have received training from us or elsewhere and want to set up their own production unit, or for business or personal reasons. The amount received from our organization has to be returned with a monthly interest of 1% per month. This interest income goes partly in maintenance of supporting staff of our organization. The actual amount returned is again provided to some other member of the community which is decided in advance in meetings with the community members. Thus, there is peer monitoring among community members and consequently rate of loan default is low. Similarly in distribution of seeds among poor and marginal farmers, the seeds are provided free during the sowing season (when price of seeds are high) but after harvesting, 1.5 times or double the amount of the seeds, will have to be returned (now price is lowest) so that more seeds can be distributed to other farmers in the locality. But part of the higher return is given to the supporting staff.

Here it may be important to note that our organization is a non-profit making organization and we are not directly involved in any production. Our objective is to provide training in organic farming, local resource management, poultry farming, and also support the farmers with organic inputs, indigenous seeds and small finance. That is, we support the community members with partial cost while recovery of this cost (with interest) is again passed on to some other member. The success of the community members enterprises and the increasing number of beneficiaries may be considered our revenue.

It is innovative in two ways:

- i) It is not providing full support to the beneficiaries, that implies that the beneficiary also has to bear a portion of the cost as a result of which there is no shirking of responsibilities.
- ii) As the benefit, that is, the return is passed on to the other members of the community there is peer monitoring among community members.

The consequence is fairly regular rate of recovery and increasing number of beneficiaries.

Green school project:

Recently, PUPA has launched an innovative project titled “SmartEducation and Project Shade & Seed” to motivate the youth to take up agriculture and allied activities as a profession. This follows the spirit behind Indian Council of Agricultural Research (ICAR) project titled “Attracting and Retaining Youth in Agriculture (ARYA)” launched in 25 states (one district in each state through the concerned KVK) since 2015-16. For the purpose PUPA has organized the students into Community Bio Circle to act as one of the local institutional pillars at grassroot level, others being farmers' club and Women's group. The members of the bio-circles are engaged in collecting traditional paddy seeds and are associated with the farmer's clubs to get practical knowledge of farming. Further they have access to online training in scientific and sustainable agriculture organized by PUPA. The objective is to help them earn a dignified livelihood by using locally available bio-resources and build self-reliant smart villages as they grow up. CEE has been partnering with PUPA for implementing Earthian Prtavarana Mitra Programme in the schools of West Bengal since the year 2018. The year 2016 was a landmark for the organization, when a small Science laboratory was set up with seed money from Zee Bangla, a Bengali cable television channel, while telecasting (DADAGIRI Episode) the innovative Study Centre's activities at the Krishna Suchitra Memorial Model Study Centre. In the next year, Miss Aunnesha Bhowmick of Commonwealth School of Boston (Class X) visited our Rural Centre at Sagar Island to explore the possibility of engaging the children in activity-based science project, just when we have taken up the responsibility of the Earthian Paryavaran Mitra Sustainability Education programme. When she went back to USA, she raised funds to buy a Salinometer and also to set up a Room for our Science lab at Sagar Island. This lab is now being used by the students of our study center and by the students of local schools to do hands on simple experiments. PUPA awarded with MEGHNAD AWARD (2019) on 28 Feb, 2020, by DST, W.B.

Education: The primary language spoken in the villages is Bengali. The literacy level among the women is much lower (over 75% of the women have education less than class IV) and the rate of higher education among both sexes is dismal. Most of the children do not attend school past the 8th or 9th grade, and female attendance drops sharply even before 8th grade. PUPA carried out a preliminary need assessment study recently in the selected villages. The SC community lives with severe poverty (with more than 70% families living below poverty line). During the time of need assessment, Group meetings were organized to find out people's aspirations

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Promoting scientific temperament of school children by our Study Centre (K.S. Memorial Study Centre for Children KRISHNA SUCHITRA Memorial Learning Centre for Pre-school children & primary students. (See Lean & discover

https://drive.google.com/file/d/1Fj0a2Ym4Rw16R1JWEmu85H2yZrHGisR4/view?usp=share_link

Alongside, PUPA took upon itself the responsibility of convincing the need for education for life and livelihood to the guardians and the teachers as well, culminating into Inclusive Smart Education Programmed. (REPORT of *Folk School Activities along with this report*)

In the year 2007, PUPA initiated a project on rural livelihood intervention in the village Phulbari of Sagar Island in association with CEE and financial support of UNDP. The objectives of the project were to motivate the community members and their children to improve their Life and Livelihood the natural surroundings of the village and think for its development by harnessing the bio-resources all around in a sustainable manner.

Important Past Activities (Young Leader for change, Green School, NEEPS, NEAC)

Brief past Activity Education

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1. School Programme: More than 15 years' experience of working with the school students of class VI to VIII from nearly 45 schools of four districts of West Bengal (Kolkata, Hooghly, North 24 Parganas, South 24 Parganas)

Paribesh Prahari Prakaalpa — This is a long-term project aimed at educating the school students, including children about the present state of our environment through classroom interactions and after-class activities. At present there are nearly 15 schools in our network.

National Environment Education Programme in Schools (NEEPS)— This programme, supported by CEE, Ahmedabad, was organized at 20 schools of four districts (Kolkata, Hooghly, South 24 Parganas, North 24 Parganas) of West Bengal in the years 1999-2000, 2000-2001 & 2001-2002. The activities include

Teachers' Workshops, Consultation cum Training Workshop, Activity Workshop Classroom Activity, Out-door activity, Nature Study camp, etc.

MHRD/EOSE Programme Development of Supplementary and workable environment education material for the Secondary School teachers and the students of Class VI and VII in West Bengal" in the year 2000- 2001 and 2003-2004

Supporting Basic Education programme: Nine such centers were established involving more than 100 children between the age group of 4+ to 5+ at Sagar Island, of which one (STUDY CENTRE) is continued with emphasis to put on the Play-way methods of learning "learning from the nature", "ethical & science education" etc., so as to reduce the study pressure and also to develop a sense of love for the nature and their own village from the very early age.

Environment Education in Schools: Green School (Green Boy & Green Girl) Programme, Paryavaran Mitra (CEE partnership), Low-carbon education programme, Green Commonwealth Game programmes (CEE partnership) are some of the EE programmes in schools

YOUNG LEADER FOR CHANGE: Miss Hasi Patra, an SC student, participated in the "Young Leaders for Change" programme of Paryavaran Mitra CEE, Ministry of Environment & Forest, Govt. of India, facilitated by CEE, held at Ahmedabad, Gujarat, during 23 – 26 July, 13, along with Anima Das (Guide Teacher) & Dr A. Misra (Paryavaran Sathi), Secretary, PUPA. Hasi was declared as one of the four National Leaders in 2014

GREEN SCHOOL PROGRAMME

Environmental Awareness Programme:

National Environment Awareness Campaign Programme (NEAC)

Environmental Awareness Mapping

Biodiversity/Climate Awareness Programmes

Observation of Environmental Days/Week: (World Environment. Day, Earth Day, International Biodiversity Day, Forest Week, Wildlife Week, etc.

PUPA also runs an informal school under the banner of its associate 'Krishna Suchitra Memorial Centre for Rural Development & Research (KSMCRDR). This school offers supplementary coaching to the students of the poor households of different villages of Sagar Island. The students are small children studying in pre-primary and primary standards in some Government-aided formal schools and are generally first-generation learners.

JOYFUL LEARNING VIDEO:

https://drive.google.com/file/d/1FgP3Nu47MSCuGtXcLkKdZGNlI05CKYZ/view?usp=share_link

In the year 2010, PUPA set up an informal school for the children named "Krishna-Suchitra Memorial Model School", an *alternative Study Centre*, besides supplementary coaching for the regular school curricula, the students are trained here how to manufacture organic manure by using locally available bio-resources. They are also apprised of the various nutrients available in the manure which nourish the soil to make it suitable for sustainable cultivation. The students get equipped to join in different project-based scientific assignments at the state and national levels.

The return of migrants to the Sagar Island following the lockdown during Covid pandemic in 2020, made the islander families remember the words of Gandhiji "Back to Village". They realized that each small and marginal farmer's family has to become self-reliant through integrated and sustainable agriculture so as to ward off both the vagaries of market and the weather. More than 25 Bio-clubs with nearly 500 children have already been formed. The students are grouped with 20 to 25 members in each bio-club under the mentorship of one senior person (preferably a village Lady) from the locality. The next step was formation of Farmers' Clubs (around 10 members). The children were engaged in a survey of bio-resources in their respective villages. *They have completed a survey of some fish ponds to find out the impact of the recent cyclone 'Amphan' on the village aquatic life.*

The objective of organizing the students into Community Bio Clubs to act as one of the local institutional pillars, others being Farmers' Club and women's Group. The members of the Bio-clubs are engaged in collecting traditional paddy seeds and making organic manure by using bio-degradable waste available at home. They are associated with the farmer's clubs to get practical knowledge of farming and also have access to online training in scientific and

sustainable agriculture organized by PUPA. The objective is to help them earn a dignified livelihood by using locally available bio-resources and build self-reliant smart villages as they grow up.

4. Data Collection

PROJECT VILLAGES

GP: Mooriganga No 1 Gram Panchayet: Villages: Kashtala, Phulbari, Sibpur, & Hendalketki

GP : DS-1 : Village : Mahendraganj

Demographic survey undertaken recently in five villages is depicted in Table -1 below.

Table 1. Demographic data of five villages, Sagar Island

Village	Total HH	Population			SC HH	Population		
		Total	Male	Female		Total	Male	Female
1. Kashtala	356	1778	968	810	96	566	290	266
2. Phulbari	272	1192	928	264	52	264	156	108
3. Sibpur	207	1033	568	465	53	280	157	123
4. Hendalketki	286	1431	736	695	190	927	485	442
5. Mahendraganj	186	945	488	457	105	423	275	148
	1307	6379	3688	2691	496 (38%)	2460 (38.5%)	1363	1087

The proposed project villages (five in number, out of total 42 in the island) are selected in northern-most & backward areas of Sagar Island. Total families in these villages are **1307** [SC families **496 (38%)**] with a total population of 6379, of which SC population is 2460 (38%) (Male 1363, Female 1087).

Table 2. Age-wise population distribution in selected SC families

Village	Total HH	Population			0 – 6 yr		7 – 15 yr		16 – 40 yr		41 – 60 yr		> 60 yr	
		Total	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
1. Kashtala	15	42	23	19	3	3	3	2	7	5	9	7	1	2
2. Phulbari	30	137	79	58	13	11	16	9	29	21	17	14	4	3
3. Sibpur	30	110	59	51	8	7	6	5	21	19	21	20	3	0
4. Hendalketki	30	126	71	55	9	4	13	10	36	28	13	12	2	1
5. Mahendraganj	40	185	92	93	5	10	20	26	45	36	14	19	8	2
	145	702	376	326	51	43	69	59	162	131	78	79	18	12
	29%				25%		18%		42%		22%		4%	

Education : The primary language spoken in the villages is Bengali. The literacy level among the women is much lower (over 75% of the women have education less than class IV) and the rate of higher education among both sexes is dismal. Most of the children do not attend school past the 8th or 9th grade, and female attendance drops sharply even before 8th grade.

PUPA carried out a preliminary need assessment study recently in the selected villages. The SC community lives with severe poverty (with more than 70% families living below poverty line). During the time of need assessment, Group meetings were organised to find out people's aspirations

Table 3. Analysis of Livelihood Systems

Predominant Livelihoods in the target area (current major occupations of the community, present average annual income etc)	Agriculture, Betel vine, poultry, Pisciculture, Average Income: Rs. 3000.00/month
Predominant Livelihoods of SC/ST community (current occupations of the target beneficiaries, present average annual income etc)	Agriculture, Betel vine, poultry, Pisciculture, Average Income: Rs. 3000.00/month
Predominant Livelihoods of SC/ST community (current occupations of the target beneficiaries, present average annual income etc)	Agriculture, Betel vine, poultry, Pisciculture, Average Income: Rs. 2000.00/month
Details of Livelihood Assets (ex: agriculture land, animals etc)	Mostly land less, Daily wage earners
Industrial milieu of the target area	Nil
Details of Existing Social/Rural Enterprises	Mostly jobless, no social enterprises
Socio-economic Status (details of social and economic conditions, availability of basic amenities and facilities etc.)	Poorest of the poor, particularly, in the current pandemic situations
Socio-economic Status (details of social and economic conditions, availability of basic amenities and facilities etc.)	Daily wage earners; very low income in the present pandemic situation.
Access to Technologies	Nil
Details of Indigenous Knowledge Systems (traditional skills, practices, art, craft etc)	Traditionally inclined to use organic input in agriculture
Information on human capital (health, education, nutrition, skill etc.) of target beneficiaries.	Poor

5. Results and Discussion

With the above-mentioned approach, PUPA formed ten Folk Schools under the umbrella support of three SMART EDUCATION CENTRES at Sagar Island to revitalize Traditional Skills of the Past, including games & sports with support from ASHIRBADAM TRUST.

Strategy of Smart Education

Our strategy is to work through a strong social network (village level institutions) of children, farmers and women by forming Groups, Community Bio-club for students, Farmers' Club for farmers and Women's Group (SHG) for the local women of the target families.

1. The members of the Bio-clubs remained engaged in collecting seeds, planting trees and finding alternate sources of Chemical fertilizers. They will be associated with the Farmer's clubs to get practical knowledge of farming as well as get online training in scientific & sustainable agriculture.

2. The Farmers' club members are provided with technical knowhow of sustainable farming with little or no reliance on the market economy. They would also act as custodians of indigenous and salt tolerant paddy varieties (Seed Bank).

3. The women Groups will be motivated in setting up nutrition garden to increase the immunity of the family members. It was also appreciated by the UN that women are traditionally & inherently more knowledgeable than men in conservation of Biodiversity & its sustainable use. Similarly, they are very rich in knowledge of cooking along with its nutritive value. So, their knowledge may be utilized in development of more nutritive food items

Keeping the objectives in mind, Paribesh Unnayan Parishad (PUPA), a NGO based at Sagardwip, Dist. South 24 Parganas, West Bengal took the initiative of setting up THREE SMART EDUCATION CENTRES involving more than 200 children grouped into eight Folk schools, under the leadership of local housewives of the respective villages since March 2022. These informal (virtual) learning centers present a totally different environment where there is provision for reviving of traditional and forgotten Games & Sports of the area in addition to providing curricular support, wherever possible,

Activities of our Alternative Study Centre: [Promoting scientific temperament of school children at our Study Centre (K.S. Memorial Study Centre for Children) It was telecasted on 16 May, 16 (Episode 55.) at 9.30 p.m. in ZEE BANGLA Dadagiri Season 6. <http://www.ozee.com/shows/dadagiri-unlimited-season-6/video/dadagiri-unlimited-season-6-episode-55-may-16-2016-full-episode.html>

PUPA had recently launched a digital online learning center, Jitatananda Maharaj Digital Learning & Community Resource Centre (JMDLCRC)”, supported by a group of ex- students of Ramakrishna Mission School at Narendrapur. JMDLCRC aims to bridge the digital divide faced by the underprivileged youth of Sagardwip and offers online training programmes on sustainable village development and soft skills including communication.

IMPORTANT ACTIVITY PHOTO GALLERY

https://drive.google.com/file/d/1VhLT69df8Kss8uxHr7Dk1Z5hanGi08a4/view?usp=share_link
Three Smart Education Centers (North Sagar Smart Education Centre, Middle Sagar Smart Education Centre and South Sagar Smart Education centers) started functioning from the month of March, 2022. Under each Centre folk schools are organized, as detailed here.

Table 4. Name of the organization and collaborative partner:

Sl. No.	Name and Address of the Collaborators	Purpose
1.	Women Technology Park, Vibekananda Institute of Biotechnology, Nimpith	All sorts field-based training on Organic manure preparation and establishing ST HUB
2.	Sagar Jal O Mati Pariksha Kendra (Supported by Sundarban Affair Dept., W.B.) Sagar Water & Soil Teasting Centre) Rudranagar, Sagar Island SAFE	Product analyses and soil testing of the SC farmers

Table 5. Problems assessed

problems	Interventions suggested
Low agriculture production due to present in spite of the use of chemical fertilizers	Soil testing and use of locally produced <u>Mycorrhiza-Sagar Sona (Organic Manure)</u> , proved to be effective. A holistic approach, combining the activities of agriculture, horticulture and livestock, balancing the three aspects so proportionately that the best use of resources may be possible and increase of the income by <u>diversifying the farming methods</u>
Organic manures are not available, as required	. Production Unit is proposed here for large scale production
High cost of chemical fertilizers & pesticides; gradual loss of production	Promoting on-farm production and use of organic manures and other low-cost farming methodology.

Low production of animals & birds (goats, cows and poultry)	Income generation by skill training in livestock farming, veterinary service and livestock & poultry management.
Unemployment / low income	Education & training for local production and finding avenues for enterprise development
Low standards of Health, Lack of Health Education & Well being	Linkages with basic health services, including Reproductive and Child Health, available with the local Government, to be developed. Health & Hygiene awareness camps for the women & children to reduce preventable diseases.
Unsafe and lack of portable Water (pond and drinking water) for use	Training for water harvesting and purification.

Table 6. Problems and Solutions

Problems	Solutions/ Alternatives	Physical benefits	Financial benefits
1. Food Production/Supply (agriculture, fishery, livestock raising)	A holistic approach, combining the activities of agriculture, horticulture and livestock, balancing the three aspects so proportionately that the best use of resources may be possible and increase of the income by diversifying the production of organic manures	Infrastructure for HUB for organic manure preparation	Money saved as the chemical fertilizers are not required; and sell of the product assures income.
2. Employment	Increase of man-days in Farms; Training on locally suited trades and through business.	Capacity building of local boys & girls	Regular earning is expected
3. Water	Training on water treatment for fish culture, human & livestock use.	Year-long availability of safe pond water.	Improvement of health condition of family members
4. Health and Nutrition	Direct intervention through awareness and training pro-gramme and linking with local govt. health service facilities.	Nutritional Kitchen Garden.	Savings on health budget
5. Education	Extra coaching, material support for needy & drop-outs.	Number of educated Boys & girls increased	Educated children & youths are the assets of the family
6. Problem of energy sources	Tree plantation as a source of fuel, fodder, fruit and construction materials Promoting Solar led lights.	Will reduce the force of cyclonic winds; Solar infrastructure & fuel wood plant will increase; Improved Chulla.	Fuel & lighting problem reduced; Savings on fuel, lighting budget.

7. Others	Farmers Clubs, SHGs will be strengthened; Village level SME development will be initiated.	Market linkage to be established.	Income through local business.
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5.2 Proposed Improvements

Add propose improvements write here including additional numerical and graphical results (10 font)

5.4 Validation (11 font)

Project SHADE & SEED (where Shade represents infrastructure development and Seed represents Livelihood intervention.

1. Socio-economic survey will be undertaken with an emphasis to find out the number of jobless persons including migrant labourers and skilled & resourceful families;
2. Prediction of crisis in near future both in terms of food, livelihood security and income will be done for each village.
- 3 Small package of practices will be developed and initiated with the integration of agriculture, fishery, poultry etc.
- 4 Emphasis will be given on traditional, low input package of practices for sustainable livelihood security.
5. Capacity Building of the children and the Youths (Bio-Clubs)

Future Plan for Agricultural Sustainability (The Rural Agricultural Interpretation Centre (RAIC): The livelihood of the area under consideration (Coastal Island) is mainly agriculture oriented (paddy, vegetables, livestock, fishery etc.), having several problems, like lower level of production, saline soil, lack of soil testing facilities, non-availability of traditional varieties of seeds (well-adjusted to local environment), easy availability of chemicals (fertilizers and pesticides) for indiscriminate use by the farmers not guided by the experts.

Considering all these, The Rural Agricultural Interpretation Centre (RAIC) as a part of "Krishna Suchitra Memorial Centre for Rural Development & Research", a unit of Paribesh Unnyan Parishad, Sagar Island, will be established for facilitating long term sustainable Agriculture.

Sagar Island is a climatically very sensitive area and hence we want to engage in a Research & Developmental project involving responses to climate change (Smart Education and Project Shade & Seed) under its broad Project on MODEL VILLAGE.

An integrated value aided Teaching-learning Centre (COMMUNITY DEVELOPMENT CENTRE) involving Smart VILLAGES

FUTURE PLAN PROJECT: "SMART STUDENTS, SMART HOUSEHOLD & SMART VILLAGES

Video <https://drive.google.com/file/d/1QofkFKWa9bohMYBv2iBCuavidtLkhj/view?usp=drive>

Agricultural production in saline coastal field become HIGH. Simultaneously, livestock productions, milk production, fisheries are also flourished. Usage of natural products reduce cost for those cultivation, pocket friendly, open job and business ways.no use of chemicals in fields minimize health issues of local people. A simple solution with numerous outcomes and economic and environmental development in rural life.

1)PUPA approached local SHG members at Mahendraganjanje Village, Sagar Island and another Group at Sibnagar Abad, Namkhana, for preparing Sagar Sona and considering a business by selling the end product to local farmers. 2) From our study it could be stated that if organic inputs are rationally used, paddy production will not be hampered. In addition, the natural soil fertility will be rejuvenated and maintained. However, to conclude we need more experiments, particularly in some paddy fields of willing farmers.3) PUPA is a non-profit making organization involved in economic and environmental developmental activities in the Sagar and some neighboring islands of the Indian Sundarbans area. 4) We are actively engaged in promotion of education among poor and drop-out students, organic farming by promoting vermicomposting and other organic manures, like SAGAR SONA and conservation of agricultural biodiversity. 5) We have conserved more than 140 varieties of indigenous paddy seeds of which nearly 15 are salt-tolerant varieties. These seeds are distributed among farmers for cultivation (sometimes in small plots to conserve the variety) but the salt tolerant varieties are in high demand among the coastal farmers because after cyclones or intrusion of saline sea water other varieties fail to grow in these saline lands. 6) We also provide training in Vermicomposting, organic farming, kitchen garden, tailoring, food-processing and so on and try to provide small

financial help to community members (primarily women) to set up their own business. 7) Loans are given to community members who have received training from us or elsewhere and want to set up their own production unit, or for business or personal reasons. 8) Similarly in distribution of seeds among poor and marginal farmers, the seeds are provided free during the sowing season (when price of seeds are high) but after harvesting, 1.5 times or double the amount of the seeds, will have to be returned (now price is lowest) so that more seeds can be distributed to other farmers in the locality.9) Our objective is to provide training in organic farming, local resource management, poultry farming, and also support the farmers with organic inputs, indigenous seeds and small finance.

INITIATIVE TAKEN

From our study it could be stated that if organic inputs are rationally used, paddy production will not be hampered. In addition, the natural soil fertility will be rejuvenated and maintained. However, to conclude we need more experiments, particularly in some paddy fields of willing farmers. It is proposed to give emphasis on conventional sustainable agriculture practices with necessary inputs from modern technology-based cost-intensive, knowledge driven practices; keeping in view of the already undertaken activities focusing on Agrarian society the RAIC will communicate the passion for knowing, discovering, learning, preserving, imagining the potential of farming activities. Recent livelihood and food security facing considerable stress in Agriculture based economy to Consumer based economy. Various themes will boost grass root innovations which will also be exhibited to handhold innovators and lead them to the next level by bringing in domain expert, investors and partners in future. Educational programmes to understand agro-biodiversity, Workshops, need-based projects, Field trips, Volunteering and internship opportunities will be available.

Total production of Rice (kg/katha) Discussion: Total farmers involved during 2020 are 190, and paddy varieties tried in farmers' field are about 30. However, we cultivated 123 varieties of paddy in our Demo Farm In spite of climatic vagaries, the production result is encouraging as the number of average final tillers counted remains slightly on higher side in case of organic manure (Sagar Sona). Impact analyses was done in Newspaper.

Addendum

Sagar Sona (a balance organic manure)

We end this report with a note on the organic manure developed by PUPA. It was a big challenge for PUPA to find a local solution to prevent excessive use of chemicals and make farming commercially viable as well. This led to improvisation of an organic manure as a substitute for the chemical fertilizer by keeping the nutrients in right proportions. PUPA named it as "Sagar Sona", being a product of Sagardwip. "Sagar Sona" uses different ingredients available locally and often mostly in the farmer's field and home, and some of which are regarded as waste materials. So, the process of producing 'Sagar Sona' ensures eco-friendly recycling as well. The manure was applied 36.75%, 37% 63.25%, 63% Total Cost on fields along with traditional varieties of seeds saved by the farmers to produce crops like paddy and vegetables. Experiments have been done over the last 5 years and the results are quite encouraging and comparable to yield under chemical farming. PUPA had to tackle other challenges as well like rekindling the interest of the youth in agriculture, following the spirit behind Indian Council of Agricultural Research (ICAR) project titled "Attracting and Retaining Youth in Agriculture (ARYA)" launched in 25 states (one district in each state through the concerned KVK). 'ARYA' prompted PUPA to organize students into Community Bio Circle to act as one of the local institutional pillars, others being Farmers' Club and Women's Group. Presently there is high demand of organic crops and vegetables as we all are aware of harm created by edible crops & vegetables cultivated by chemical fertilizer. Beside that regular use of inorganic manure destroy the quality of land and makes it hard and barren. But the main problem is that quantity of organic products is very less and mostly sold at shopping malls at high price and became beyond the reach of middle-class and below middleclass people.

So, the ordinary people consume inorganic products to protect their pocket. The farmers who cultivate food for us should realize the harmful effect of inorganic manure on body human and on the soil of land. Some farmers may be aware of the fact but all are not. Even those who have knowledge regarding this are not ready to take the risk of using organic manure as there is no continuous source of organic manure in large scale and also for not having the idea about production cost and marketability of their products. So, most of the farmers refuse to use organic manure. "Paribesh Unnayan Parishad", formulated an organic manure- "Sagar Sona", after long research. And the most significant part of this manure is that it keeps soil health good and gives a higher production than any other chemical fertilizer available in the market. Farmers can produce this low-cost manure in home as all the ingredients used are easily available. For research PUPA selected a village Shivnagar Abad, of Namkhana Block and formed a group of

farmers and also a volunteer consisting local school students. Dr. Misra demonstrated the preparation of Sagar Sona and reached physically in each farmer's house to help them preparing one quintal manure per house with the condition that each farmer will cultivate by using Sagar Sona in a small part of his land in addition to his normal cultivation by inorganic fertilizer. A lady farmer Smt Juthika Pramanic took the lead role of the volunteers having twenty farmers. After proper training farmers started experimental cultivation in addition to their normal from the mid-week of July 2020. They used Sagar Sona for both paddy and vegetables. After few weeks result shows that growth of paddy saplings and vegetables are good enough. Each student from the group of volunteers monitored the work of two farmers and they send the reports to PUPA at regular intervals.

As a result of several Awareness Meetings, and training programs, we organized more than 25 farmers in 2019 and about 190 farmers in 2020. In addition, we organized students in Sustainable Farming training. A brief report is appended below. Meetings to analyses & document the local problems faced during paddy cultivation (seed, fertilizers, rainfall & other local weather hazards, etc.)

Conservation(in-situ) of traditional paddy with special emphasis on salt tolerant paddy for food security for marginal farmers of Sundarbans, West Bengal, India

- 1) Awareness: A general awareness among the villagers and especially among the farmers are important on a number of issues. The current trend in the islands, like many other places, is that there is use and sometimes overuse of the chemical fertilizers, pesticides in the farming process. This trend is mainly due to the use of HYV seeds, in the process losing the indigenous seeds of the region. The awareness aspect of the program would target put forward the importance of the conservation and cultivation of the indigenous variety of seeds (paddy in this project). Along with this emphasis will be on a) reduction of the use of chemical fertilizers and pesticides (which will have an impact on the health of the general population and help to reduce the pollution aspect that is associated with the use of chemical fertilizers) b) the cost component associated with the use of chemical fertilizers and pesticides which have to be used in large quantities while farming and thus adding up to the production cost. c) the use of organic manures that can be easily made from natural elements and waste materials.
- 2) To achieve the targets of the project, the awareness of the villagers is of utmost importance. So, achieve this goal it has been decided that: Two meetings will be organized in the form of Focus Group Discussions (one at North Sagar and the other at South Sagar). The participants of the FGD would be members of the local Self-Help Groups (SHG), the farmers and members of the local administration (Panchayat). From the participating members, some of the willing members were selected to attend workshops on problems and their local solutions. (problems concerning the needs of the farmers, manure, seeds and such). There will be surveys that will be conducted during the workshops. There will also be two sessions of Training provided to the participating member of the workshops. 3) Another important aspect of the program is the on- farm conservation of the traditional paddy and a discussion of the production and cost components.
- 3) The formation of seed banks (4 to 5) which will help store the traditional variety paddy seed for future use of other farmers. Field visits A team of PUPA officials and well-wishers comprising Dr. Amales Misra, Secretary, Dipankar De, Vice-president and Dr. Narayan Das, Retired Principal, Basir hat College and an environment-enthusiast visited Sagar Island (the epicenter of PUPA's activities) on 20th, 21st and 22nd November, 2019. The purpose of the visit was primarily to have a preliminary assessment of the damage caused to the environment particularly trees by the recent cyclone 'Bulbul'. The trigger for the survey arose from the gap in this respect as the government agencies have focused on the immediate issues of relief to the people, viz. providing food, clothes, shelter and also lantern, etc. to the examinees in view of the ensuing annual exams. A structured questionnaire was prepared for the purpose.

The PUPA team visited a total of 8 schools and the only college at Sagar. They exhorted the students (from Std. V onwards excluding Std. X & XII in view of their Board exams.) to participate in this non-funded survey in their respective neighborhood adjoining school/residence. Dr Misra, in particular, highlighted that even if action is taken on planting the trees today, the effect will come after a gestation period of 20/25 years. So, we need to act asap as the human population meanwhile goes up and places a bigger demand on the depleted oxygen stock. Impromptu feedback was that fast-growing eucalyptus trees which were planted extensively as part of government-sponsored social forestry in the past decades have been most vulnerable to this cyclone. Another feedback was that the mangroves have been most resilient to the cyclone. The responses of the schools have been reasonably encouraging. One particular

school, viz. Krishnanagar High School, deserves a special mention as the probable guide teacher (Geography) volunteered to do this work by roping in the interested students during the impending vacation following completion of the annual exams. This baseline survey can also enthuse the students, teachers and other residents of Sagar Island to realize the need for ring-fencing the surviving trees and thus prevent/mitigate the impact of such climatic change by replanting locally suitable climate-resilient trees/shrubs. This survey can also help PUPA to approach a potential funding agency for financing replantations.

A collateral benefit will be facilitation of forming a dedicated Climate Action Group, which PUPA is thinking of, to focus on research & data depository, climate-resilient livelihood and conservation activities, environmental awareness for maintaining ecological balance and post-cyclone immediate relief measures. Meeting with MLA: The team also met Shri Bankim Hazra, honorable MLA (now Minister-in-charge, Sundarbans Affairs dept.) who advised the team to visit Nam Khana, even if we do not do any work there, as the most extensive damage has occurred in that block. He assured to provide all support in carrying out this survey and appreciated the work planned by PUPA at Sagar Island involving school's students. Farmers' MEET (Mrityunjay Nagar): During their stay in Sagar Island, the PUPA team also held farmers' meetings in the two villages of Mrityunjay Nagar and Kamalpur. The meeting at Mrityunjay Nagar was organized with the support of a local club, Maa Saradamoyee Sangha (MSS).

The foremost purpose of the meeting was to gather feedback from the farmers on their experience of growing paddy on their fields with 15 types of indigenous seeds distributed to them by PUPA in July, 2019. However, it was observed that the farmers have not documented their experience. In the context they expressed their willingness to learn preparation of organic manure to be applied for growing indigenous varieties of paddy. This meeting brought out the need for more organized monitoring from PUPA when such seeds and fertilizers are given to the farmers. PUPA team also advised for formation of a farmers' club, women's SHG and a youth club for all-round development of the village as a model village. On this occasion, some old clothes, etc. were handed over to MSS for distribution among the Bulbul-affected villagers. A farmers' meeting was organized in this village with the support of Mr. Asit Das, a school teacher of environmental studies and a resident of the village. The farmers in the village appeared to be forward-looking and were interested in making Kamalpur a model village. With this purpose in mind, a preliminary village census was done during the meeting. This exercise included listing out important public places and facilities available in the village, viz. schools, PHCs, doctors including quacks, temples, mosques, etc. A number of small farmers' groups was formed to experiment with alternative farming involving indigenous paddy and organic manure. (Cultivation Report (2019) PUPA Farm)

Traditional & salt tolerant paddy no of 30: - Hangra. Tangra. Taldi. Hormanona. Nonaketki. Talmugur. Orasal. Jhingesal. Rabonsal. Malaboti. Nonadudheswar. Laldudheswar. Nonabokhra. Sadamota. Nonapankoj. Langalmura. Kokilapatnai. Nonaswarna. Morichsal. CARI-V. Gosaba-5. Banskata. Bhuri. Moul. Kalavat. Sakvat. Asamlal. Pusa-5. Binni. Korpurdhuli. A List of paddies cultivated in Demi Farm in given in Annexure III A fiery cyclonic storm coded 'Bulbul' hit the coasts of South Bengal and Bangladesh between November 06 and 12, 2019. The storm lashed out at Sagar Island on November 08, 2019. As a result, all electrical connections were snapped and it caused huge damage to houses, particularly those made of mud. Irreparable loss was there in terms of damage of crops, trees, plants, etc. The main crop of paddy bore the biggest brunt of loss. However, there was no loss of life as the local government agencies moved people from vulnerable locations to a sizeable number of cyclone shelters built in recent times. Paribesh Unnayan Parishad (PUPA) has been cultivating various types of indigenous paddy for the last seven years in Sagar Island. In its demo plot, 130 types of indigenous paddy were cultivated this year. Due to incessant rain and wind brought by 'Bulbul' for a continuous period of 5 days, water level in the paddy fields rose to more than 2 feet. The plants were left shelter by the 'Bulbul', although a few streaks stood straight.

The best among these were the indigenous paddy varieties of tangra and tangrashal. Besides, the streaks of other varieties like CARI-5, hogla, narasinghasaru, khara, dhanraj, sadamota, pa tnai, dokra patnai could get straight quite fast even though they fell in the initial aftermath of Bulbul. Other plant varieties viz. HMTD, mugai, Nona Pankaj, hogla, nilanjana, hangra were affected most as these plants are very small-sized (2'-3' in height) and were under water for a longer period. Indigenous varieties like Pashkathi, asamlal, PNF, shakbhat, pusa5 grow fast and can be harvested within 90-120 days, but the flip side is that this early maturity makes the crop vulnerable to destruction by rats and the farmers have to wait for the second crop. This year yielded a good crop for all the paddy varieties. Jagannath silet, tangra, tangrashal, churnakathi, dhanraj, dokra patnai, niko, barsha, narkel chhari--the streaks of all these varieties could hold the crop despite wind, rain and Sun. Agriculture patnai, sada jhumur, mayur pankhi, niko, tangra, dhanraj, narkel chhari, -- these varieties could hold their green color for a long time till mid-December. PUPA

has been undertaking cultivation in the demo farm for a long time by using organic manure. This year we used 'Kala Sona' on an experimental basis. The manure was used first during preparation of the bed and then again one month after sowing. It was observed that the color of the plant was very good and the number of side streaks (Pashkathi) were comparatively more in number. Lal dudheshwar, aman dudheshwar, ghoramara dudheshwar--these varieties produced 40 to 50 side streaks on an average. Kokila patnai, CARI-5, jagannath silet, tangra, kamal, churnakathi--these yielded 30 to 35 side streaks on an average. PUPA wants to ensure ecologically safe and friendly cultivation through use of organic manure including cow urine and 'neem juice' as pesticide.

The minimum number of side streaks in other varieties is 17 or 18. The maximum and minimum number of side streaks in an adjoining field through non-organic methods of cultivation are 12 and 7.

- Seeds: 6-7 gms. for thin variety 7-10 gms. for thick variety
- Vermi compost: 1 kg. during rowing
- Cow urine: spraying 10 ml. with 50 ml. of water if the sampling size is 3"-4".
- Sagar Sona: 300 gms. with 5 litre of water once during preparation of bed and again after one month of sowing.

6. Conclusion

The beneficiaries will be from the families of small and marginal farmers. These farmers sell their produce immediately after harvesting when the price is the lowest as they do not have holding capacity. They purchase products like seed, fertilizers and daily consumables like vegetables, spices, oil, etc. at high market price. Owing to high cost of chemical fertilizers and pesticides and low crop productivity, agriculture is becoming non-profitable. This project aims at attracting the children to agriculture from an early age so that they take it as a viable profession as they mature as youths. Hence, we propose to introduce viable organic integrated farming among the families of the targeted beneficiaries by involving the children as part of their education and instilling interest, confidence and respect for the profession.

Recent prolonged pandemic situations, in addition to its associated crises of public health and economic hardships, provoke another most unfortunate consequence of losing reading-days as the schools remained closed and the children belonging to underprivileged families do not have access to online learning facilities, unlike their more fortunate counterparts in cities, and also do not get full support from their parents; causing increasing drop-out rate in rural areas of our country. It was also observed that the children do not get the opportunity of mixing together for outdoor games & sports, which are also equally important for their overall development, physical & mental.

The continuing progress of science and technology has made the world dependent on machines; along with comfort and convenience, tending towards 'work aversion'. In the year 2020, the humanity faced one of the worst crises of modern times as the virus 'Corona' locked us all at home and made the children 'the most vulnerable'; segment 'as a fall-out of the spread of the virus. All Government and private schools had to close down. Despite their unwillingness, the parents were forced to equip their children with mobile phones to facilitate studies. This constant companionship with the mobile phone and computer, the adverse impact on the body and mind of the children, and they started developing obesity and frayed tempers.

Further, nowadays, we observe little difference between life in a town and a village. There was a time when every afternoon in every village, the small children and the teens would gather in an open ground to engage in various games. This formed an integral part of the repertoire of Bengal's culture. The touch of modernity in the village life has made such scenes gradually fade more and more. The playgrounds are deserted and the people have started forgetting the names of the sports of those past. The advent of 'civilization' has driven the children towards the 'rat race' and their childhood is severely compromised. The games of yesteryears were full of simple and plain pleasure.

Considering all these, we (PUPA) started the SMART EDUCATION programme at Sagar Island, one of the biggest islands of Sundarbans, West Bengal with a modest support.

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Biography (12 font)

Dr. Amales Misra is trained Zoologist, but with a difference. After his retirement from Zoological Survey of India (ZSI), spanning more than 30 years as a scientist, decided to go back to his roots in the far-off Sagardwip where he was born and spent his childhood and conserve flora and fauna. While in service itself, he along with some of his colleagues formed

an NGO called "**Paribesh Unnayan Parishad (PUPA)**", dedicated to the cause of environmental conservation. Back in his village, he was shocked to see indiscriminate use of chemical fertilizers and pesticides in growing different crops which was a long way off the farming practices during his childhood days. Farming was then more rooted to the local agro-climate which can be technically called '**Organic Agriculture**'. The biggest challenge, to find a local solution to prevent excessive use of chemicals, led him to improvise an organic manure, '**Sagarsona**', being a product of Sagardwip, as a substitute for the chemical fertilizer. He is engaged in motivating the youth towards agriculture and local bio-diversity for quite some time, personally providing hand-holding support to a large number of students for attending **Children's Science Congress** and other state level programs, by promoting school curricula linked **Activity and Project-based learning under the banner of 'Krishna-Suchitra Memorial Centre for Rural Development & Research'**, with "**WIPRO Earthian Sustainable Education Programme**" for the last four years. Thus, he is a perfect embodiment of **environmental education, conservation and eco-friendly livelihood intervention** to develop **MODEL Village** at Sagar Island.

Mrs. Mahasweta Guha is an asstt. teacher (bioscience) of Pratapnagar Giridhari High School (H.S.) and simultaneously a Ph.D. scholar of WBSU. After completion secondary and higher secondary examination, with 75.6%, and graduation with 1st class, she joins in a govt. aided school at 2009. Simultaneously, she completes my B.Ed with 80% (2015), 1st class third and then M.Sc. with 86.2%(2020), 1st class second, but she never wants to stop my learning and exploring, also being a mother of three children and become victim of domestic violence's. Motherhood is not always another name of sacrifice but also strength. Then she qualifies GATE-Exam (2022) and West Bengal SET-Exam (2022), managing my all duties for my family and my babies. Then she pursues Ph.D. from 2022. During this time, she finds mycorrhiza and its beneficial roles which is helpful for sustainable developments to save our mother earth increasing the productivity of the agricultural field. She is an active member of **Paribesh Unnayan Parisad (PUPA)** and Breakthrough Science Society. With in one year of research she publishes three international publications and another three are in under procedures. Including these, she awarded from **WB science congress, JBNSTS- DST, National level innovation idea competition arranged by RK Mission and Ministry of Culture of Govt. of India** and honored for poster presentation from **IIT Madras and Australian National University**. Her initiative shows her responsibilities for poor dwellers of Sagardwip. She is an excellent teacher, resource person, communicator, leader, documenter, multitasker, trainer, mentor, narrator and writer with computer knowledges.



Picture: some glimpses of paddy cultivation

Picture: some glimpses of paddy cultivation

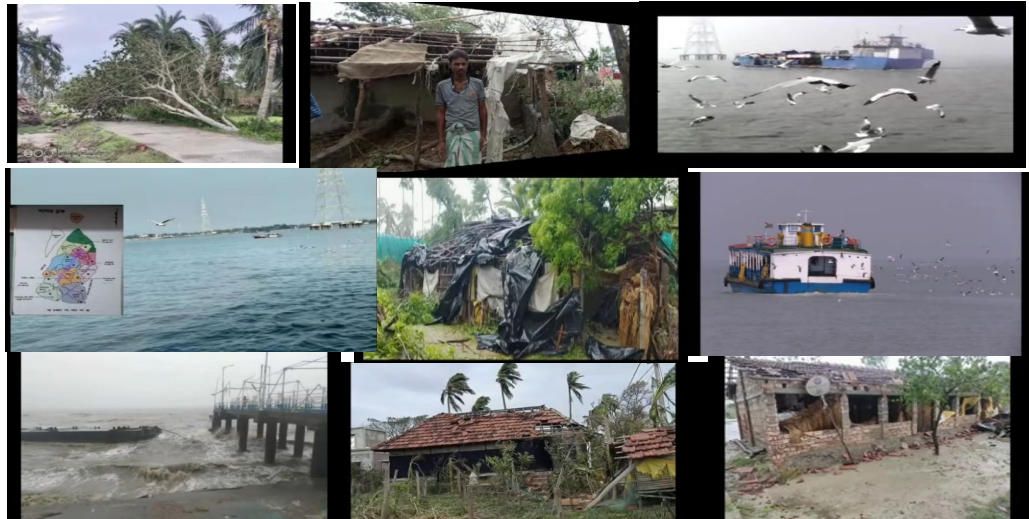


<p>A. NORTH SAGAR SMART EDUCATION CENTRE COORDINATOR: SUDIPTI HALDER</p> <ol style="list-style-type: none"> 1. Jeebanjyoti Bodhaday Folk School Village : Phulbari, Kashtala Coordinator: Rajnandini Das 2. Shilpara Nabajagaran Folk School Village : Shilpara Coordinator : Sumitra Giri 3. Bamankhali Pratam Alo Folk School Village : Bamankhali Leader : Susmita Bhunia 4. Bamankhali Alor Disha Folk School Village : Bamankhali Leader : Supriti Pramanik 	 <p>Yashirvadam Towards A Happier World... From The Ground Up</p> <p>NORTH SAGAR SMART EDUCATION CENTRE PARIBESH UNNAYAN PARISHAD Sagar Island, West Bengal</p> <p>Nature-based activity oriented Study Centre</p> <p>Approach of integrating traditional Knowledge with Science & Technology for a Sustainable Future</p> <p>Jeebanjyoti Folk school Phulbari Village Coordinator: Rajnandini Das</p> <p>Shilpara Nabajagaran Folk School Coordinator: Koyeli Giri</p> <p>BAMANKHALI PRATHAM ALO FOLK SCHOOL COORDINATOR - Supriti Pramanik Pradha</p>
<p>B. MIDDLE SAGAR SMART EDUCATION CENTRE COORDINATOR: SUMANA DAS</p> <ol style="list-style-type: none"> 5. Mahendraganj Dakshin Palli Folk School Village : Mahendraganj Coordinator : Renuka Maity 6. Mrityunjoynagar Mukhtangan Folk School Village : Mrityunjoynagar Coordinator : Annapurna Jana 	 <p>Yashirvadam Towards A Happier World... From The Ground Up</p> <p>Middle Sagar SMART EDUCATION CENTRE PARIBESH UNNAYAN PARISHAD Sagar Island, West Bengal</p> <p>Nature-based activity oriented Study Centre</p> <p>Approach of integrating traditional Knowledge with Science & Technology for a Sustainable Future</p> <p>Mahendraganj Dakshin Palli Folk School</p> <p>Mrityunjoynagar Mukhtangan Folk school Coordinator: Annapurna Jana, Date of Start: 01.03.2022</p>
<p>C. SOUTH SAGAR SMART EDUCATION CENTRE</p> <p>Co-ordinator : Anamika Manna</p> <ol style="list-style-type: none"> 7. Chemagari Kalpataru Folk School Village : Chemagari Coordinator : Rekha Dey 8. Bankimnagar Netaji Folk School Leader: Santanu Manna Village : Bankimnagar 9. Purushottampur Alor Disha Folk School Village : Purushottampur Coordinator : Rakhi Dinda 10. Purushottampur Achena Atithi Folk School Coordinator : Kamala Mondal Vill. : Purushottampur 	 <p>Yashirvadam Towards A Happier World... From The Ground Up</p> <p>SOUTH SAGAR SMART EDUCATION CENTRE PARIBESH UNNAYAN PARISHAD Sagar Island, West Bengal</p> <p>Nature-based activity oriented Study Centre</p> <p>Approach of integrating traditional Knowledge with Science & Technology for a Sustainable Future</p> <p>Bankimnagar Netaji Folk School</p> <p>Achena Thikana Folk School</p> <p>Purushottampur Alor Disha Folk School</p> <p>Chemagari Kalpataru Folk School</p>

Picture: some glimpses of Smart school of Sagar Island

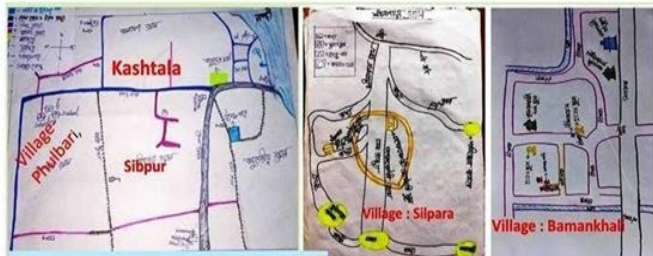
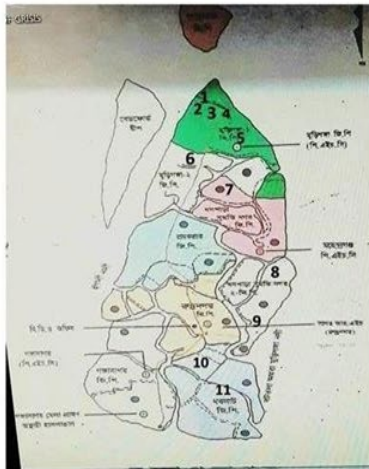


Selected 5 villages of Sagar Island for SC project (ST HUB)
★ Flooded area during YAAS Cyclone (2021)



Sagar Island Villages

1. KASHTALA
2. PHULBARI
3. SIBPUR
4. KACHUBERIA
5. Silpara-Hendalketki
6. Bamankhali
7. Mahendrganj
8. Mrityunajnagar
9. Bankimnagar
10. Purusottampur
11. Dablat Sibpur



Kashtrivadam NORTH SAGAR SMART EDUCATION CENTRE
 PARIKESH UNNATAN PARISHAD
 Sagar Island - West Bengal
 Nature-based activity oriented Study Centre
 Approach of Integrating Traditional Knowledge with Science & Technology

NORTH SAGAR SMART EDUCATION CENTRE
 Coordinator : Sudipti Halder
JEEBANJYOTI BODHADAY Folk School
 Village : Phulbari, Kashtala, Sibpur
 Leader : Rajnandini das
Shilpara Nabajaganar Folk School
 Village : Silpara
 Leader : Sumitra Giri
Bamankhali Pratam Alo Folk School
 Village : Bamankhali
 Leader : Susmita Bhunia

Village : Mahendrganj

Kashtrivadam Middle SAGAR SMART EDUCATION CENTRE
 PARIKESH UNNATAN PARISHAD
 Sagar Island - West Bengal
 Nature-based activity oriented Study Centre
 Approach of Integrating Traditional Knowledge with Science & Technology

Middle SAGAR SMART EDUCATION CENTRE
 Coordinator : Sumana Das
Mahendrganj Dakshin Palli Folk School
 Village : Mahendrganj
 Leader : Gouri Das
Mrityunajnagar Muktagan Folk School
 Village : Mrityunajnagar
 Coordinator : Annapurna Jana

Village : Mrityunajnagar

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 Village : Mrityunajnagar
 Coordinator : Annapurna Jana

Village : Bankimnagar

Village : Purushottampur

Kashtrivadam South SAGAR SMART EDUCATION CENTRE
 PARIKESH UNNATAN PARISHAD
 Sagar Island - West Bengal
 Nature-based activity oriented Study Centre
 Approach of Integrating Traditional Knowledge with Science & Technology

South SAGAR SMART EDUCATION CENTRE
 Co-ordinator : Anamika Manna
BANKIMNAGAR NETAJI Folk School
 Village : Bankimnagar
 Leader : Santanu Manna
Purushottampur Achena Athi Folk School
 Village : Purushottampur
 Leader : Kamala Mondal

Village : Dablat Sibpur

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 Village : Purushottampur
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Picture: MAP SHOWING THE TARGET VILLAGES (drawn by the students) Picture: some glimpses of natural calamities of Sagar Island