Federal Ministry
for Economic Cooperation
and Development

Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

Progress Report BMZ Project Funding

General Information

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Reporting period	January 1st, 2018 to December 31st, 2018
Submit by e-mail to	beaf@giz.de

Federal Ministry
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giz Deutsche Gesellschaft
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1. Basic data

The IARC applicant	The International Potato Center (CIP), Lima, Peru
Project title	Strengthening food system resilience in Asia's mega deltas with salt-tolerant sweetpotato and potato
Funding type, GIZ Project Number and Contract Number	International Agricultural Research, GIZ Project No. 17.7860.4-001.00, Contract No. 81219432.
Reporting Period	January 1st, 2018 to December 31st, 2018
Project Coordinator and Project Scientists	Dr. Jürgen Kroschel, Head Agroecology/IPM Team Project Leader Av. La Molina 1895, Lima 12, Peru Tel: (51)(1) 349-6017 Annex 3070 Fax: (51)(1) 317-5326 Email: j.kroschel@cgiar.org Dr. Ebna Habib Md Shofiur Rahaman (Project Manager) Dr. Marcel Gatto, Economist (CIP, Vietnam) Dr. Wolfgang Grüneberg, Sweetpotato Breeder (CIP–Peru) Farhana Hossain Ibrahim, Admin Officer (CIP–Bangladesh) Gazi Shamsuzzaman, Finance Officer (CIP–Bangladesh)
Project Partners	University of Hohenheim (UoH), Germany Prof. Dr. Folkard Asch Bangladesh Agricultural Research Institute (BARI) Dr. Abul Kalam Azad (DG-BARI) Dr. A.K.M. Shamsul Hoque (Director-TCRC) Dr. Horidas Chandra Mohanta (PSO-TCRC) Dr. Bimal Chandra Kundu (PSO-TCRC) **Prodipan** Md. Ferdausur Rahman, Executive Director Durgapada Sarker, Project Officer **ACI Seed Ltd.** Sudhir Chandra Nath, Head of Business **Supreme Seed Ltd.** Md. Mokfor Uddin Akond, Vice-Chairman

2. Progress Report

State of Project Implementation

Goal:
Contribute to increased system productivity and healthier diets in Bangladesh's delta region through adoption of resilient, nutritious potato (P) and sweetpotato (SP) varieties, better agronomic practices, and improved utilization of the crops.

Purpose/outcomes:
Strengthen farmer access to and utilization of improved, salt-tolerant P and SP, specifically biofortified orange-fleshed sweetpotato (OFSP) varieties and support the capacity of

National Agricultural Research Systems (NARS) for continued varietal development, selection, adaptation, and release.

State of activities and achievements of the indicators for the project outputs:

Output 1: Improved, accelerated breeding methodologies adapted, and improved phenotyping tools and evaluation methods identified to support development of salt-tolerant P and SP varieties by NARS.

- Five CIP potato clones with three check varieties were evaluated in 2018 at an advance yield trial (AYT) experiment at six locations. The highest average marketable yield (44.51 t/ha) was observed in clone CIP-225, which was statistically similar to clones CIP-218 (43.29 t/ha) and CIP-235 (43.01 t/ha). Average dry matter (DM) percentage of all tested clones was 18–19%, which is below requirements for processing purposes. When organoleptic tests were conducted, CIP-235 outperformed checks regarding taste, appearance, and texture. Fewer disease and insect infestations were observed in all CIP clones (BARI Research Report for 2018 is in Annex 2). Considering yield, percentage of DM, taste, and disease reaction, the best three clones (CIP-225, CIP-218, and CIP-235) were selected and planted as a regional yield trial (RYT) in 2019 and will be harvested in March 2019. The results of such experiment will be presented in next year's report.
- A total of 73 genotypes introduced from CIP–Mozambique were evaluated in 2018 considering yield and yield-contributing characteristics. Wide variation was observed in yield, which varied from 5.56 t/ha to 42.59 t/ha, and flesh color, from white to deep orange with purple shade (see Annex 2). Considering all parameters, 30 clones have been selected and planted as RYTs in 2019 and will be harvested in March 2019. The results of such experiment will be presented in next year report.
- Fifteen SP genotypes with contrasting beta-carotene and mineral content that were provided by CIP were evaluated at Gazipur and Bogura. This was done to identify clones contrasting with higher yield, high sugar and DM content, earliness, weevil resistance, and better nutritional quality. Considering these criteria, only 9 genotypes were selected out of 15 for the next year trial: CIP-106082.1, CIP-188002.1, CIP-189151.8, CIP-194281.2, CIP-199062.1, CIP-420001, CIP-440004, CIP-400039, and CIP- 440181 (see Annex 2).
- To develop biofortified P varieties resistant to late blight (LB) and virus, 50 zinc- and iron-rich P germplasm were introduced to TCRC, BARI, from CIP–Peru in February 2019 (Table 1). The germplasm is now maintained and multiplied at TCRC's tissue culture laboratory.
- To develop high DM, short-duration OFSP, and purple-fleshed sweetpotato (PFSP), 22,591 seeds from 12 crossing families and 5,000 seeds from 33 crossing families were imported from CIP–Peru and CIP–Mozambique, respectively, during the reporting period (Table 2).
- Two SP scientists, Dr. H.C. Mohanta and Ms. Shamima Sultana, and two P scientists, Dr. B.C. Kundu and Mr. Manik Ali, of BARI were trained on accelerated breeding schemes and evaluation methods on both crops by participating SP breeders' workshop at the Central Tuber Crops Research Institute, Kerala, India, and Global CIP Potato Breeders Workshop in Guwahati, Assam, India. There will be another training program on the same topics involving other scientists and technicians of TCRC, BARI in 2019.

- Owing to high security risks in Bangladesh and the fact that the GIZ is not sending students currently to Bangladesh, all student-related activities will take place at UoH, Germany. The activities will be supervised by Prof. Dr. Folkard Asch if they cannot be linked to field-based activities in Bangladesh as originally planned. The following persons were trained, and activities were conducted during the reporting period:
  - **Johannes Brunner** (training for BS): Research on "Salt stress effects on the uptake and distribution of Sodium, Potassium, and Chloride in potato genotypes." Training period: 1 March–31 October 2018. Content of training: plant cultivation in soil in the greenhouse, soil analyses, salt stress theory, sampling procedures, sample preparation and extraction, flame photometer, auto-analyzer, statistical treatment of data, science writing.
  - **Ines Münchinger** (training for BS): Research on "Effects of salt stress on the enzymatic detoxification of oxygen radicals in leaf tissue of sweet potato clones." Training period: 1 July 2018–31 January 2019. Content of training: multiplication of SP clones, plant cultivation in hydroponics in the greenhouse, hydroponic solution, salt stress theory, sampling procedures, sample preparation and extraction, enzyme activity analyses for glutathione reductase, ascorbate peroxidase, superoxide dismutase, and peroxide dismutase, statistical treatment of data, science writing.
  - **Ebna Rahaman** of CIP received post-doctoral training on "Plant response to salinity using potato" on 13 June–28 July 2018. He received hands-on training on plant sample analysis to determine sodium, potassium, and chloride. Further training is due for June 2019, to acquire knowledge and hands-on training on enzyme activity analysis of P plants under salinity-stress condition. (See Annex 8 for content of the training.)
  - **Shimul Mondal** (training for PhD): Research on "Salinity tolerance of selected sweet potato clones." First training period: 1 October 2018–30 April 2019. Content of training: multiplication of SP clones, plant cultivation in hydroponics in the greenhouse, SPAD, hydroponic solution, salt stress theory, sampling procedures, sample preparation and extraction, flame photometer, auto-analyzer, statistical treatment of data, science writing.

Output 2: Improved methodologies and capacities in the seed value chain for sustainable and socially inclusive production, distribution, and marketing of high-quality seed of released salt-tolerant and nutritious P and SP varieties.

- A multistakeholder workshop on P and SP seed systems was conducted in Khulna in November 2018; 22 participants from different stakeholders were present. A workshop report was prepared (Annex 3) and a seed system report will be available in May 2019.
- Between November and December 2018, data collection to establish a socioeconomic baseline was conducted. Dr. Saiful Hayat, consultant from Bangladesh Agricultural University in Mymensingh, led the implementation of the survey. MOOD Technologies supported the data handling from Uganda. A team of six enumerators interviewed 450 households (HH) in six Upazilas in two districts, Khulna and Satkhira. The final datasets were submitted on 26 February 2019, and the data are being analyzed. A detailed baseline report is expected to be available by May 2019. MOOD Technologies has produced some basic, descriptive statistics (see Annex 4).
- The Ministry of Agriculture has signed on with two large P seed-producing companies, Supreme Seed Company Ltd and ACI Seed Ltd, to involve them in seed production and marketing system of newly released, salt-tolerant P variety (CIP-396311.1 [BARI

Alu-72]) in southern Bangladesh. Both companies multiplied seed of this variety and required amount of seeds for marketing will be available in November 2019.

- Twelve SP vine multiplication nurseries were trained on quality vine multiplication and established nurseries of five OFSP varieties to disseminate among the project beneficiaries. All the nurseries received 250 vine cuttings of these varieties from TCRC, BARI on August 2018, in order to multiply vines to conduct participatory variety evaluation trial in farmers' fields. Up to the reporting period, all the nurseries produced 32,500 vines cuttings, sold to project beneficiaries, and from where they earned BDT 13,000 (Table 3).
- TCRC, BARI produced breeder seeds of saline-tolerant P varieties and provided 500 kg of BARI Alu-72 to BADC, 300 kg to Supreme Seed Ltd., and 500 kg to ACI Seed Ltd. for multiplication.

Output 3: Participatory selection of P and SP varieties and agronomic practices best suited to local cropping patterns, agro-ecologies, and farmer and consumer preferences.

- A total of 28 demo plots of a newly released, saline-tolerant P variety were established in two communities of Khulna and Satkhira districts. All the farmers were trained on improved production technology and postharvest management of the crops. There will be farmers' field days during the crop harvesting time in March 2019.
- Twelve demo plots consisting of five BARI-released promising OFSP varieties were established in six communities of Khulna and Satkhira districts. Preferred varieties will be identified by the farmers during field days and taste-testing program during crop harvesting time in April 2019. Next year, 250 vines of selected varieties will be given to each of the HH to produce OFSP roots in their home gardens.

Output 4: HH-level utilization of OFSP and P improved, in particular, to support young-child nutrition.

- A total of 5,000 HH were selected from six communities of Khulna and Satkhira districts by Prodipan, with the help of local Department of Agricultural Extension (DAE) to disseminate saline-tolerant P and SP varieties and nutrition messaging among the beneficiaries.
- Fifty community nutrition scholars (CNS) were recruited and trained on 12 different topics of nutrition, personal hygiene and sanitation, child feeding, appropriate cooking practices, home gardening, P and SP production, and others. (A training report is attached in Annex 5). All the CNS received a printed copy of a nutrition messaging module (Annex 6) and a flipchart (Annex 7). They have started nutrition messaging sessions to 5,002 women beneficiaries from November 2018; these will continue until April 2019. Next year, they will also provide same sessions from November 2019 to April 2020.
- A total of 5,002 women received a winter vegetable seed package of 50 g of red amaranth, 50 g of Indian spinach, 25 gm of *kangkong*, and 10 pieces of pumpkin seeds in January 2018. They planted the seeds in their home gardens from where they will consume required amount of green fresh vegetables. They will also receive summer vegetable seed package in April 2019.
- As of the date of this report, among the 5,000 farmers trained, 600 received 50 OFSP vine cuttings of BARI SP-4 and BARI SP-8 varieties to grow in their home gardens. Vine distribution is underway; every participant of nutrition messaging session will receive 50 vine cuttings by 2019.

General Achievements and Problems encountered

a) General Achievements

- A letter of agreement was signed by all the project implementing partners: UoH, Germany, BARI, Prodipan, ACI Seed Ltd., and Supreme Seed Co. Ltd.
- Two large seed companies in the seed production and marketing system of salt-tolerant P variety were engaged in southern delta of Bangladesh.
- Before trainings, farmers in the project territory had very little knowledge about OFSP and its nutrition value. But through the messaging session they show enthusiasm and willingness to adopt OFSP to produce in their home gardens as a novel food.
- The nursery owners want to expand their nursery area next year because they found it is very profitable business that requires very low investment and getting three times more benefit. Recruited CNS also showed interest in establishing vine multiplication nursery to get quick benefit, having seen the demand from the beneficiaries.
- Supreme Seed Co. Ltd. provided 700 kg of certified seeds of saline-tolerant P variety (BARI Alu-72) to be distributed to 28 farmers to establish demo plots in two communities of Khulna and Satkhira districts. Planting this seed in their farms and observing the substantial growth difference between salt-tolerant P and local P varieties greatly pleased the farmers. They expected the new variety to be more profitable than local ones and wanted to keep part of their produce as seed potato for next season if suitable storage facilities are available. Prodipan will facilitate linking storage facilities and farmers.
- A project baseline study and seed system study has been completed, and the final report will be available in May 2019.
- Fifty biofortified and LB- and virus-resistant P germplasm was imported from CIP–Peru.

b) Problems Encountered

The problems/challenges encountered during the reporting period which impacted project implementation and achieving intended purposes are as follows:

- Shortage of manpower at field level is a great challenge to implement and monitoring the project activities smoothly.
- Availability of newly released, salt-tolerant potato variety quality seeds was one of the major challenges to technology dissemination.
- Farmers are less interested in introducing OFSP to their home gardens. Instead, they are expecting large number of vine cuttings for root production in the field.
- There is not enough good quality mini-seed packet of vegetables available in the market to distribute among beneficiaries for their home gardens.
- Implementation of some of the project activities was delayed due to political instability during the national parliament election in November–December 2018.
- One German student is expected to conduct a “sandwich” research program both in Germany and Bangladesh. However, because of GIZ’s travel restrictions, this important activity is on hold.

Conclusions for the Following Reporting Period

All planned outputs of the project are relevant and achievable. Since the project's inception in March 2018, CIP and its project partners have made overall good progress in all four project outputs (see, too, Annex 1). The availability of seeds and vines to farmers in a short span of time created huge demand in the project's area of influence, which will help in quick dissemination of saline- tolerant P and SP varieties during the next season. Nutrition messaging through CNS activities at community level will help change people's behavior. The distribution of seasonal mini-packs of vegetable seeds will create demands for growing vegetables in the homestead gardens, in turn enhancing the consumption of vegetables among the HH members.

Publications, Papers, and Reports

1. Kroschel, J., E.M.H.S. Rahaman, and F.H. Ibrahim. 2018. Project Inception Workshop Report. International Potato Center, Dhaka, Bangladesh. 32p.
2. Darda A., E.M.H.S. Rahaman, and J. Andrade. 2019. RTB Workshop Report on Potato Seed System. International Potato Center, Dhaka, Bangladesh. 32p.
3. Mood Technologies Ltd. 2018. Adoption and Impact of Salt Tolerant Potato and Sweetpotato Varieties in Khulna and Satkhira Districts of Bangladesh. A Report for Household Baseline Survey 2018. 5p
4. Islam, M.S., E.H.M.S. Rahaman, and F.H. Ibrahim. 2018. CNS Training Report. CIP–Dhaka, Bangladesh. 31p.
5. Hoque, A.K.M.S., H.C. Mohanta, and B.C. Kundu. 2018. Annual Research Report on Potato and Sweetpotato. A CIP-TCRC, BARI collaborative research report on potato and sweetpotato. 35p.
6. Rahaman, E.H.M.S. 2018b. Health and Nutrition Security through potato, sweetpotato and vegetables—A CNS Training Flipchart (in Bengali). CIP–Dhaka, Bangladesh. 26p.
7. Rahaman, E.H.M.S. 2018a. Health and Nutrition Security through potato, sweetpotato and vegetables—A CNS Training Module (in Bengali). CIP–Dhaka, Bangladesh. 49p.
8. Folkard, Asch. 2018. Annual Technical Report of University of Hohenheim, Germany. 14p.

Summary

Bangladesh's fertile delta soils are suffering from increasing salinization, which threatens the lives and livelihoods of farmers and their families. This project helps increase farmers' access to improved, salt-tolerant varieties of P and SP, diversifying their production, and boosting their food and nutrition security and climate resilience. The project will strengthen farmer access to, and use of, improved, salt-tolerant varieties of P and SP in two districts of the southern delta. It will also work to improve the capacity of the NARS for continued varietal development and adaptation to local needs and preferences. This project supports BARI in breeding new varieties of vitamin A-rich, salt-tolerant SP and iron- and zinc-rich P. Farmers will have better access to these improved varieties through development of a more efficient seed value chain. Experience shows that adoption rate of new crops and varieties are high when agricultural extension is linked with nutrition education. The project, therefore, includes training for 50 CNS, who are now disseminating nutrition message to 5,000 HH. This should lead to some 25,000 individuals adopting improved diets, with efforts focused on HH with young children. The nutrition education component of the project seeks to increase demand for P and SP among non-farming families. During the reporting period, the project established 12 OFSP nurseries in different areas of the project territory for continuous supply of OFSP vines to the community. Twenty-eight demo plots of salt-tolerant P variety (BARI Alu-72) has been established; they are performing very well and have created positive impact among the community. About 5,000 HH engaged in homestead gardens received vegetable seeds from the project to meet their nutrient requirements. Most

of the families reached through training and nutritional counseling are very interested in planting OFSP vines in their home gardens. Up to the reporting period, 600 farmers received OFSP vines to plant in their home gardens.

Table 1. List of imported potato germplasm from CIP–Peru

List of biofortified (zinc- and iron-rich) potato germplasm							
Sl. No.	**CIP number**	**Sl. No.**	**CIP number**	**Sl. No.**	**CIP number**	**Sl. No.**	**CIP number**
1.	CIP312507.311	11.	CIP312682.005	21.	CIP312725.001	31.	CIP312735.062
2.	CIP312507.312	12.	CIP312682.011	22.	CIP312725.036	32.	CIP312735.105
3.	CIP312535.032	13.	CIP312682.042	23.	CIP312725.041	33.	CIP312735.114
4.	CIP312595.053	14.	CIP312721.004	24.	CIP312725.047	34.	CIP312751.021
5.	CIP312609.247	15.	CIP312721.029	25.	CIP312725.048	35.	CIP312751.025
6.	CIP312609.252	16.	CIP312721.038	26.	CIP312725.052	36.	CIP312751.028
7.	CIP312633.155	17.	CIP312721.163	27.	CIP312725.057	37.	CIP312763.441
8.	CIP312637.020	18.	CIP312721.169	28.	CIP312725.067	38.	CIP312764.013
9.	CIP312637.069	19.	CIP312721.212	29.	CIP312731.004	39.	CIP312767.014
10.	CIP312637.132	20.	CIP312721.245	30.	CIP312735.051	40.	CIP312871.043
List of LB- and virus- (PVX & PVY) resistant and heat-tolerant potato germplasm							
Sl. No.	**CIP number**	**Sl. No.**	**CIP number**	**Sl. No.**	**CIP number**	**Sl. No.**	**CIP number**
1.	CIP304079.10	4.	CIP398208.670	7.	CIP398192.553	10.	CIP398098.570
2.	CIP302534.17	5.	CIP398208.620	8.	CIP398192.213		
3.	CIP302551.26	6.	CIP398208.219	9.	CIP398190.200		

Table 2. List of OFSP germplasm seeds imported from CIP, Lima, Peru

Crossing Combination	Female CIP No.	Male CIP No.	No. of Seeds	Crossing Combination	Female CIP No.	Male CIP No.	No. of Seeds
1	CIP190094.91	CIP107160.1	1,315	7	CIP106373.1	CIP107160.1	3,515
2	CIP190094.29	CIP107215.2	1,893	8	CIP106373.1	CIP105886.1	3,146
3	CIP194513.23	CIP107160.1	4,307	9	CIP106806.2	CIP105495.1	1,643
4	CIP194575.8	CIP107160.1	2,600	10	CIP106082.1	CIP105495.1	13
5	CIP194575.8	CIP107154.1	222	11	CIP194575.8	CIP107095.1	1,773
6	CIP106311.2	CIP107215.2	163	12	CIP109151.34	CIP107095.1	2,001
Total seeds			**10,500**	**Total Seeds**			**12,091**

Table 2 (contd.). List of PFSP germplasm seeds imported from CIP, Mozambique

Sl. No.	Female Parent	Pedigree	No. of Seeds	Sl. No.	Female Parent	Pedigree	No. of Seeds
1	MGSG 11003-3	MUSG0619-16 X 105268-10	150	18	MGSG 12130-7	105419-3x199062.1	150
2	MGSG 11003-14	MUSG0619-16 X 105268-10	150	19	105268-1	105268	150
3	MGSG 11004-3	MUSG0619-16 X 105413-4	150	20	MGSG 12020-12	107011-2x199062.1	150
4	MGSG 11005-11	MUSG0621-07 X 105268-10	150	21	MGSG 12032-20	105413-4x199062.1	150
5	MGSG 11005-8	MUSG0621-07 X 105268-10	150	22	105268-10	105268	150
6	MGSG 11005-31	MUSG0621-07 X 105268-10	150	23	MGSG 12120-12	107031-18xMUSG0621-07	150
7	MGSG 11006-4	MUSG0621-07 X 105413-4	150	24	MGSG 13003-3	105413-4xLocal	150
8	MGSG 11007-43	MUSG0621-07 X 105268-7	150	25	MGSG 13025-3	105369-4xResisto	150
9	MGSG 11016-1	Resisto X 105193-4	150	26	MGSG 13092-2	Tio Joe x 105369-4	150
10	MGSG 11018-37	Gaba-Gaba X 105193-4	150	27	MGSG 13146-3	199062.1 x 105097-12	150
11	MGSG 11018-15	Gaba-Gaba X 105193-4	150	28	MGSG 13152-4	Local x MGSG 11018-34	150
12	MGSG 11016-6	Resisto X 105193-4	150	29	MGSG 13159-3	199062,1 x MGSG 11018-19	150
13	MGSG 11023-3	199062,1 X 105268-10	150	30	MGSG 13169-1	MUSG 0621-07 x MGSG 11020-2	150
14	MGSG 12019-21	105259-5x199062.1	150	31	MGSG 13178-19	MUSG 0619-16 x MGSG 11020-2	150
15	105101G07-07	105101	150	32	MGSG 13186-9	MUSG 0619-16 x 105419-3	150
16	105141G07-03	105141	150	33	MGSG 12100-4	107039-13xMUSG0621-07	200
17	105268-34	105268	150				
Total seeds			**2,550**	**Total Seeds**			**2,450**

Table 3. Vine production status of 12 OFSP nurseries in southern delta till Feb. 2018.

Nursery Owners Name and Address	No. of Vine Cuttings Produced	Income from Vine Sold (BDT)	Nursery Owners Name and Address	No. of Vine Cuttings Produced	Income from Vine Sold (BDT)
1. TasmiaKhatunEti Sovna, Dumuria	17,000	6,800	7. Sazeda Begum Sovna, Dumuria	3,000	1,200
2.Esmotara Begum Gaziara, Uttar Bedkasi, Koyra	3,500	1,400	8. Kakoli Sen Horidaskathi, Paikgasa	3,000	1,200
3.Khadiza Khatun Bularati, Alipur, Satkhira	5,750	2,300	9. Salma Begum Horishchondrakati, Tala	3,000	1,200
4. Uma Rani Mahata Horohorpaara, Koyra	3,000	1,200	10. SufiaKhatun Paikara, Kaliganj	2,000	800
5. Sahida Begum Katipara, Paikgasa	3,500	1,400	11. MonishaMondal Kushlia, Kaliganj	3,000	1,200
6. Purnima Sarker Mohandi, Tala	9,000	3,600	12. MirannaharKhatun Haroddah, Satkhira	3,000	1,200
Total	**15,500**	**6,200**	**Total**	**17,000**	**6,800**

Photos of project activities

Fig 1. OFSP vine multiplication nursery of Ms. Afrin at Sovna, Dumuria, Khulna.

Fig. 2. A cadre of CNS after ToT session in Satkhira.

Fig. 3. Nutrition messaging session at Dumuriaby CNS Nargis.

Fig.4.FGD for seed system analysis in Gazendrapur, Dumuria, Khulna.

Fig. 5. Seed Potato distribution at Chotobanda, Dumuria, Khulna.

Fig. 6. OFSP vine distribution at Sovna, Dumuria, Khulna.

Fig. 7. Indian spinach in homestead garden at Sovna, Dumuria (Ms. Lovely Begum).

Fig. 8. OFSP vine in homestead garden at Chotobanda, Dumuria (Ms. Probasi Mondal).

Fig. 9. BARI Alu-72 demonstration plot at Chotobandha (Ms. Shovaroti Biswas).

Fig. 10. Red amaranth field at Sovna, Dumuria (Ms. Lima Akhter).