

Climate resilient agriculture in the coastal areas of the Sundarbans, W.B.

(Promotion of Salt tolerant Paddy)

Implemented by

PARIBESH UNNAYAN PARISHAD

(A project of GEF/UNDP/SGP/CEE/MoEF & CC)

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Summary

The project undertook, as one of its activities, the task of identifying, collecting and distributing salt tolerant varieties of paddy seeds (*Hangra, Nona Dhdheswar, Nona Malabati, Talmugur, nona Bokra, Kerala Sundari*, etc.) among the small and marginal farmers whose lands were affected by saline water intrusion at Sagar & Patharpratima Blocks. The result was miraculous in terms of significant growth in productivity (increase was more than 500-1000 kg/hectre) which ensured the subsistence farmers a square meal a day throughout the year. The farmers were also provided with training on **Farming with high organic inputs**. The project was also able to identify the salt tolerant capacities of the different paddy seeds. It was also necessary to create a stock or seed reserve of these rare varieties (SEED BANK) of traditional seeds so that more and more farmers could be reached. It was achieved through designing a **cost benefit sharing model** which has been implemented for keeping the project sustainable. We started with nearly 300 small farmers in 2014 and was able to extend the facility to more than 800 farmers at the end of the second year(2015).

As a result of extensive Community mobilization, a total 14062 HHs with a total population of 74163 (male 39031 & female 35132) and SC population 12501 under 28 villages, 6 GPs and 3 Blocks, **110 SHGs, 1651 SHG members, 25 Farmers Club, Farmers 650** were involved and nearly 100 traditional varieties of Paddy including 15 varieties of salt tolerant ones cultivated in 3732 bighas (**504 hectares / 1244 acres**) of land .

Name of the Project:

“Conservation of Local Agro Biodiversity for Better Livelihoods through use of Local Resources in Response to poor Areas of Sundarban”

Location/region and geographical scale of the project:

Patharpratima & Sagar Block, Sundarban; South 24 Parganas, West Bengal

Objective

Prime objective is to enhance the livelihood security of small and marginal farmers, particularly in climate sensitive zones of sundarban, WB through conservation and sustainable utilization of indigenous agro-biodiversity resources, particularly, salt tolerant varieties of paddy and empower the farmers with organic farming technologies , so as to adopt climate resilient livelihood options.

Other objectives are :—

- i) to establish sources of salt tolerant paddy seed and other crop & vegetable varieties;
- ii) to promote cultivation of all these varieties on a pilot demonstration basis for seed production and storing these seeds in Seed Banks for further distribution among the farmers;
- iii) to strengthen the capacity of farmer groups to produce and make available of all these seed to farmers, and to share experience;
- iv) to facilitate farmers' access to markets, including organic markets;
- v) to enhance access of farmers to local and state authorities, research stations, and other stakeholders for information on local agricultural biodiversity and improve information sharing among them.

The project undertook, as one of its activities, the task of identifying, collecting and distributing salt tolerant varieties of paddy seeds (*Hangra, Nona Dhdheswar, Nona Malabati, Talmugur, nona Bokra, Kerala Sundari, etc.*) among the small and marginal farmers whose lands were affected by saline water intrusion at Sagar & Patharpratima Blocks. The result was miraculous in terms of significant growth in productivity (increase was more than 500-1000 kg/hectre) which ensured the subsistence farmers a square meal a day throughout the year. The farmers were also provided with training on **Farming with high organic inputs**. The project was also able to identify the salt tolerant capacities of the different paddy seeds. It was also necessary to create a stock or seed reserve of these rare varieties (SEED BANK) of traditional seeds so that more and more farmers could be reached. It was achieved through designing a **cost benefit sharing model** which has been implemented for keeping the project sustainable. We started with nearly 300 small farmers in 2014 and was able to extend the facility to more than 800 farmers at the end of the second year(2015).

Project Report (Brief)

Most of the activities (climate resilient biodiversity conservation & livelihood options), particularly the promotion of salt tolerant paddy cultivation, were undertaken at two blocks of Sundarban (Patharpratima & Sagar Block).

Activities undertaken

- Traditional paddy with diversified organic inputs (available mostly locally) with satisfactory production. Salt-tolerant paddy cultivation with organic inputs and following the land-shaping methodology was promoted in saline lands;

[Highest productivity recorded was 2500 kg/acre (**6425 kg/ha**) for **Keralasundari** which is a traditional variety and can withstand salinity to some extent. Next to Keralasundari, the higher productivity was recorded for Hangra, Dhudheswar & Ranjit (HYV), all these are moderately salt tolerant, total 19 varieties of salt-tolerant paddy and the production enhanced (average 360 Kg/ 0.33 acres or **2694.5 kg/ha**) in saline affected areas.]

- Several Training programmes arranged Organic manure preparation [Compost (FYM), vermicompost, Jeebamrutha (Ghana & liquid), Fish tonic, use of *Trichoderma viridae*, *pseudomonas* sp., *Azotobactor* with PSB, Bacillus, etc.] during the period;
- Organic manure preparation [Compost (FYM), vermicompost, Jeebamrutha (Ghana & liquid), Fish tonic, use of *Trichoderma viridae*, *pseudomonas* sp., *Azotobactor* with PSB, Bacillus, etc.] continued by the farmers and used as organic manure & organic bio-pesticides for **soil biodiversity conservation**;
- Dhaincha (*Sesbania baculeate*), Bokful (*Sesbania grandiflora*), Sunhemp (*Crotalaria juncea*), Atasi (*crotalaria* sp.), Cowpea (*Vigna* sp.), black gram (*Vigna mungo*), *Moringa oleifera* etc. were introduced in the locality for the first time;
- SRI methodology was practiced during Aman & Boro seasons (with low input methodology);
- Vocational training (Organic farming, House wiring & food processing) with co-financing support by CDTP scheme of J. C. Ghosh Polytechnic, Kolkata;
- **Two six day long Poultry training (TOT)** was conducted by Dr. Indira Nayar, Central Poultry Development Organisation, Bhubaneswar so as to make profit by following effective vaccination schedule and also by using locally prepared balanced feed material. 50 candidates participated in the training;
- Institutional arrangements with local stakeholders to bring together the '**knowledge holders**' of traditional farming, rituals (customs) and food preparation to give due recognition and empower them. Awareness campaigns on climate variability and the need to adapt to climate change;
- Providing incentives for in situ seed conservation, introduction of sustainable farming methods, establishing a **savings and credit scheme**, training in group dynamics, handholding support for financial management and marketing of organic produce designed.

Project Implementation results

- 106 Kitchen Gardens developed
- Five Training programmes arranged Organic manure preparation [Compost (FYM), vermicompost, Jeebamrutha (Ghana & liquid), Fish tonic, use of *Trichoderma viridae*, *pseudomonas* sp., *Azotobactor* with PSB, Bacillus, etc.] during the period.
- Organic manure preparation [Compost (FYM), vermicompost, Jeebamrutha (Ghana & liquid), Fish tonic, use of *Trichoderma viridae*, *pseudomonas* sp., *Azotobactor* with PSB, Bacillus, etc.] continued by the farmers and used as organic manure & organic bio-pesticides for **soil biodiversity conservation**
- SRI methodology was practiced during boro season by limited farmers (5 farmers) .
- Vocational training (Organic farming, House wiring & food processing) supported by CDTP scheme of J.C.Ghosh Polytechnic.

- A six day long Poultry training was conducted by Dr. Indira Nayar, Central Poultry Development Organisation, Bhubaneswar so as to make profit by following effective vaccination schedule and also by using locally prepared balanced feed material. 50 candidates participated in the training.
- Awareness campaigns on climate variability and the need to adapt to climate change.
- Providing incentives for in situ seed conservation, introduction of sustainable farming methods, establishing a **savings and credit scheme**, training in group dynamics, handholding support for financial management and marketing of organic produce designed.
- Water & soil tested for salinity level.
- As a result of counselling for promotion of salt tolerant and traditional paddy varieties a total of 3732 bighas of land (534 hectares / 1244 acres) of land included under paddy cultivation by more than 650 farmers.
- Total paddy varieties cultivated were 100 traditional varieties of Paddy including 15 varieties of salt tolerant ones at 10 Demo Plots.
- Ten Demo farms for salt tolerant paddy (Talmugur, Hamilton, Sada ghetu, Malabati, Dhudheswar, Hangra, sada bakra and few others) conservation are supported.
- 100 traditional varieties of Paddy including 15 varieties of salt tolerant ones, were conserved and the following varieties were cultivated for seed production: Dhudheswar, Malabati, Sadamota, Nonasampad, Nonaswarna, Radhatilak, CR2314, CR2328, Ranjit, Radhatilak, Patnai, Sadakalobakra, Radhuni-pagal, Hangra, Tulaipanji, Talmugur, Hamilton, Lalghetu, Bhuri, Keralasundari, Gobindabhog, Charmani, Jugal, Kamalabhog.

Major outputs and benefits

- Output 1: Salt-tolerant Paddy and vegetable seeds of local varieties available to farmers through Seed Banks;
- Output 2: Capacity building of farmers & SHG members :
 - *[Organic farming (>150 farmers); Integrated Farming System (>100 farmers); Low cost Paddy Cultivation (>200 farmers); Nursery management (>50 SHG Members); SHG Management (>150 Women); Poultry cultivation (> 50); Miscellaneous vocational Training (> 40)]*
- Output 3: Local Markets for local varieties of crops & vegetables grown with organic input (accessed by farmers);
- Output 4: Information on local agricultural biodiversity available to farmers, local govt. authorities, donor Agency and the public;
- Output 5: A draft plan for replication of best practices on agro-biodiversity conservation and lessons learned agreed with local stakeholders.

Table: 1– Production of salt tolerant paddy varieties in one of the ten Demo plots

Sl. No.	Paddy varieties	Plot No. *	Salt tolerant (opinion of Farmers)	Maximum tillers noticed	Production (recorded for 10 varieties only) Kg/ha
1.	Hangra	P-4, P-10	+++	23	3828.5
2.	Hamilton	P-10	+++	24	2595.5
3.	Malabati	P-1, P-3, P-5, P-6, P-9, P-10	+++	21	2595.5
4.	Talmugur	P-10	+++	23	2595.5
5.	Dudheswar	P-1, P-3, P-4, P-5, P-6, P-7, P-8, P-9, P-10	++	29	2964
6.	Kalobakra	P-5	++	13	NC**
7.	Kerala Sundari	P-10	++	23	5557.5
8.	Ranjit	P-1, P-2	++	27	3828.5
9.	Chamarni	P-9	+	26	3087.5
10.	Lal Ghetu	P-10	+	14	NC**
11.	Nonasampad	P-1	+	NC	NC**
12.	Nona swarna	P-1	+	NC	NC**
13.	Patnai	P-2	+	15	NC**
14.	Sadakaakra	P-3, P-7, P-8	+	NC	2223
15.	Sadamota	P-1, P-3, P-5, P-8	+	21	3211

*** Plot No. & Farmer's Name :** P-1: Saroj Panda (Kachuberia, Sagar); P-2 : Bhaskar Pramanik (Kachuberia, Sagar); P-3: Pradip Mandal (Pakhirala, Sagar); P-4: Achinta Khanra (Pakhirala, Sagar); P-5: Madan Pal (HendalKetki, Sagar); P-6: Anusuya Maity (Boatkhal, Sagar); P-7 : Tapasi Kalsa (Boatkhal, Sagar); P-8: Arati Bhuniya (Boatkhal, Sagar); P-9: Sudhanshu De (Durbachati, Patharpratima); P-10: Ashoke Pradhan (Rakshashkhal, Patharpratima)

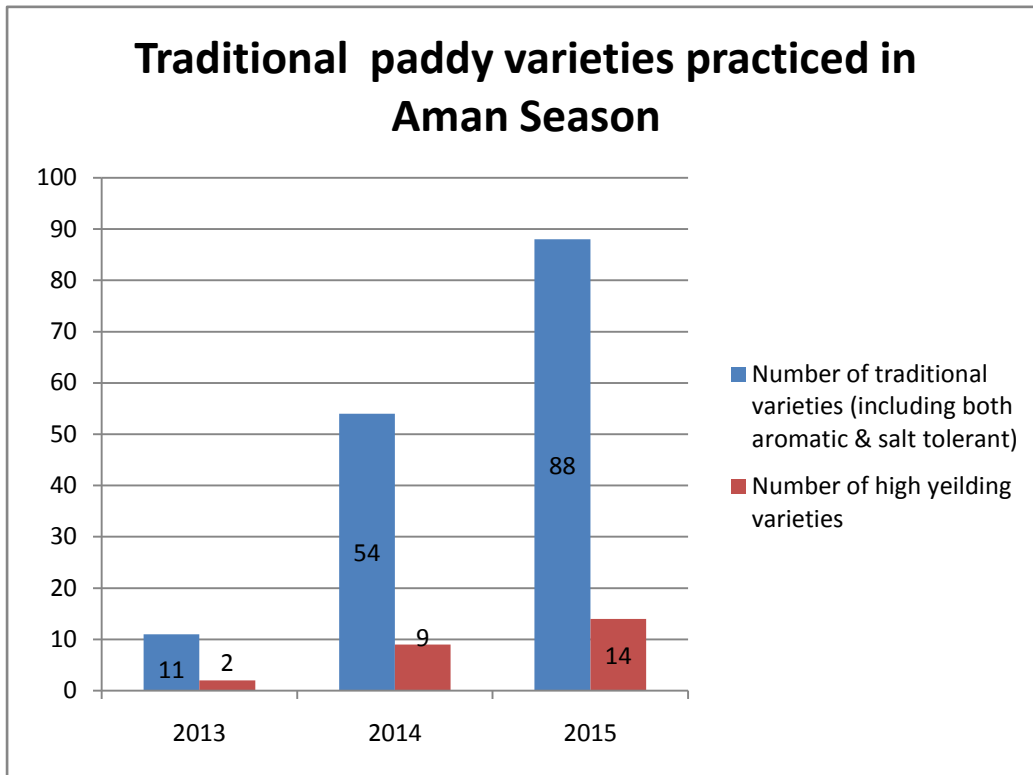


Table: 2 – Details of Paddy cultivation report (Village wise):

Sl. No.	Name of the Village	Name of the Block	Name of the varieties Cultivated	No. Of farmers Adopting	Area of land Cultivated in (in acre)	Productivity of Paddy/ Hectare (Kg)
1	Durbachati	Patharpratima	Malabati, Dhudheswar, Charmani, Jugal, Anticancer, Tulsimukul, Joha, Tulaipanji, Gobindabhog, Kamalabhog	28	30	2000 to 2240
2	Rakshaskhali		Dhuseswar, bhuri, hamilton, Hangra, lalghetu, talmugur, keralasundari, gobindabhog, malabati	122	150	2000 to 2250
3	Gobindapura bad		keralasundari,	39	4	4250
4	Indrapur		keralasundari,	37	92	4250
5.	Dakshin Sitarampur		keralasundari, malabati	47	14	2250
6	U.Sitarampur		keralasundari	21	21	2260

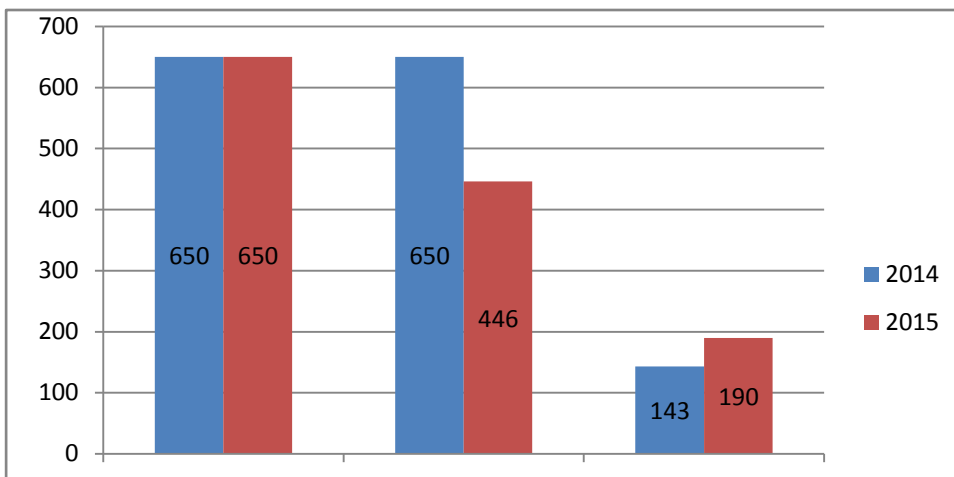
7.	Buraburirtat		keralasundari	28	84	3200	
8.	Gobardhanpur		keralasundari	29	87	3200	
9	Kachubera		Dhudheswar, Malabati,sadamota,nona sampad, nona swarna, radhatilak, CR2314, CR2328, Ranjit (HYV)	25		1500 to 2000	
10	Pakhirala		Radhatilak, Patnai, Ranjit Dhusesar, malabati, sadamota, sadakalobakra, radhatilak, radhuni pagal, Hangra	20		1400 to 1550	
11	Patharpratima		Dhudheswar	26		2520	
12	Hendal ketki	Sagar Block	Sadamota, malabati, dhuseswar, tulaipanji, kalobakra	35		1800 to 2500	
13	Silpara		Dhudheswar, patnai	20		1600 to 2500	
14	Mooriganga		Dhudheswar,patnai	20		1600 to 2500	
15	Phulbari		Dhudheswar,malabati,patnai	15		1500 to 2500	
16	Sibpur		Dhudheswar	12		2000 to 2500	
17	Mrityunjaynagar		Dhudheswar	15		2000 to 2500	
18	Boatkhali Sibpur			Malabati, dhudheswar Kalobakra, sadmota	10		1800 to 2500

Organic farming or cultivation of traditional variety was not of extensive use in Sagar Is. But some farmers like Sushil Patra (Khan Sahib Abadh), Soshanka Maity (Kostala), Prabhas Bhunia (Sapkhali), Robin Jana (Kastala), Amar Das (Patharpratima) used to practice the process of cultivation from their ancestors. Those were not scientific and technically strong.

After establishment and working of PUPA, due to continued awareness and different training programs, many farmers have understood the ill effects of chemical fertilizers as well as High yield varieties. So many farmers now a days are trying to shift towards organic farming, if not fully then partially. In a training program, a brief discussion on benefit-cost ratio of High yield and traditional varieties was calculated, it was almost equal in both the cases, but high yield needs application of more

chemical fertilizers and insecticides which leads to both environmental problems and also health problems of consumers. In a survey conducted in 2014, it was found that among 650 households cent percent farmers used to apply chemical fertilizers and only 143 farmers used to cultivate traditional varieties like Malaboti, Hangra, Dudheswar, Chapakusi. Where as in 2015, among 650 households, 446 farmers were found to reduce their chemical fertilizers to some folds and replaced it with organic manures and 190 farmers were found to produce traditional varieties of rice. Some new traditional varieties like Kerala Sundari, Darokasal, Tangrasal, Jhingasal, Harinakhuri, Binni came into existence.

No. of farmers using Traditional paddy & Organic manures (2014 & 2015)



**Detailed information on paddy cultivation from 2013
Aman paddy, 2013**

Total varieties cultivated	13
Traditional varieties (including both aromatic & salt tolerant)	11
High Yielding varieties	2

Boro paddy, 2013-14

Total varieties cultivated	4
Traditional varieties (including both aromatic & salt tolerant)	2
High Yielding varieties	2

Aman paddy, 2014

Total varieties cultivated	63
Traditional varieties (including both aromatic & salt tolerant)	54
High Yielding varieties	9

Boro paddy, 2014-15

Total varieties cultivated	5
Traditional varieties (including both aromatic & salt tolerant)	3
High Yielding varieties	2

Aman paddy, 2015

Total varieties cultivated	102
Traditional varieties (including both aromatic & salt tolerant)	88
High Yielding varieties	14

Emission reduction / increase in adaptive capacity

Emission reduction has not yet been studied. However, paddy cultivation in saline low-production field/barren fields certainly keeps green vast areas of Sundarban and absorbing Carbon-di-oxide for a period of 5-6 months in a year.

Capacity building of the farmers & SHG members mentioned in Output 2 under Column 8 above proves the increase in adaptive capacity of the community members targeted.

Success Story

Paddy Seed Support (Var. Kerala Sundari) Amrit Das

Dakshin Sitarampur, Patharpratima

He has 2 bigha (1 bigha=0.162 hectare) land in two different places, one bigha each. Out of these two lands, one land is fully saline (Plot-II) whereas the other is slightly saline (Plot-I). He tried to cultivate many varieties of rice but failed. But, with the help of PUPA, he was



provided 5 Kg Kerala Sundari free of cost with the condition of returning the same quantity of rice to the organization after harvesting so that the help can be spread to more needy people having saline soil. Both in Plot-I and Plot-II, he prepared his seed bed on 2nd July, 2015 with wet bed method. Transplantation was done after one month i.e on 2nd Aug, 2015. No fertilizer or medicine was used to cut the expenditure cost as he was not sure of the production. In terms of flowering, Plot-I having slightly saline soil flowered on 20th Nov, 2015 whereas Plot-II having fully saline soil flowered a little late on 28th Nov, 2015. Soil is collected from both the plots to know in details about the soil. When the discussion comes to production, Kerala Sundari in Plot-I produced 29.616 quintals/ hectare and Plot-II produced 24.68 quintals per hectare. For further details, please refer to the tables given below.

Lessons Learned:

Intrusion of saline water and consequent degradation of agricultural soil is a major threat in this coastal area. This has caused large-scale migration of young-folks from these areas to South Indian states as labourers.

- ❑ The productivities of salt-tolerant paddy varieties are not independent of soil salinity, so replication in experimental fields over a few years are necessary before conclusive results can be inferred.
- ❑ Moreover, the problem of climatic hazards is increasing and likely to increase further with water level rising.
- ❑ Salt tolerant paddy varieties are known to some farmers of some parts of Sundarban, but not to all. This project provides the scope of exchanging information amongst the farmers.
- ❑ Sadakalo bakra, Talmugur, Hamilton, Talmugur, Lal Gheus, etc. are well known salt tolerant varieties. However, paddy like, **nona Dhudheswar, Malabati, Hangra, Chamarmoni**, collected from Farmers of Sundarban area and **Kerala Sundari** (Horticulture Farm, Calcutta University, Agriculture Dept., Baruipur) etc. are proved to be salt tolerant.
- ❑ Most important lesson learnt by all of us (NGO, Community members & other stakeholders) that no **HYV varieties of paddy** is able to tolerate even a lower level of salinity. However, only one HYV variety, **Ranjit** was found to be survived in lower salinity.
- ❑ Land shaping, seed selection, transplantation of older sapling, organic manuring — all these gave us the better results.
- ❑ Lesson learnt by all of us (NGO, Community members & other stakeholders) that diversified organic manures are essential for cultivation of Salt tolerant varieties of seeds. These inputs could be produced in the farmers' own fields.
- ❑ Another lesson learnt from the field that, nature would help paddy varieties to evolve & adjust in the coastal saline areas, which needs to be observed, recorded and promoted.

Best Practices (three, so far identified)

i) Identification of salt-tolerant paddy varieties corresponding to salinity of soil & Traditional paddy conservation

The intrusion of saline sea water during the devastating cyclone (Aila) in 2009 not only destroyed the standing crops but degraded the soil to such an extent that the lands were left barren for nearly five years. The project introduced indigenous salt-tolerant paddy varieties (like Hamilton, Tal Mugur, Kerala Sundari, Gheus, Malaboti & so on) on an experimental basis in the farmers fields. The outcome was positive but productivity varied depending on salinity of the soil. It was positive in the sense that substantial output was obtained in fields that had little or no yields with the common HYVs. But to get the best result the paddy varieties need to be matched with the soil salinity. First year's results reveal



Salt tolerant Paddy Cultivation Report:

Name of the farmer	Village (Pathar Block)	Soil testing Report [ECe (dSm ⁻¹)]	Cultivation (2014) & productivity/hectre	Cultivation (2013) productivity
Shyamal Kinkar Das	Krishnadaspur	9.0	Hamilton Talmugur 1120 kg	Dhudheswar 560 kg
Bharat Hasda	Satyadaspur	1.5	Dhudheswar & Malabati 1960kg	1010 & 1017 1120 kg
Bimal Kr. Bhunia	Dakshin Sitarampur	1.9	Dhudheswar & Malabati 1960kg	Barsa pankaj 840 kg
Ananta Bera (Lang shaping)	Dakshin Sitarampur	8.5	Malabati & Sadakalobokra 1120 kg	Uncultivated due to salinity
Ramchandra Das	Krishnadaspur	6.5	Dhudheswar & Charmani 1400 kg	Sada mota champakusi 840 kg
Bimal Dinda	Gobordhanpur	8.7	Dhudheswar & Malabati 1680 Kg	Champakhusi 1120 kg

But these have to be replicated a number of times under varying conditions to get robust inferences.

ii) Integrated farming using local resources.

At present there is single cropping as agriculture is monsoon dependent. The river & canal waters are saline. To increase cropping intensity either a pond is excavated or the depth of the existing pond is increased to store rain water. This gives an additional winter crop /vegetables. Fruit trees or other plants can be grown along the bank of the pond and during summer when the water level falls, the slopes of the banks can be used for growing leafy vegetables. In addition there is scope of fishery and ducks. One can also have poultry. For marginal farmers these are sources of additional income. There income can be further enhanced by reducing cost of fertilisers by using home-made fertilisers and manures like vermicompost, fish tonic, jeevamurtha. These also help in retaining the fertility of the soil. Fish and poultry feed can also be prepared at home at low cost. It may also provide income security through diversification of activities.

iii) Cost-Benefit Sharing (with interest free project support)

This particular economic design is followed in supporting any income generation activity of the project. The cost of the activity (calculated jointly by the beneficiaries & the skilled project staff) is equally shared in most of cases between the beneficiary and the project fund. The project fund is given at zero percent interest but the principal amount has to be returned to another member of the group or community (discussed, finalised resolution recorded in Group's meeting, and written in MOU). Thus timely payment benefits another member of the group or community. Moreover, repayment is assured by peer monitoring. By providing interest free loan of half the activity cost, the interest cost on the full amount is halved, thereby increasing profitability of livelihood activities as well as making repayment easier. This revolving fund should make the project economically sustainable even after the completion of the project, with the help of village level institutional development (Village Committee including SHG members).

*This is prepared from the **Final Report** submitted to National Coordinator, GEF/SGP/SGP, during 2016.*