Contents

ABBREVIATIONS AND ACRONYMS

AIS	Agricultural Information Service
BARC	Bangladesh Agricultural Research Council
BADC	Bangladesh Agricultural Development Corporation
BARI	Bangladesh Agricultural Research Institute
BRRI	Bangladesh Rice Research Institute
BKGET	Bangladesh Krishi Gobeshona Endowment Trust
CGP	Competitive Grant Program
CIG	Common Interested Group
DOF	Department of Fisheries (MOFL)
DLS	Department of Livestock Services (MOFL)
DAE	Department of Agriculture Extension (MOA)
DG	Director General
GOB	Government of Bangladesh
GIS	Geographical Information System
GO	Government Organization
GnB	General Body
IDA	International Development Association (WB Group)
IFAD	International Fund for Agricultural Development
IPM	Integrated Pest Management
KGF	Krishi Gobeshona Foundation
MOU	Memorandum of Understanding
M&E	Monitoring and Evaluation
MIS	Management Information System
NATP	National Agricultural Technology Project
NARS	National Agricultural Research System
NGO	Non-government Organization
PCU	Project Coordination Unit
PIs	Principal Investigators
RM	Research Management
SCA	Seed Certification Agency
TBS	Trap Barrier System
TTMU	Technology Transfar Monitoring Unit

Progress of Implementation with focus on Research Accomplishments and Impacts of Competitive Grants Program (CGP) Under NATP: Phase-1

Introduction

Krishi Gobeshona Foundation (KGF), a government sponsored non-profit organization was established in 2007. During the initial 2 years KGF activities mainly concentrated on the establishment of KGF office, organizing program for research grants, procurement of equipment and hiring of personnel. During the last 5 years of its operation KGF had been engaged in the management of Competitive Grants Program (CGP) of the National Agricultural Technology Project (NATP) Phase-1. Need based projects were awarded following the procedure (research guidelines) among the public and private sectors in 2009.

Governance of KGF

- A 15 member General Body representing both public and private sectors provides overall guidance and policy decisions
- A 7 member Board of Directors headed by the Executive Chairman, BARC is overall responsible for running its program of activities

Financing of KGF

- An endowment fund of Tk 3.50 billion (US $ 50.00 million) was established to support program of activities of KGF.
- BKGET headed by Secretary Ministry of Agriculture, GoB was established for the management of Endowment fund. The interest accrued out of the endowment fund is the sustainable source of funding (trust fund) for the KGF programs and it operation.
- BKGET started funding KGF beginning August 2012 and the progress support stared in 2013.

Initially KGF operated Competitive Grants Program (CGP) as a component of NATP:Phase-1 receiving fund from WB.

Project Implementation status and its Achievement

Through two public announcements KGF invited for short-term research proposals under CGP framework on specific thematic areas/research issues from public and non-government organizations. After rigorous evaluation and selection procedures, KGF offered 93 sub-projects in two spells. Additionally one special project on citrus canker disease was awarded in response to the request of Hortex Foundation with due processes. For convenience of management and effective monitoring, projects approved in each spell were implemented in two phases.

The sub-projects approved and funded for implementation in different thematic areas. Most subprojects were on problem solving issues relating to commodities. Some of the sub-projects addressed problems of specific geographical regions and technological constraints. Six sub-projects dealt with policy issues. Results of individual sub-projects completed have been presented in the form of Technical Bulletins (36) for the extension officials and researchers and 'Prujukti Barta' (10) for the farmers.

All implemented projects are: 2-3 years duration. Call -1 projects (54) stated in May/09 ended in the month of June 2011. In call-2 projects (39) started in sep/11 and ended in the month of October 2014.

Projects were implemented under different locations of Bangladesh. This has been arranged under 13 areas as geographical regions and technological constraints including livestock, fisheries and policy issues. The geographical regions deals with 5 unfavorable ecosystems.

- Pilot projects (11) were implemented incollaboration with the Department of Agricultural Extension (DAE) and the researcher of the respective PI and institute.

Institution-wise distribution of CGP sub-projects (awarded)

Call	BARI	BRRI	BINA	BAU	BSMRAU	KU	CVASU	Other Govt.	NGOs	Total
Call 1	15	2	2	11	6	3	1	-	14	54
Call 2	17	3	1	7	4	1	2	4	*	39
Total	32	5	3	18	10	4	3	4	14	93

*1st call 3 projects terminated
*2nd call 4 projects terminated/ Withdrawal

Sectoral distribution of CGP sub-projects

Call	Crops	Socio-economics	Fisheries	Livestock	Cross-cutting	Total
Call 1	38	6	4	6	-	54
Call 2	26	2	2	5	3	39
Total	64	8	6	11	3	93

Total farmers invloved in CGP Projects: 10320

Common Interested Group (CIG) Farmers: 796
(CIG only in 2nd call)

Financial Progress:

Currency	As per RDPP	Fund received (IDA)	Expenditure (IDA)	Unspent
US $	6.15 million	6.060 million	6.038 million	0.022 million
Taka	480.10 million	472.71 million	470.995 million	1.715 million

1$=Tk.78.00

CGP Research Accomplishment

1. Crop production in unfavorable environments

Coastal ecosystem*:* CGP projects addressing constraints in coastal region included screening salt tolerant crops and crop varieties in Noakhali, Khulna and Satkhira districts, production enhancement through improving production technology and increasing cropping intensity growing one additional dry season crop in tidal flooded areas of Jhalakati, Pirojpur and Patuakhali districts, and crop intensification by growing maize after T. Aman in Khulna and Satkhira districts, and vegetables and quick growing fruits in Patuakhali and Jhalakati districts. Growing of sunflower and soybean proved to be successful under moderate to high salinity conditions during dry season in Satkhira district. Sunflower, sugar beet, barley and a local variety of chili were found to have tolerated moderate soil salinity in the charland of Noakhali district. Land topography and hydrology in the tidal floodplain of greater Barisal region favor growing no HYV rice in the rainy season. Farmers growing low yielding, long duration local varieties in aman season keep land fallow during dry season. Addressing the issue

scientists of PSTU and SAU introduced HYV aman rice (cv. BRRI dhan 44) in the periphery of the fields, improved management systems for local varieties (cv Lalmota, Sadamota) and relay planting of chickpea and maize at the terminal stage of aman rice that allowed an additional crop in the dry season. Improved practices included transplanting 65 d old seedlings of local varieties of aman rice in rows, 40 cm x 30 cm, configuration, and 5-7 seedlings per hill, and application of 25% of standard fertilizer dose recommended for HYVs.

Improved practices resulted in 45-50% more yield than traditional farming practice in salinity affected areas in southern part of Khulna district. Planting of improved variety of sesame (BARI til 4) during mid-February with moderate dose (20 kg N, 10 kg P and 10 kg borax per ha) of fertilizers increased yield by nearly 50%. The new technology has been upscaled through a pilot project whereby over 3,000 farmers in Batiaghata and Dumuria upazila of Khulna have adopted.

Suitable areas for sustainable shrimp farming without bringing environmental hazard to habitats or agricultural crops in the districts of Satkhira, Khulna and Bagerhat in South-Western coastal region has been delineated employing sophisticated GIS and RS techniques.

Vegetables are in short supply in the central coastal districts covering almost whole of Barisal-Patuakhali region. Maize production during dry season in the salinity affected Khulna region is constrained by soil salinity. Implementation of two sub-projects attempting to introduce production of vegetables and quick-growing fruits in the tidal flooded ecosystem in Patuakhali and Jhalakati districts and adaptation of maize after harvesting aman rice in dry season in salinity affected areas of Satkhira district is in progress.

Hill agriculture*:* Four CGP projects looked at improving productivity and increasing income of hill farmers of south-eastern region. BARI scientists developed and a large number of hill farmers adopted Khagrachari model of vegetable garden on a small parcel of land (6 m x 6 m) that could ensure nutrition for the family and fairly good income through raising 9 different types of vegetables throughout the year. Over 1500 farmers adopted the model in Khagrachari and Rangamati districts.

Most farmers in Chittagong Hill Tracts grow crops in the hill slopes following traditional jhum system. The system essentially follows slash-and- burning prior to dibbling seeds of several crops (3-11) into a single hole immediately after first rain of the year. Growing a mixture of several species simultaneously is an insurance against crop failure. Replacement of jhum was attempted in many different ways but system persists widely in the hills. CDB scientists engaged in a CGP project (C 1.2) involving 40 farmers compared productivity of intercropping of rice and cotton with that of traditional multicrop jhum system. It appears that growing two rows of rice after every row of cotton gives better yields and substantially (30%) higher return than any jhum production system. Traditional local varieties of rice (Cokrow, Shere and Gellom) performed better in terms of yield, quality and farmers' preference compared with HYVS. Soil erosion in jhum system is, however, lower than in intercropping.

Gregarious flowering of bamboo, once in 50 years, causes simultaneous rat outbreak causing heavy damage to the crops particularly in jhum fields in the hilly region of south-eastern Bangladesh . Ecological consequence of bamboo flowering, simultaneous rat outbreaks and consequential crop damanage and impact on livelihood of farmers in CHT was studied. Out of 1857 rats collected representing 10 rodent species, the most dominant was Rattus rattus. Trap barrier system (TBS) and bamboo fencing (BF) effectively controlled crop damage by rat infestation.

Crop production in drought-prone areas**:** Barind tract covering the districts of Rajshahi, Chapai Nawabganj, Naogaon, Joypurhat, Bogra, and Dinajpur is traditionally drought-prone. Despite the expansion of irrigation facilities, agricultural production in agricultural production in major parts of

High Barind tract is dependent on rainfall. An extensive post-monsoon (January-May) drought is a characteristic feature of the region. Crop production in the dry season is severely constrained due to drought resulting to low productivity and thin cropping system. Productivity can be enhanced through effective drought management. Two years' results of a CGP project (NR 15.22) strongly suggest that agricultural productivity can be enhanced if the validated technologies are extensively adopted in the Barind area. The three improved techniques tried and found to have enhanced production are (i) growing chickpea using residual soil moisture, (ii) growing potato with minimum tillage and using straw mulch, and (iii) adopting wheat – mungbean- transplanted aman cropping system with minimum irrigation. In the area where irrigation facilities are not available, chickpea and potato will be raised on residual soil moisture using minimum tillage and mulches, respectively during dry season. Production will be enhanced adopting wheat-mungbean-aman rice cropping system in the area with installed irrigation facilities but land remaining fallow during dry season.

Improving productivity of acidic soils: Crop production in Himalayan piedmont soil in the northern districts of Panchagarh, Thakurgaon, Dinajpur, Rangpur and Nilphamari districts is constrained due to low pH. Two sub-projects addressed the issue by successfully growing maize, wheat and rice using lime (Dolochun) at 1-2 tons ha^{-1}. In a separate CGP project rate and application method ofliming has been standardized for improving yield of tea in hill soils of Sylhet region.

Crop Production in charlands: Crop production in charland or accreted river beds presents problems of sandy soil or a thin layer of sandy soil over sand deposition of several meters depth. Farmers barely grow a single aman rice crop during monsoon leaving the land fallow during dry season stretching from November through June. Development of production technologies enabling farmers growing short duration, high yielding aman rice (BU dhan 1, BINA dhan 7 or BRRI dhan 56) replacing long duration BR 11 or Swarna followed by lentil or chickpea during dry season following the harvest of aman rice, and growing an extra- mungbean during pre-monsoon moist/dry period (March through June).

2. Climate Change: Bangladesh is most vulnerable to climate change. Collection of information on the extent of crop damage due to extreme events and adaptation practices being followed in different vulnerable areas was the objective of one the CGP projects. In the coastal region, yield reduction of T. aman due to tidal floods, yield reduction in boro rice due to high temperature and increasing salinity. Crop production without tillage (potato, maize), floating bed for vegetable production and seedling raising, ditch-dyke system for d crop and fish culture are potential adaptation mechanisms for coastal agriculture. Likewise, no-tillage for growing maize, potato, wheat, chickpea and garlic; raised-bed for vegetable production are the promising adaptation options for flood-prone ecosystems.

3. Variety Development: Implementation of CGP projects resulted in development and adoption of four varieties of pulses and spices. Two varieties of garlic – BAU rasun 3 and BAU-KGF rasun 4 have been developed by BAU and released by the National Seed Board (NSB). The varieties are high yielding with more alicin contents than the existing recommended varieties. One chickpea variety (BARI chola 9) and one lentil variety (BARI masur 7) have been developed by BARI and released by the NSB. These two high yielding, disease resistant varieties have wider adaptability.

4. Enhancement of Farm Production: Production enhancement was an issue for at least 11 projects in phases. Introduction of short duration rice varieties (BRRI dhan 33, BU dhan 1 BINA dhan 7, and BRRI dhan 56) instead of long duration varieties (e.g., BR 11) facilitated timely planting of wheat/potato/mustard and fitting an additional crop mungbean after dry season crop before transplanting aman rice (CGP FPE 055). Early harvest of rice created employment opportunity for day laborers of rice and thus helped eradicate monga (hunger due to unemployment) in a large tract of greater North Bengal. Subsequently, the cropping system was further intensified fitting an additional short duration au crop (cv Parija) in between mungbean and T. aman (C2.11). Development and

introduction of intensive cropping systems in greater Rangpur and Dinajpur districts helped farmers increase production and farm income and created additional job for hired farm laborers.

Due to poor fertility and low water holding capacity of the soil, agricultural productivity in the charlands of Kurigram district is poor where boro rice is the crop that the farmers grow. Large area remains uncultivated or poorly cultivated with insignificant productivity. Working for nearly 3 years, BSMRAU introduced three crops – short duration, HYV of T. aman (BU dhan 1, BINA dhan 7 and BRRI dhan 56)- lentil (BRI masur 6) –mungbean (BU mug 4) in sequence. The new cropping system has been boon to many farmers in the charlands of Kurigram, Nageswari and Bhurungamari upazila of Kurigram district. Currently over 1000 farmers are practicing the system.

5. Pulses and oilseeds*:* 4 sub-projects on pulses and 7 sub-projects on oilseeds have been implemented. One chickpea variety (BARI chola 9) and one lentil variety (BARI masur 7) have been released. BARI chola 9 is resistant to notorious BGM disease while Bari masur 7 is a widely adapted high yielding, disease variety. Both the varieties command substantial area under production. The varieties are quickly replacing the old ones in the traditional area. BARI chola 9 shows excellent performance in non-traditional areas like Barind, Madaripur and tidal flooded areas of Jhalakati and Pirojpur districts.

Activities of the sub-projects on oilseeds focused on increasing oilseeds production through adoption and upscaling of modern rapeseed and sesame varieties. BARI sharisha 14, BARI sharisha 15 and BINA til 1, and BARI til 4 produced to the tune of 50-96% higher yield compared with that of existing varieties. Production expanded replacing old varieties with modern ones in the districts of Manikganj, Faridpur, Jenidha, Jessore, Kushtia, Khulna, Pabna, Sirajganj, Bogra, Rangpur, Gaibandha, Tangail and Mymensingh.

6. Spices**:** Two improved varieties of garlic (BAU rasun 3 and BAU-KGF rasun 4) have been released (CGP C-VI 006). Both the varieties produce 80-100% more yields than traditional varieties. BAU-KGF rasun 4 is resistant to viral diseases.

Production of summer onion is expanding but the availability of seeds and planting materials has been critical. Improved method of raising seedlings for planting in summer has been developed to overcome the problem (CGP SPM 096).

7. Plant protection**:** Canker disease of citrus ravaged the production and export of Jara lemon- an indigenous citrus fruit of high demand in European market. The export was stopped. An especial project funded under CGP grant developed and applied an improved management system of lemon production that salvaged lemon export. Improved management practice includes –sanitation followed by eradication of infected plants in the orchard, application of balanced fertilizers and manure, pruning of older branches followed by application of Bordeax paste, application of copper fungicides at 15 days interval beginning the disease initiation, and monthly application of Imidacloropid. Post-harvest operation includes lemon fruit soaked in 2.3% SOPP solution for 1 minute. Administration of management practices for the control of canker disease resulted in resumption of lemon export from Bangladesh.

Infection of root rot, bacterial wilt and virus diseases causes extensive damage to brinjal and tomato – two major vegetable crops in the country. To control the diseases, BARI scientists developed intensive management practice (CGP 8.14). Improved practice (seed treatment with provax+seedling raising under net house and spraying with Imidacloprid + application of stable bleaching powder+Furadan+ Imidacloprid spray every 10 days) reduced wilt disease by 95% or more. The practice has been tested on-farm and standardized running trials involving commercial 25 farmers in Jamalpur and Sherpur districts.

Coconut is an important cash crop in Bangladesh but its production is rapidly declining primarily because of widespread mite attack. Mite has been a major pest during the recent years. The pest attacks on coconut fruits at the early stage results in deformed, small fruits. Mite being a very small insect remains unnoticed and effective management practice for controlling coconut mite was not available. Working on CGP project, a group of BARI scientists identified the mechanism and extent of coconut damage due to mite attack and standardized an effective management option for

controlling mite infestation in coconut. A 5-step management practice includes I: harvesting of all the infested young nuts and burning, ii. after harvesting the infested nuts, spraying Omite-57 EC; 1.5 ml per liter of water on the foliage and the trunk stem attaching the bunch of fruits, iii. spraying for the second time when the young nuts attain 2 months old (iv) spraying for the third time after harvesting young and mature nuts; and (v) repeating step iii for the coconut bearing plants as well as neighboring non-bearing plants. Application of management treatment successfully controlled mite and increased coconut productivity in Jessore and Narail districts. Campaign is underway in five southern districts to make the coconut growers aware of the pest problem and its remedial measures.

Two popular varieties of ber – BAU kul and Apple kul extensively grown throughout the country are seriously infected with powdery mildew disease (organism- Odium ziziphi) causing serious yield reduction. A management practice developed through CGP C12.1 (pruning at end-March followed by 4-5 sprays with sulfur containing fungicide like McSulphur 80 WP and Caivest 80 DF at 15 d interval from the visible appearance of the disease symptom) effectively controls powdery mildew disease of ber.

8. Farm Machinery & Post harvest technology: Development of power tiller: An efficient KCM (KGF-CASEED_MAWT) power tiller has been developed. The walking type power tiller with deep tillage capacity can be effectively used in land preparation both under upland and lowland conditions for growing different types of crops including rice, mustard, wheat, jute and vegetable crops.

9. Post-harvest: C-PHT 179, C-PHT 175 and C-FM 163 focused on post harvest processing and storage. A low-cost, well-ventilated thatch house measuring 4.0 m L x 3.5 m W x 4.0 m H with a capacity of about 8000 kg storage capacity was designed and tested on-farm. Spoilage of potato stored in the newly designed thatch-house during 4-5 months was the minimum. The technology is being up-scaled in greater Bogra and Rangpur districts involving wider farmers' participation. Hybrid dryer for drying seeds of wheat and groundnut has been developed by a BARI scientist. The dryer operates on solar power or on electricity.

10. Marketing; Analysis of global market and feasibility of growing crops suggested strong potentiality of exporting sesame, cashewnut, baley, vegetables and banana from Bangladesh (CGP C-HV 202). Potentiality of growing barley and sesame in the coastal areas is high while sloping uplands in the Chittagong Hill Tracts can be used for growing banana and cashewnut.

Feasibility of growing four high value crops – strawberry, broccoli, capsicum and cherry tomato in the hills and plain land, and mechanism of linking farmers with super market was studied in an another CGP project.

Constraints of marketing five selected crops – brinjal, bean, cucumber, bottle gourd and papaya in the hills, and opportunities, and market actors were identified and their value chains analyzed (CGP SE-MSC 279). Improved production technologies for growing these selected crops were also introduced to a large number of participating growers. The project output is expected to result enhanced competence and economic benefit of the farmers.

11. ***Livestock:*** Pullorum disease caused by Salmonella enteric in chicken is most prevalent in Bangladesh. Molecular characterization of S. pullorum bacteria and vaccine to control Pullorum disease has been developed using local isolates (L-DD-232). A CGP project (L 20.4) focused on clinicopathological and serological surveillance of FMD and PPR diseases and adopting preventive measures against them in remote villages in Tangail district. Priming and boosting at an interval of 2-3 weeks enhanced immune response against FMD vaccine for a period of 6 months. De-worming cattle, buffaloes and goats thrice a year yielded an overall 20-30% increase in weight gain and 25-35% increased in milk production.

Two projects (L-HM-214 and L-HM219) addressed herd health and suggested appropriate veterinary service delivery system. Low-cost feed formulation was the focus of another two projects (L-LM 227 and L-LM 235). Techniques of growing fodder from African Dhaincha and making hay and box-bailing thereof was developed and disseminated. Feeding fodder and hay to milking cows resulted in increased milk yield to the tune of 20-23%.

Introduction of duck raising in the rice fields directly benefited 200 resource-poor farmers in the low-lying areas of Netrokona and Kishoreganj area. In the rice-duck plots, duck droppings acted as source of plant nutrients, ducks scavenging in rice fields effectively controlled insect pests and weed growth and consequently rice yield increased by 17-23%. Net income margin ranged between Tk 35,198 to Tk 62,839 per ha across growing seasons and locations.

12. Fishery: A total of 6 projects were awarded in two calls. All the projects were implemented in southern coastal belt or in central region.

Stocking density significantly affected Shing (H. fossilis). A density of 500 fries per decimal gave the highest fish weight (57.17 g) and highest yield (5426 kg/ha) with a net return of Tk. 889,524 per ha (F 21.20).

13. Policy Issues: Conversion of agricultural land to non-agricultural purposes to the tune of 0.56 percent annually has been pointed to great concern for attaining and sustaining food security. The extent of such loss of agricultural land is however lesser than the prevailing consensus of annual loss of about 1.0 percent agricultural land.

Publications:

Technical Bulletins published: 48 No.

Projukti barta (in Bangla): 35 No.

Project Completion Report: 95 No.

Annual Report of KGF published:4 No.

Peer reviewed journal articles: 7

List of potential technologies:

Variety Development:

1. Two high yielding garlic varieties developed: BAU Rashun-3 (8.6 mt/ha instead of traditional variety-7 ton) and BAU Rashun-4 (9mt/h) has been released.
2. Development and release of two HYV pulse varieties: BARI Chola-9 (Resistant to BMG) and BARI Mashur-7 (Resistant to Rust and S.blight disease) for large scale adoption.

Hill Agriculture:

3. Development of rice-cotton intercropping wbith imporved management practices as an alternative to traditional jhum farming (Jhum income Tk. 10,000 per hect and rice cotton Tk. 70,000)
4. Development of hoestead vegetable production practices (Khagrachari Model) throughtout the year for the poor farmers in the hills (Vegetable production increased 40 gm to 120 gm/head)

Unfavourable/Stress Condition:

5. Selectin of high yielding sesame variety (BARI-Till-4) and development of its production practices for growing in the saline areas of Khulna region.(Yield 1.5 mt/h instad of 1.0 mt)
6. Productivity enhancement of converting the fidally flooded medium low and low land into ditch and dyke system for raising vegetable and fish production. (income per decimal Tk. 100)
7. Conversion of Dhorola river char lands covered with vetivar grass into green crop lands (cropping intensity increased 150% Amon-fallow-mug)
8. Identification of saline (moderate-high) tolerant crop varieties fro growing in the coastal areas of Noakhali (Sugar beat, sunflower and Barley)

Livestock:

9. Development of Salmonella pullorum vaccine for poultry (against S.P bacterial disease)
10. Development of an improved animal health service management practices and milk marketing method for the char area of Rangpur and Jamalpur (Disease incidence rate reduced by 37%, Milk production increased 0.8 L/day/cow, Producer price of milk increases 37%)

Plant protection:

11. Development of package of practices for the management of coconut mites in southern Bangladesh (control: Spray. "Omite" (Miticide)
12. Development of improved management practices for the control of rhizome rot disease of Ginger (Seed Treatment with Clorox against foot rot)
13. Development of improved management practices for the control of canker disease of citrus (By Sanitation, pruning older branches and treatment with chemicals) Chemical: Sodium orthophenyl phenate (Sopp)
14. Development of integrated management practices for the control of major diseases of Brinjal and Tomato. (Seed, seed bed & soil treatment can save 40-45% yield reduction).

Cropping System:

15. Development of an intensive cropping system (3 crops/year) for the droutht-prone areas of Barind tract with & without irrigation. Short duration: amon-wheat-Mungbean
16. Identification of shorter duration HYV BARI Sharisha-14/15 and development of their management practices for inclusion in between T.Aman-Fallow-Boro cropping pattern.
17. Development of improved seed production practices for the summer onion (800 kg to 900 kg/ha)
18. Improvement of the land productivity of acid soil through application of Dolochon (1 ton/hect).
19. Development and dissemination of relay inter planting of rice-chickpea, rice-lentil and rice-maize systems in tidal floodplain ecosystem for crop intensification and increased production.
20. Improvement of cropping intensity and system productivity incorporating mustard and sesame in the cropping systems in some specific locations/AEZ (Sirajgonk, Chapai Nawabganj and Rajshahi, keeping the soil nutrient balance)
21. Development of an intensive cropping system (4 crops/year) with less irrigation water requiring crops for the N-W region of Bangladesh. (Cropping Pattern: T.Aman-Potato/mustard-aus-mug.

Others:

22. Development of hybrid dryer, operated either by electricity or solar power for seed drying (Rice, wheat and maize).
23. Improvement of STW operation through installation of a check valve at the suction pipe. (Starting is easier than before)
24. Development of a low-cost thatch store house with a capacity of 8 tons for storing potato tuber at farmers level (store for 4-5 months per Kg cost 1 Taka)

M&E of of CGP Projects

- Periodical M&E of the projects is a routine work of KGF professionals. Both desk and field monitoring of each project has been done at an interval of 5-6 months and necessary suggestions were given to PI to keep the project on track.
- Some revisions were suggested to 3 projects (L-17.4; F-21.20 and F-22.1) in order to make them appropriate to deliver the desired outputs.
- Two projects have been terminated (L-18.4 and L-17.14) due to unsatisfactory progress. Besides, one NGO component of a project has also been terminated.

SCIENTIFIC IMPACTS:

A number of scientific impacts have resulted as a consequence of on-farm and on-station trials, and technologies and practices developed as part of the CGP projects carried out during the past five years. The major impact is the introduction and sustenance of competitive environment in scientific research in the field of agriculture- both public and private sectors. Technologies developed from 11 projects have been scaled up as an intermediate step between technology generation and large-scale adoption by farmers.

1. Khagrachari Model, a year round vegetable production to promote production and consumption of vegetable for meeting family requirements of human nutrition and generation of cash income for the poor and marginal hill farmers is gaining popularity. The technology has been adopted by a large number of farmers (>2000 farmers) in Khagrachari, Dighinala, Mohalchari of Khagrachari and Baghaichari and Longadu upazila of Rangamati districts.
2. Jhuming or dibbling mixture of seeds of several crops (3-12) in hill slopes and harvesting at different maturity dates over the season spanning from May through November is the traditional farming practice. Productivity of jhum farming is low but better farming in sloping upland has not been evolved yet. Systematic arrangement in rice-cotton intercropping with improved agronomic practices as an alternative to jhum farming resulted in greater yield advantage. Farmers in Thanchi, Ruma, Bandarban sadar and Rowangchari of Bandarban district, Khagrachari sadar, Matiranga of Khagrachari district and Rangamati sadar and Naniarchar of Rangamati district are increasingly adopting the rice-cotton intercropping instead of jhum farming. The technology has generated both social and economic benefits to thousands of hill farmers
3. Constraint of fitting HYV rice in deeply flooded land in the tidal floodplain of Jhalakati and Pirojpur districts can now be overcome with local varieties lalmota, sadamota with improved management practices developed through C-2.20. Large number of farmers (>2500) in the area have adopted row planting of 65 d old seedlings at 40 x 25 cm configuration, 5-7 seedlings per hill with 25% of recommended fertilizers recommended for HYVs.
4. Relay inter-planting of chickpea (BARI chola 9), lentil (BARI masur 7) with standing aman rice (local varieties) under moist soil condition helps farmers getting an additional crop in dry season where land usually remains fallow. The technology is rapidly getting popularity in the tidal floodplain of Jhalakati district.
5. Converting low land into ditch (pond) and dyke for raising vegetable crops in dyke and raising fish into the pond has been proved to be more profitable than any other enterprise in the coastal ecosystem that small farmers can afford.
6. Salinity tolerant sesame variety – BARI til 4 has been identified and agronomic practices developed for growing in saline areas. In the salinity affected areas of southern part of Khulna district farmers are now increasingly adopting an improved method of sesame production using BARI til 4 variety. Estimated income from sesame production in Batiaghata and Dumuria upazila of Khulna districts is over Tk.280 million annually using the land that remained fallow during dry season.
7. High productive, multi-crop sequences have been developed, tested and adopted in monga-prone northern districts (Gaibandha, Rangpur, Kurigram, Nilphamari and Lalmonirhat). The three crop annual cropping system developed is growing short duration rice variety BU dhan 1 or BINA dhan 7 (replacing long duration BR 11) favors timely planting of subsequent potato/wheat and the subsequent mungbean (instead of fallowing) in between wheat and aman rice. Curtailing more than 30 days by growing short duration rice eliminates post-monsoon for rice irrigation water requirement during reproductive growth. Fitting an additional crop mungbean during lean period presents an opportunity of labor employment and additional income. Planting cv Parija –an extra-short duration aus rice variety after harvesting mungbean and harvesting before transplanting aman seedlings is further advancement of the four crop-system providing additional income. Major focus of developing intensive cropping system was reducing the amount of irrigation water. The system is being followed by a large number of farmers in the northern districts.

8. Introduction and adoption of improved cropping system with short duration HYV aman rice, wheat or potato and mungbean in sequence created employment opportunity for the monga affected day labors and potentially increased farm income in Northern Bangladesh. Over 5000 farmers in Gaibandha, Ragpur, Nilphamari, Kurigram, Dinajpur and Thakurgaon districts have been practicing the new cropping system. More intensive cropping system potato-mungbean-aus- aman rice replacing boro with mungbean followed by short duration aus (cv Parija) and thereafter T. aman is now being developed. The new cropping system saves electric energy (5,112 KJ) and 190 kg TSP and 125 kg MoP fertilizers and at the same time substantially increases system productivity. The four-crop system is now being rapidly adopted in the northern districts.

9. For the charland or accreted river beds along the Dharala river in Kurigram district development of production technologies enabling farmers growing short duration, high yielding aman rice (BU dhan 1, BINA dhan 7 or BRRI dhan 56) followed by lentil or chickpea during dry season following the harvest of aman rice, and an extra- mungbean during pre-monsoon moist/dry period turned the fields once covered with wild vetivar grass to green fields without leaving land fallow even for weeks. The technology generated by CGP project and adopted by a large number of farmers (>3000) creates an immense social and economic impact in the region.

10. CGP projects engaged in location specific screening and adoption of high yielding varieties of rapeseed-mustard. Most projects were successful demonstrating the technical feasibility of growing of mustard after harvesting transplanted aman. A large number of farmers (over 7,000) realized the potential benefit of growing mustard in post-monsoon dry season on residual soil moisture. BARI sharisha 9, 14 and 15, and BINA sharisha varieties were disseminated through on-farm trials. Neighboring farmers gained the technology through spill-over effect. Margin of benefit comparing the old indigenous and modern varieties was quite high. Participating farmers as well as the neighboring farmers gainfully produced additional as much as 1,500 tons using modern rapeseed varieties.

11. Crop intensification fitting wheat or potato after harvesting transplanted aman rice (short duration) and mungbean after wheat or potato harvest in the drought-prone Barind tract of Rajshahi, Chapai Nawabganj and Naogaon districts has created massive impact on farmers' economy and environment. The 3-crop intensive cropping system with or without irrigation is proved to be more remunerative than existing cropping system with long duration t. aman rice. More and more farmers beyond the participating 1,200 farmers in the region are now benefiting by adopting the technology.

12. Development of package of practices for management and control of coconut mites has been a milestone to arrest yield loss and decline of production area in Jessore, Khulna, Bagerhat, Gopalganj, Pirojpur and Jhalakati districts. Over 2,000 farmers benefited receiving training and treatment packages.

13. Export of citrus from Bangladesh stopped due to infection of canker disease. Development and adoption of clinico-pathological management methods helped eradicate canker disease in citrus growing areas in Moulavi Bazar, Habiganj and Sylhet districts that spurred export of citrus fruits again.

14. Effective control of root rot, bacterial wilt and virus diseases in two major vegetable crops – brinjal and tomato helped avoid extensive damage to these two crops.

15. Converting medium lowland and low land subject to inundation into ditch and dyke system in the tidal flood ecosystem convincingly demonstrated system increased more than three-folds compared with traditional single crop aman rice. Production of vegetables in dykes round the year and fish culture in the ditch/pond during monsoon substantially increased farmers' income

in the southern district of Jhalakati. The potential benefit of the project is discernible in increased supply of vegetable in the local markets.

16. Extensive cultivation of two newly developed varieties of chickpea and lentil (BARI chola 9 and BARI masur 7) in northern, central and southern districts bears the testimony of farmers' acceptance. BARI chola 9 and BARI masur 7 are resistant to BGM and Stemphylium blight, respectively and give around 40% and 30% higher yields than existing varieties.
17. Adoption of intensive management practices will potentially increase production and farm income of brinjal, tomato and ber producers.

Institutional and Social Impacts:

1. Nearly 300 scientists from public and private sectors engaged in the CGP projects had direct contact with the farmers in implementing the projects. A linkage among scientists, farmers and extension personnel has been established by running the trials under CGP projects. Over 15,000 farmers in 50 districts associated with the implementation of CGP projects benefited by improving their knowledge and skill. Apart from economic gain that they accrued from adopting improved practices and technologies, many of them now gained command over the farming communities because of their knowledge and skill.
2. Scientists engaged in the CGP projects could have gained deeper knowledge of the problems they worked on and acquainted with field problems that empowered them to have engagement with new scientific assignments.
3. All the leading NARS institutions and the agricultural universities engaged in implementing CGP projects improved scientific capacity of undertaking and implementing research projects. A healthy competitive environment for doing research has which was virtually absent been created in the NARS institutions.
4. For effective implementation of the CGP projects 500 scientists, 200 scientific assistants, 15,000 farmers and 1,200 extension personnel have been trained on aspects of agricultural production or related issues. This has created enormous impact on the capacity of research and extension organizations in the country.
5. Backward and resource-poor hill farmers and women farmers have been especially encouraged to increase production adopting improved technologies like vegetable production through Khagrachari model, adopting intercropping instead of jhum farming, growing vegetables in coastal region, raising duck in rice crop in Netrokona and Kishoreganj.
6. Greater emphasis was laid on production enhancement in coastal areas with greater risk of climate change. Vegetable production has been increased in Jhalakati and Patuakhali districts as a result of implementation of a CGP project.

LIST OF CGP PROJECTS OF 1ST CALL
UNDER NATP PHASE-I

List of CGP Phase-I Projects of 1st Call

Serial No.	Code and Title of the project	Name of PI and Address
1.	C-CC-129: Assessing the long term impacts of climatic vulnerabilities on crop production and evaluation of adaptation practices in the vulnerable areas of Bangladesh	Dr. Moslem Uddin Miah, Senior Agriculture Specialist, Bangladesh Centre for advanced studies. House-10, Road-16/A, Gulshan-1, Dhaka-1212, 01711591066
2.	C-CA-117: Adaptation of suitable crops in saline soils of Noakhali	Dr. Mohammad Amin, Principal Scientific Officer,OFRD, Bangladesh Agricultural Research Institute, Maijdi Bazar, Noakhali, 01819803229
3.	F-DD-240: GIS and Remote Sensing database for Spatial decision support system for sustainable shrimp culture in South-West coastal region of Bangladesh	Dr. S.M. Bazlur Rahman, Associate Professor, , Fisheries and Marine Resource Technology Discipline, Khulna University, Khulna- 9208, 01914325048
4.	L-DD-232: Molecular characterization of poultry salmonellae and production of fomalin killed pullorum disease vaccine using local isolate in Bangladesh	Dr. Makbul Hossain, Deptt. of Pathology, Bangladesh Agricultural University, Mymensingh-2202, 01715154694
5.	C-FM- 163: Development of small scale electric powered oil expeller suitable for adaptation among the rural farmers' in Bangladesh	Prof. Dr. Md. Daulat Husain, Department of Farm Power and Machinery, Bangladesh Agricultural University, Mymensingh-2202, 01716411105
6.	C-FPE-049: Wider adaptation of modern rapeseed, mustard and sesame varieties with production technology for yield gap reduction	Dr. Md. Ali Akbar, Executive Director, Agrarian Research Foundation, House-48, Road-5, Pisciculture Housing Society, Dhaka-1207, 01731628722
7.	C-FPE-054: Up - scaling of integrated rice - duck farming in Bangladesh: Improvement of rural livelihood through community approach	Dr. Sk. Tanveer Hossain, Maneger, , Padakhep Manabik Unnayan Kendra, House-548, Road-10, Baitul Aman Housing Society, Adabar, Dhaka-1207, 1730026955
8.	C-FPE-055: Impact of rice - wheat/potato mungbean cropping system on farmers employment opportunity, food security and livelihood in selected monga prone areas in northern districts of Bangladesh	Dr. M. Moynul Haque, Professor, Deptt. of Agronomy, Bangabandhu Sheikh Mujibur Rahman Agricultural University,, Salna, Gazipur-1706, 01711908640
9.	L-HM-214: Study of herd health management practices for Ruminants in Bangladesh	Dr. Sayed Anwar Hossain, Livestock Advisor, Social Upliftment Society (SUS), 76/A Uttarpara, Savar, Dhaka, 01715 0222 67
10.	L-HM-219: Improving Livelihood through Herd Health Management and Milk market access to poor farmers living in the northern Bangladesh	Dr. Md. Golam Shahi Alam, Professor, DSO, Faculty of Veterinery Science, Bangladesh Agricultural university, Mymensingh-2202, 01199288630

Serial No.	Code and Title of the project	Name of PI and Address
11.	C-VI-006 Collection, conservation, characterizations and varietal development of garlic and onion through selection and molecular techniques	Dr. M. A. Rahim, Professor, Deptt. of Horticulture, Bangladesh Agricultural University, Mymensingh- 2202, 01711854471
12.	C-HV-194: Assessment of effectiveness of IPM practices for pest management in Brinjal	Kbd. Rafiqul Haider, Programme Advisor, SEDA, Rebeca Cottage, Mashkanda, Mymensingh, 01715022673
13.	C-HF-103: Validation of improved agricultural technologies at farmer's field in hill farming system	Dr. Md. Mohabbat Ullah, Principal Scientific Officer, Hill Agril. Research Station, Bangladesh Agricultural Research Institute, Khagrachhari
14.	C-HF-104: Ecological determinants of bamboo flowering and rodent population outbreacks in the Chittagong Hill Tracts	Dr. Nazira Q. Kamal, , AID –Comilla, Vill.-Raghupur, P.O.-Rajapara, Union-Jagannathpur, Upazilla- Comilla Sadar, Comilla. 01713018973
15.	C-HV-202: Global market analysis for production and export potentials of high value crops in Bangladesh	Mr. Abdur Rashid, Senior, Research Fellow, Agrarian Research Foundation, House-48, Road-5, Pisciculture Housing Society, Mohammadpur, Dhaka-1207, 01919282978
16.	C-PHT-175: Up-scaling and adoption of hybrid dryer for quality grain seed production	Dr. Md. Ayub Hossain, SSO, FMP, Engineering Division, Bangladesh Agricultural Research Institute, Gazipur-1701, 01716979034
17.	C-PHT-179: Increasing storability of potato in natural storage and income generation through small scale processing of potato	Dr. Md. Azizul Haque, SSO, Tuber Crops Research Sub-center, Bangladesh Agricultural Research Institute, Munshiganj-1500, 01912126302
18.	C-SPM-092: Quality improvement of farmers stored seeds of mungbean, lentil, chickpea and its relation to diseases development in Bangladesh	Dr. A. H. M. Mahfuzul Haque, SSO, Pulse Research Sub-station, Bangladesh Agricultural Research Institute, Gazipur-1701, 01712154073
19.	C-SPM-096: Seed production of summer onion varieties: Determining Appropriate Method and Agro-ecological Condition for Optimal Production	Dr. Md. Shawkat Ali Mallik, CSO, Spices Research Centre, Bangladesh Agricultural Research Institute, Sibganj, Bogra, 01715527855
20.	C-S-144: Maximizing yield of tea in some selected problematic Acidic soils through improved management practices	Dr. Quamrul Ahsan, Senior Research Associate, CASEED, House-59, Road-12/A, Dhanmondi, Dhaka-1209, 01715199264
21.	F-SE-290: Factors affecting shifting from food insecurity to food security, A study of selected Monga prone areas	Dr. Ashoke Kumar Ghose, Research and Development Foundation for the Poor Silicon Arcade,, 1/1(B), Mohonpur, Adabar, Ring Road, Shyamoli, Dhaka-1207, 01711189398
22.	F-SE-291: Assessment of techno-Socioeconomic Resources and	Dr. Md. Abiar Rahman, Asstt. Professor, Deptt. of Agrofroestry and Environment, Bangabandhu

Serial No.	Code and Title of the project	Name of PI and Address
	development of strategies for Promoting food and economic securities of Ethnic communities in Bangladesh	Sheikh Mujibur Rahman Agricultural University, Salna, Gazipur-1706, 01552495452
23.	C-S-132: Agricultural land loss and food security: An Assessment	Dr. Md. Abul Quashem, Bangladesh Unnayan Parishad, , House-50, Road-8, Block-D, Niketon Gulshan-1, Dhaka-1212, 01715006916
24.	SE-MSC-266: Processing of indigenous fruits and vegetables to improve livelihood of rural poor in Madhupur Region	Professor Dr. Md. Shams-Ud-Din Department of Food Technology & Rural Industries, Bangladesh Agricultural University (BAU), Mymensingh
25.	SE-MSC-279: Promotion of Agricultural Marketing in Hills	Md. Badrul Alam, , International Development Enterprises, House-28 (3rd floor), Road-130, Gulshan-1, Dhaka-1212, 01711591613
26.	SE-MSC-285: Capacity building of the farmers through exporting comparative advantaged horticultural products	Md. Kamruzzaman, Associate Professor, Agril. Econ. Division, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Salna, Gazipur-1706, 01712650662
27.	SE-MSC-287: Linking small farmers with supermarkets through promotion of peri-urban agriculture	Md. Moksedur Rahman, Programme Officer, Social Upliftment Society, 76/A Uttar para, Savar, Dhaka- 1340, 01715022673
28.	C-VI-025: Rice germplasm collection and conservation from hilly, coastal, haor and other areas of Bangladesh	Dr. Md. Khairul Basher, CSO & Head, Genetic Resource and Seed Division, BRRI, Gazipur-1701, 01711283982

List of CGP Phase-II Projects of 1st Call

Serial No.	Code and Title of the project	Name of PI and Address
29.	**C-CA- 109:** Development of appropriate irrigation and water management technologies for increasing and sustaining crop production in the saline coastal area of Bangladesh	Dr. Nazmun Nahar Karim, Principal Scientific Officer, Agricultural Engineering Division, BINA, P.O. BOX-04, Mymensingh-2200, 01715013033.
30	**C-CA- 113:** Adaptation of improved Sesame varieties in Khulna District optimizing sowing time and Nitrogenous fertilizer management	Dr. Md. Sarwar Jahan, Professor, Agrotechnology Discipline, Khulna University, Khulna-9208, 01712813106
31	**C-CA- 116:** Improvement of cropping system through introduction of pulse and species crops during the fallow period in Khulna area	Dr. Md. Sirajul Islam, Chief Scientific Officer, OFRD, Regional Agricultural Research Station, BARI, Jessore, 01712142042
32	**C-FM- 173:** Design and development of power tiller for dry and wet crop land cultivation in Bangladesh	Mr. Md. Abdus Satter, Principal Investigator of the project and senior research fellow, CASEED, House-59, Road-12/A, Dhanmondi, Dhaka-1209, 01712082656
33	**C-FPE- 033:** Evaluation of herbicide use in Bangladesh agriculture with special reference to wetland Rice	Mr. Md. Nasimul Bari, Associate Professor, Department of Agronomy, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706, 01552356277
34	**C-FPE- 051:** Validation and Up-scaling of Improved Varieties of Mungbean, Blackgram, Groundnut and Sweet Potato in the Char Areas of Jamalpur and Sherpur Districts	Dr. Mrityunjoy Biswas, Senior Scientific Officer, BARI Regional Agricultural Research Station, Jamalpur-2000, Jamalpur 01711240580
35	**C-FPE- 052:** Productivity Improvement of Acid Soil by Using Dolochun in Dinajpur and Thakurgaon Districts	Dr. Abdul Hakim, SSO, Wheat Research Centre, BARI, Nsashipu, Dinajpur, 01711788153
36	**C-FPE- 063:** Determination of factors responsible for yield Gaps in rice and wheat at farmer's field	Dr. M Abul Kashem, Professor, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh-2202, 01711957558
37	**C-VI- 010:** Validation and dissemination of new varieties and advanced lines for increasing the productivity of lentil, chickpea, mungbean and blackgram in the northern region of Bangladesh	Dr. Md. Jalal Uddin, Chief Scientific Officer, Pulses Research Centre, Regional Agricultural Research Station, BARI, Ishurdi, Pabna-6620, 01720620621
38	**C-VI- 015:** Collection and conservation of indigenous vegetable germplasm	Dr. Md. Khaled Sultan, CSO, Plant Genetic Resources Centre, BARI, Gazipur-1701, 01921857809
39	**SE-PP- 262:** Employment generation and food accessibility in the Monga regions: An analysis of existing and improved technologies	Dr. M. Mazharul Anwar, SSO, Agricultural Research Station, BARI, Burirhat, Rangpur, 01720660167

Serial No.	Code and Title of the project	Name of PI and Address
40	**SE-PP- 264:** Impact analysis of spices research and extension in Bangladesh	Dr. M. Serajul Islam, Professor, Department of Agricultural Economics, BAU, Mymensingh, 01715028792
41	**C-FPE-01:** Study of Canker Disease of Citrus and Development of its Management Practices	Dr. Tapan Kumar Dey, Chief Scientific Officer, Plant Pathology Division, BARI Gazipur-1701, 01716122331
42	**C-PHT- 177:** Reduction of post-harvest losses of selected horticultural crops through improved handling and packaging	Dr. M. Abdul Baqui, Visiting Professor, Department of Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706, 01713881104
43	**C-S- 135:** On-Farm soil fertility management through IPNS approach	Mr. Dilwar Ahmed Chowdhury, Senior Scientific Officer, On-Farm Research Division, BARI, Joydebpur, Gazipur-1701, 01711318685
44	**C-S- 149:** Acid soil amendment through liming for improving livelihood of farmers	Mr. Md. Bodruzzaman, Senior Scientific Officer,, Wheat Research Centre, Nashipur, Dinajpur, 01712600518
45	**C-S- 150:** Validation refinement and dissemination of imporved water management technologies for increasing water use efficiency and rice production	Dr. Md. Nazmul Hassan, SSO, Irrigation Water Management Division, BRRI, Gazipur, 01711431370
46	**C-S- 156:** Effects of Household wastes on vegetable production in monga area of Bangladesh	Dr. G.K.M. Mustafizur Rahman, Professor, Department of soil science, BSMRAU, Gazipur-1706, 01718186642
47	**C-S- 161:** Water management practices for increasing cropping intensity in Chapai Nawabganj district of Bangladesh	Dr. Md. Asgar Ali Sarkar, CSO (cc), Agriculture Engineering Division, BINA, P.O. BOX-04, Mymensingh-2202, 01715998145
48	**C-S- 162:** Upscaling alternate wetting and drying (AWD) to reduce irrigation cost in high yielding rice production in Tangail, Pabna and Sirajgonj district.	Mr. Md. Monir Uddin, Executive Director, Centre for Integrated Rural and Agricultural Development (CIRAD), Biswas Betka, Dhaka Road, Tangail Mobile: 01711987113
49	**L-LM- 227:** Integrated rice/forage production and storage technology increase milk yield of diary cows of smallholder rural farmers	Dr. M. Ali Akbar, Professor, Department of Animal Nutrition, Bangladesh Agricultural University, Mymensingh, 01711592145
50	**L-FF-231:** Development of low cost milk replacer with locally available feed ingredients for rearing calves	Dr. Md. Nurul Islam, Department of Dairy Science, BAU, Mymensingh-2202, 01712621079
51	**C-PHT- 186:** Small-Scale processing of functional fruits Juices applying enzyme technology	Prof. Dr. M Burhan Uddin, Department of Food Technology and Rural Industries, BAU, Mymensingh2202, 01711110509

Impact of CGP Projects 1st call Phase-I (May 2009-June 2011):

Sub-Sector: Crops

Thematic Area: Climate Change

1. C-CC-129: Assessing the Long-term Impacts of Climatic Vulnerabilities on Crop Production and Evaluation of Adaptation Practices in the Vulnerable Areas of Bangladesh

PI: Dr. Md. Muslem Uddin Miah, Senior Agriculture Specialist, BCAS, Gulshan-1, Dhaka

Bangladesh is one of the most vulnerable countries in the world to climate change. The major disasters and environmental vulnerabilities are floods, flash flood, droughts, cyclone, salinity, tidal surges, submergence, river bank erosion, soil erosion & land slides in hills, extreme temperature and low light intensity, fogginess, incidences of pests and diseases etc. These vulnerabilities have direct and/or indirect implications on the performance of crops, livestock, fisheries and agro-forestry. The vulnerabilities due to climate change are likely to aggravate more in the future. These vulnerabilities hinder the agriculture production systems, economic and social development through two processes:

Firstly, damaging the crops, livestock, fisheries and agro-forestry, natural resources and infrastructure;

- Secondly, pulling back the on-going development, business and trade at local. regional and even global levels.

During the study, time series data/information on land use systems, conversion of agricultural land, climatic parameters viz. erratic rainfall, changes in temperature, humidity, sunshine, day length, fogginess etc were assessed in the context of crop loss or yield reduction in the project areas due to climate risks as follows:

i) Cropping Intensity: Average cropping intensity in the vulnerable areas of droughts, floods, salinity/tidal surges and hills has not increased as much compared to Flood Plain Agriculture during 1976-77 to 2006-07.

ii) Changes in annual rainfall: Erratic nature of rainfall, number of days without rainfall and more rain is occurring in short duration. Total rainfall in Kharif season is decreasing that affects the cultivation of rainfed crops in the drought prone and coastal region. But the total rainfall during rabi season is increasing in Cox's bazaar and Satkhira districts that also affecting the cultivation of rabi crops.

iii) Changes in temperature: Temperature is generally increasing in the monsoon, average monsoon maximum & minimum temperatures show an increasing trend annually 0.05oC and 0.03oC respectively. Level of rabi max. temperature is increasing compared to min. temperature affecting winter crops. Level of both Kh-I & Kh-II max. and min. temperatures is increasing. Temperature rises in all three seasons indicate a sign of global warming in the drought prone and coastal region.

iv) Increasing soil salinity**:** Long-term data demonstrate that there is an increasing trend of pH level due to increasing salinity. The salinity level (Ec:ds/m) has increased almost double (Ec: 2.8-18.5 to 4.0-42.8 ds/m) in some coastal areas viz. Sharankhola Upazila of Bagerhat district, Dumuria Upazila of Khulna district and Shamnagar Upazila of Satkhira district.

v) Increasing salt affected areas**:** Survey showed that salt affected areas have significantly increased (26.71 % increase) to 950,780 hectares in 2009 from 750,350 hectares in 1973 in the coastal region.

vi) Increasing river water salinity: There is an increasing trend of river water salinity (12.9-24.5 % increase) in Bishkhali river at Pathorghata point, Andarmanik river at Kalapara point and Payra river at Taltali point during 2001 to 2009.

vii) Increasing Vulnerable areas of Droughts, Floods, River Bank Erosion, Soil Erosion and Tidal Surges due to climate change during last 30 years.

viii) Estimation of crop loss due to different climatic risk factors**:** Crop losses and yield reductions were estimated based on field visits, survey, FGDs, case studies and discussion with local scientists, extension personnel and farmers in evaluating the severity of long-term climate risk factors affecting crop production systems in the vulnerable areas of droughts, floods, salinity/tidal surges and hills following a standard criteria of FGD checklist. During evaluation/estimation of crop losses, major climatic risk factors were also identified. Estimation of crop loss/yield reduction has been summarized in the following table (Table 1) based on the local estimates, observations/experiences of last 20-30 years and long-term crop productivity trend (15-20 years) of different project sites:

2. C-CA-117: **Adaptation of Suitable Crops in Saline Soils of Noakhali**

PI: Dr. Mohammed Amin, CSO, RARS, BARI, Hathazari, Chittagong

More than 30% of the country's cultivable land lies in the coastal area of which 1.0 million ha is affected by soil salinity to different degrees. Most crops are not suitable for growing in salt affected soils, particularly during dry season. Salinity renders the land fallow for a prolonged period after the harvest of aman rice in Subarnachar and Sadar upazila of Noakhali district and hence cropping intensity and the system productivity in the area is low. Scope of enhancing production and system productivity exists provided salt tolerant crops and varieties are planted. Few farmers do plant soybean, groundnut, chili, cowpea, grasspea, sweet potato, watermelon etc. during dry season but with little success. Scientists carried out a series of on-farm trials and scientific studies for two years beginning June 2009 in three locations of two upazila – Noakhali Sadar and Subarnachar to test and validate crops and crop varieties that withstand moderate to high salinity during dry season in charlands.

In the first year, some promising crops and varieties were screened for tolerance to soil salinity developed naturally under farmers' field conditions in those two upazila of Noakhali district. In the second year, two experiments were conducted in two locations of salt affected areas of Noakhali for validation of the results. Simultaneously on-farm trials of the promising crops tolerant to salinity were conducted in 4 upazila of Noakhali and Laxmipur districts for further confirmation of the findings, determination of critical/ threshold level of salinity and drawing a conclusion on the possibility of growing promising crops in the coastal saline soils of the region. Two years' results indicated that depending on season and crop growth stage and land topography soil salinity level fluctuated ranging between 1.2 dS/m and 17.56 dS/m. Salinity level increased over time, and it was low in the beginning of the season reaching its peak in April. Based on the degree of tolerance, crops were ranked in the order of:

Sunflower, sugarbeet, barley and linseed proved to be promising crops for large scale production in the salt affected coastal areas. Production of these salt tolerant crops can be expanded in about 20,000 ha in the coastal area of Feni, Noakhali, and Luxmipur districts.

3. F-DD-240: GIS and Remote Sensing database for Spatial decision support system for sustainable shrimp culture in South-West coastal region of Bangladesh\

PI: Dr. S. M. Bazlur Rahman, Associate Professor, Fisheris & Marine Resource Technology, Khulna University, Khulna.

Southwest coastal region of Bangladesh has experienced a rapid expansion in shrimp farming in the last decade. Congenial conditions such as availability of coastal land and water, successful transfer of hatchery technology and increased export demand led to this rapid expansion of shrimp culture. The rapid development of shrimp culture has been accompanied by many controversies and it demands a closer look at the environmental and socio-economic impacts. The ecological and social impacts of shrimp culture include large-scale degradation of agricultural areas acidification, salinization of ground water pollution of agricultural land and coastal waters by farm effluents, loss of hundreds of indigenous species and subsequent loss of goods and services generated by natural resource system. Conversely shrimp aquaculture has itself been affected adversely by environmental problems such as poor water quality and disease leading to reduced productivity and in some cases abandonment of shrimp farms. The major step for scientific and sustainable development of shrimp culture is better site selection followed by improved culture management. For a sustainable use of the land, it is essential that pragmatic planning and monitoring to be done. Remote sensing integrated with GIS can play a major role in sustainable shrimp culture development by providing information on land use/land cover water quality Productivity tidal influence and coastal infrastructure. These tools help to maintain the sustainability of shrimp culture through proper site selection by considering the impact of the development on other land use activities like agriculture, protected areas like sanctuaries human uses, etc. that are part of the same ecosystem. Considering all these, a systematic and scientific research work had been undertaken in three coastal districts of Bangladesh. For conducting the study GIS, remote sensing and ancillary data like topographic and administrative maps of Bangladesh, soil map, shrimp culture related data such as types of the farm, culture area, method production, source of fry, water source and seasonal availability of water, drainage system, water logging situation, disease outbreak, sanitation facility, road communication, water quality parameters soil characteristics, land use pattern, land elevation, hazard frequency, depot facility, electricity supply, fisheries statistics and population census data etc were collected using different sensors, through laboratory analysis, questionnaire survey and also from different sources. Base map of the study area was prepared using satellite data. Visual interpretation of the images was performed using the most important diagnostic characteristics. Through this study a spatial (GIS) database was prepared for sustainable shrimp culture and finally potential sites of shrimp culture were shown through zonation maps having three categories i.e. most suitable, moderately suitable and less suitable areas of shrimp culture in the study locations.

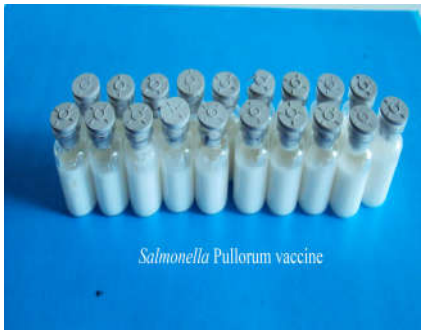
Sub_Sector: Livestock

Thematic Area: Disease Development

4. L-DD-232: Molecular characterization of poultry *Salmonella* and production of formalin killed pullorum disease vaccine using local isolate in Bangladesh

PI: Dr. Md. Mokbul Hossain, Dept. of Pathology, Faculty of Vet. Science, BAU, Mymensingh

Pullorum disease (PD) is one of the most common infectious and fatal diseases of chickens in Bangladesh causing huge losses during the first 1-3 weeks of age. The disease is caused by the bacteria *Salmonella enterica,* subspecies enterica, serover Pullorum. For prevention and control of PD in chicks vaccination with an effective vaccine to the layer or breeder flocks is the most important and effective tool. For this an attempt was made through this project to develop an effective vaccine from the locally available field isolates of *Salmonella* Pullorum bacteria. A total of twenty pure cultures of the bacteria was obtained through morphological and biochemical tests and confirmed using PCR. For PCR confirmation *inv*A (284 base pair) and *rfb*S (187 base pair) genes were amplified. Moreover, other methods of confirmation like necropsy, gross and histopathology along with ELISA were also used in this study. From among the twenty isolates, one isolate designated as SP-BD (Bangladesh)-11 was used as master seed for production of PD vaccine. An oil adjuvant vaccine was developed with the colony forming unit (CFU) of $2x10^8$/ml. The mean antibody titer of the vaccine was found to be 3553±463.60 (post primary) and 4834±582.74 (pot boosting). An antibody titer of >654 is considered as protective when BioChek ELISA kit (BioCheck, Cat. No. CK 117, Holland) is used. Clinical illness of the vaccinated birds was 16.67% while in unvaccinated birds the illness was 80% after challenging orally with the double infective dose ($2x2x10^8$ CFU) of live *Salmonella* Pullorum bacteria. Re-isolation of *Salmonella* Pullorum bacteria in the liver and in the cloacal swab from challenged vaccinated group was 10% and 30% respectively after 3 weeks of challenge. In unvaccinated challenged control birds the re-isolation rate of *Salmonella* Pullorum in the liver and in the feces was 45% and 80% respectively. Maternally derived antibody titer in chicks at the age of 7 days, 14 days and 21 days was 2751±701.85, 1581±371.75 and 1156±247.11 respectively. A total of 301 nucleotides of the *rfb*S gene of *Salmonella* Pullorum vaccine bacteria was successfully sequenced. A blast search for homology of the *rfb*S gene was shown the vaccine bacteria to be 93% homologous to the Korean isolate of *Salmonella* Pullorum.



5. C-FM-163: Development of small scale electric powered oil expeller suitable for adaptation among the rural farmer's in Bangladesh.

PI: Prof. Dr. Md. Daulat Hussain, Dept. of Farm Power & Machineary, Bangladesh Agricultural University (BAU), Mymensingh.

An expeller press is a screw-type machine that presses oil seeds through a caged barrel-like cavity. Raw materials enter one side of the press and waste products exit the other side. The machine uses friction and continuous pressure from the screw drives to move and compress the seed material. The oil seeps through small openings that do not allow seed fiber solids to pass through. Afterward, the

pressed seeds are formed into a hardened cake, which is removed from the machine. Pressure involved in expeller pressing creates heat in the range of 140-210^{0}F (60-99^{0}C) (Adeeko *et al.*, 1990)

Electric powered small oil expeller was constructed and installed at BAU campus, Modhupur forest area and Biddyaganj under Muktagachha Upozilla. The basic information on the design of the expeller was collected from the oil mills and industries operating in towns and cities in Bangladesh. Most of the big expellers are imported from abroad. The capacity of our expeller was 40 kg/hr which with big expeller was 100 kg/hr 150 kg/hr. The oil extraction efficiency was 75.44 percent while the machine was running at 36 rpm.

The factors which affects oil extraction from this expeller was determined. Moisture content of seeds were in the range of 10-12 percent and 1-2 percent water was added before expelling operation.

Considering time and oil recovery 36 rpm was considered better for the expelling. The inside temperature of the expeller gradually increased from 30 to 65^{0}C for one batch and it took about 30 minutes.

The fabrication cost of the machine was Tk. 2 lacs including machine cost, motive power either electric motor or small diesel engine, belt, starter, RCC foundation while for a big expeller the total cost was minimum 5 lacs. Materials required for the construction of the small expeller are described in the text of this report. All materials were purchased from the local market. Local artisans with little training will be able to fabricate the small expellers. About 30 man days are required to fabricate the whole expeller system. The machine frequently needs repairing of the worm screws at an interval of 30 to 40 days of operation or crushing of 10,000 to 12,000 kg seeds.

To run a small oil extraction industry two labors and one supervisor is needed for its operation and the owner of the expeller can make net profit up to Tk. 52,000/- per month. The life of the machine is expected to be 25 years if maintenance activities are done properly and good quality materials for fabrication are ensured.

A distinct feature of the screw pressing method is that chemicals are not used, so products are free of chemical residue and are safe for storage or consumption. The quality of the oil and the cake is quite superior and is suitable for human foods and animal feed respectively. The initial installation cost and operating costs are less than from the solvent extraction method and the capacities range from al low of 0.1 t/ha to very large capacities of 100 t/h. The residual oil content in the cake has been estimated to be as low as 8% in the case of mustard seeds.

Sub-Sector - Crops

Thematic Area: Farm Productivity Enhancement

6. C-FPE-049: Wider adoption of modern rapeseed-mustard and sesame varieties with production technology for yield gap reduction

PI: Dr. Md. Ali Akbar, Executive Director, Agrarian Research Foundation, 5/48 Pisciculture Housing Society, Dhaka.

Rapeseed-mustard and sesame are the major oil crops in Bangladesh. Oilseed crops are planted to about 300,000 ha producing 3.0 lakh tons of seeds annually and the yield is low which is attributed to the low yielding varieties and inappropriate production methods adopted by farmers. This project sought to reduce yield gap and increase production of rapeseed-mustard and sesame conducting on-farm trials comparing modern varieties with traditional varieties involving a large number of farmers

in Manikganj, Faridpur and Rajbari districts in two successive growing seasons during 2009-2010 period. Five varieties each of rapeseed-mustard (Tori 7, BARI Sharisha 9, BARI Sharisha 14, BARI Sharisha 15, and Maghi Sharisha) and sesame (BARI Til 2, BARI Til 3, BARI Til 4, BINA til 1 and a local variety) were planted.

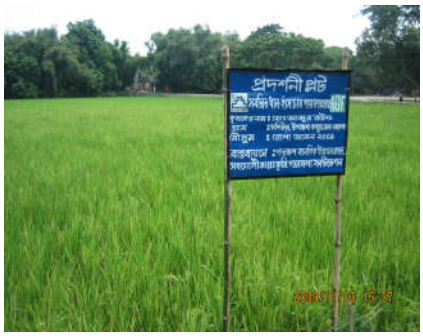
Averaged over two years and locations, BARI Sarisha 15 outyielded other varieties producing 1,571 kg/ha. This was 96% higher compared with Maghi Sarisha. Bari Sarisha 14 (1,420 kg/ha) and BARI Sarisha 9 (1,239 kg/ha) ranked second and third giving 78% and 55% higher yield than local variety, Maghi Sarisha. BARI Sarisha takes about 10 days more to mature compared with local variety; but can easily be planted in the intensive cropping system after the harvest of aman rice and harvested prior to transplanting boro rice after harvesting rapeseed-mustard. BARI Til 4 produced consistently higher yield in both the years and locations. Average yield of BARI Til4 was 1,536 kg/ha closely followed by BINA Til 1 (1,456 kg/ha). All the modern varieties performed better than the local variety.

In view of acute shortage of edible oil, a massive program of expanding cultivation of rapeseed and sesame using high yielding varieties can be taken up by the DAE with seed production support of the BADC.

7. C-FPE-054: Up-Scaling of Integrated Rice–Duck Farming in Bangladesh: Improvement of Rural Livelihood through Community Approach

PI: Ms. Salma Akhter, Padakhep Manabik Unnayan Kendra

The present system of rice cultivation requires fertilizers and pesticides that are harmful to the environment. The system can also reduce the yield of resource-poor farmers because they cannot afford to use optimum dosage of inputs. Rice-duck farming presents an opportunity of increasing income through improving soil fertility and reducing cost of applied fertilizers and reducing yield loss due to pests and weeds. When ducks are reared in rice fields, ducks feed on weeds and pests and duck droppings provide supplemental nutrients to the crops. Padakhep initiated an integrated rice-duck project in Kendua upazila, Netrakona in May 2009 and in Kotiadi upazila, Kishoreganj district the following year.



The study was conducted in farmers' plots. Some 200 farmers were involved in the project. In the second year the study was conducted on community basis in several villages in two upazila of Netrakona and Kishoreganj districts in the second season. . Locally popular and modern rice varieties (BR 11 for T.Aman 2009; BRRI dhan 29 for Boro 2009-10; BR 3 for T.Aus2010 and BR 11for T.Aman 2010 seasons) were planted. Each plot was divided into two and ducklings at the rate of 400–500 birds per ha were released in one parcel of land 14 days after transplanting. Other portion remained as check. Ducklings were removed at the time of flowering.

Results showed that duck droppings acted as a source of plant nutrient and saved Tk 3,827 -, 9, 852 per ha on account of chemical fertilizers. Duck itself effectively controlled the insects and weed population thereby saving Tk 7407-9877 per ha. Rice-duck technology also enhanced yield by 20-30%. Rice-duck farming also improved soil quality. Technology enabled farmers to obtain 50-60%

higher net returns per ha over sole rice system. Economic benefit of rice-duck farming was appreciably higher in Kishoreganj (Tk 41,913 – 62,839) than in Netrokona (Tk 35198 – 39444).

8. C-FPE–055: Impact of Rice-Wheat/Potato-Mung bean Cropping System on Farmers' Employment Opportunity, Food Security and Livelihood in Selected *Monga* prone Areas in Northern Districts of Bangladesh

PI: Dr. M Moynul Haque, Professor, Dept. of Agronomy, BSMRAU, Salna, Gazipur

Greater percentage of farmers in northern Bangladesh is poor and ultra-poor. Most farmers or farm labors in Rangpur, Kurigram, Nilphamari and Gaibandha districts find no job for prolong period after transplanting aman rice until the beginning of harvest (Sep.- Dec.). Again a lean period occurs between the harvest of rabi crops and the beginning of aman crop when poor farmers remain idle. Such temporary unemployment creates a near famine situation for the smallhoders and landless farmers called *monga.* In this project Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU) in partnership with Rangpur Dinajpur Rural Service (RDRS) attempted to develop an improved cropping system to increase yield, create uniform job opportunity almost throughout the year by incorporating short duration rice varieties during aman and an additional mungbean crop immediately after harvest rabi crops (potato or wheat). The project involved 100 farmers of Gaibanda, Rangpur, Nilphamari, Lalmonirhat and Kurigram districts.

Field test of improved cropping system for two years demonstrates that a moderate yield of mungbean (667 kg ha^{-1}) may be harvested as an additional crop. Adoption of short duration rice varieties (e.g., BU dhan 1) increased yield by 8.4% and facilitated early planting of potato and wheat. This also helped increase potato and wheat yields by 19.2% and 13.0% respectively. By growing mungbean as an additional crop a gross return of Tk. 43,626 per ha was obtained with a benefit cost ratio of 1.85. Harvesting of early rice also created job for 84.75 labors per ha during October-November and 121.83 labors per ha for mungbean during April-May. The tested cropping pattern increased the system productivity by 20.1% with gross return by 101.0% and 51.8% higher BCR in comparison with existing cropping systems. Results of nutrition surveys showed that introduction of improved cropping system improved human nutrition of the members of poor farm families through greater intake of mungbean (26.7 kg per family).

Sub-Sector: Livestock

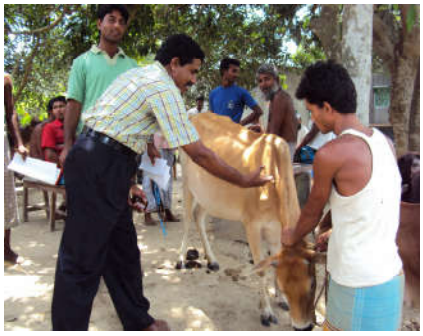
Thematic Area: Herd Health Management

9. L-HM-214: Study of Herd Health Management Practices for Ruminants in Bangladesh

PI: Dr. Syed Anwar Hossain, Herd Health Project Social Upliftement Society, Savar, Dhaka

The Ruminants of Bangladesh are reared mostly by small house holds, for generating cash income and for draft power. Ruminants rearing is an important instrument for poverty reduction and livelihood improvement. But Ruminants in Bangladesh suffer from various diseases and chronic nutritional deficiencies. Endo and Ecto parasitism cause a high degree of un production, ill health and even ruminants mortality. But these nutritional deficiency can be overcome by production of improved variety of fodder and by different technologies for straw processing.

Disease can be controlled by attempting through proper treatment, de -worming of parasitic disease affected ruminants and through mass vaccination against infectious diseases. Treating or vaccination to a few ruminants, nevertheless is useful in controlling diseases, while rest of the ruminants remain susceptible which is unknown to the farmers of the community. Instead of treating individual disease affected ruminants herd health management practices were attempted in this project.



The proposed project seeks to determine the effective of the existing treatment/ preventive measure as well as ruminants health practices that are in vogue in the country and to identify the needs of the farmers as well as skill, knowledge and awareness development, require for improving the herd health management practices. It also assessed the role and capacity of the govt. organization and NGO in adopting the needed technologies for control of diseases, fodder production, breed improvement and to create awareness and skill for needed husbandly practices.

All the house holds and ruminants in these villages were targeted for implementation of the work. After conducting a bench mark major activities included keeping health, and production records for each individual ruminants, routine deworming of each animal twice in a year, mass vaccination against. An., B.Q, F.M.D. for cattle and P.P.R in goat along with A.I/N.S for ruminants breed development. In addition to additional activities, were such as demonstrations of improved husbandly practices, skill and awareness development training, taking weight of calves and growing ruminants and milk yield of each ruminant.

Three villages one on each upazila in the proposed districts, such as Sirajganj, Jamalpur and Manikgonj were selected on the basis of accessibility, ruminants population density and availability of veterinary service providers both public and private sectors. Fifty households rearing ruminants out of around 150 households and 191 farmers in each project area were intercepted using both the close end and open end questionnaires. At the begging of the project implementation, a baseline survey was conducted to the study of socio-economic condition of the farm families and collection of constraints for healthy herd's management practices. To sets of data collection, a structural questionnaire containing both close end and open end were used. Farmers are also interviewed, using these questionnaire.

Data were analyzed to determine the relevance to the concept of herd management practices. Short falls, and constraints were determined for developing of effective and suitable, economic model for thus purpose.

For developing skills awareness, eagerness and knowledge farmers in groups of 25-30, were given 1-2 days 50 potential farmers were identified, trained and encourage to act as linkman for related problems and there solution and they well known to the farmers. ULDC/private sectors service providers are now in linkage with the farmers. In the meantime, 2500 (twice in a year) cattle, 380 (twice in a year) goat were dewormed and necessary vitamins were supplied for the dewormed ruminants.As a result herd's health and production yield is increased., 47 heads of cattle and 29 goats were treated for general diseases and received good response .Vaccination for FMD-1250, Anthrax-625, HSV-325, B.Q-1250 and PPR-190 were done for which no infections disease is found. Disposal Farmers made 259 of cow dung pits deposit it, others are trying to do it. Cow dung of 157 pits were used in cultivable lands as composed fertilizer.

Feeding systems are maintained for which health and production yields of ruminants are increasing Improved varieties of fodder such as Napier, para, oats, gamboo, sorghum, rosy and maize are cultivate fore feed.Breed improving through A.I and N.S with Frisian, shalriwall blood are performing properly production yield and body wt. growing maintained by the farmers which were taught to them.

Development of egarness of the farm families and are willing to rear more ruminants.General diseases are decreased and health conditions of the ruminants are good.Increase the production ability of improved quality of fodder, causes removal of scarcity of feed and chronic nutritional deficiencies of ruminants. Out break of infectious diseases like An., HS, B.Q, FMD, PPR etc. are nil due to the proper vaccination, as such Mortality is nil. Local breeds of ruminants are developing to improved breed through A.I, N.S and the production rate is increase.Farm families are well trained for ruminants necessary feeding, housing, rearing of high yielding milk cows, pregnant cows, calves at early life and in all other sectors of rearing of Herd Health Management Practices.

10. L-HM-219: Improving Livelihood through Herd Health Management and Milk Market Access to Poor Farmers Living in Northern Bangladesh

PI: Dr. Md. Golam Shahi Alam, Professor, Dept. of Surgery & obstetrics, Faculty of Veterinary Scince, BAU, Mymensingh

To improve livelihood of very poor people living in island *Char* areas of northern Bangladesh a package delivery of productive veterinary service was delivered.

It is showed that 1516 (50.1%) and 1508 (49.9%) people from 12 villages of Sariakandi, Islampur, Belkuchi Upazilas (sub-district) were involved in dairying [n = 300 households (100/area)] and non-dairying [n= 300 households (100/area)], respectively.

Ownership of five (202 m^2) and ten (405 m^2) decimals homestead area of dairy group were 61%, 14%; 62%, 10%; 60% and 13% in Sariakandi, Islampur and Belkuchi Upazilas, respectively. In the same group, cultivable land of 10 and 20 decimals were recorded in 44.5%, 13.5%; 43.5%, 12%; 38% and 15%, respectively. But in the non-dairy group, lower land ownership was recorded, and as such homestead area of five and 10 decimals were 34%, 4.5%; 26%, 2.5%; 27% and 2.5% in the same areas as above and at least 10 decimal cultivable land were 15.5%, 15% and 14% in Sariakandi, Islampur and Belkuchi Upazilas, respectively. Households of 70%, 74% and 49%, 44% of dairy and non-dairy groups had access to drinking water and sanitation facilities, respectively. The livestock population in 300 dairy households was 946 cattle, 845 sheep & goats, 1271 chicken & ducks and 3 horses. However, 300 non-dairy households had only 17 cattle, 766 sheep & goats and 1132 chicken & ducks.

Average self-declared daily cash income of each dairy household was Taka: 129/- (1US $= Taka: 72/). But Taka: 109/- was the sole income for the non-dairy group. Many of the dairy household group had a bicycle (n=54), radio (n=59) and cell phone (n=211), but few in the non-dairy group had a bicycle (n=8) and cell phone (n=43).

The existing reproductive performances of 1466 heifers and cows were assessed before and after various productive veterinary interventions. On average, 97.2% of the cattle in these three areas were indigenous (*Desi*) and only 2.8% were crossbreed. Both men (46.8%) and women (53.2%) were

involved in cattle rearing. About 24% of the cows were affected with various reproductive problems such as longer (>430 days) calving intervals (20.1%), repeat breeding (3.7%), abortion (5.1%), dystocia (6.7%) and retention of placenta (4.6%).

All selected animals were immunized with Foot and Mouth Disease (FMD), Anthrax, Black Quarter (BQ) and Haemorrhagic Septicaemia (HS) vaccines. Deworming (Triclabendazole INN 900 mg & Levamisole BP 600 mg @ 19.5 mg/kg body weight; Renadex®, Renata Animal Health Ltd, Dhaka and Nitronix @ 1ml/25kg body weight; Dovenix® ,MERIAL-17,rue Bourgelat 69002 Lyon-France) against common parasitic infestation was administered *per os* or s.c. together with vitamin-mineral premixes [Vitamins AD3E 10,000,000, 1,000,000 iu & 10g, respectively and Trace Minerals Co-0.20g, Cu-1g, Fe-6g, I-1g, Mn- 1.20g, Se-0.01g & Zn-2g (Renavit DB® @ 1g/kg feed) & Combination of Zn, Mn, Cu, Co & Amino Acid (Availa 4® , Renata Animal Health Ltd, Dhaka @ 4g/120 kg body weight orally)] supplementation.

The milk yield and body weight of 581 cows was recorded. After veterinary intervention, the average milk yield increased from 1.4 to 2.2 litre/cow. There was an apparent effect of improved health on body weight gain (80g/day/cow).

A total of 268 sub-fertile cows from three areas (Sariakandi, Islampur & Belkuchi) were synchronized using $PGF_2\alpha$ analogue (PG) and 67.5% of the treated cows showed oestrus after an average of 68-70 hours of PG injection. Pregnancy (54.1%) was confirmed by rectal examination of the genital tract between Day 60-80 post services.

A total of 115 cows from Sariaknadi and Belkuchi were served by Artificial Insemination (AI) using frozen semen and pregnancy was confirmed in 39.1% animals. Eighty eight repeat breeding cows from Sariakandi, Islampur and Belkuchi areas were treated with Gonadotrophin Releasing Hormone (GnRH) immediately after natural service. Pregnancy was confirmed in 29.5% cows.

Six hundred farmers were selected as potential group members for the development of milk marketing channels. The, 600 farmers were organized into 24 groups. Then after a series of discussions between the Gowalas (Middlemen) and group members, an informal contractual arrangement for milk marketing was made between the milk producing groups and Gowalas. After developing this market channel, both parties benefited in terms of a better milk price.

Therefore, a package delivery of productive veterinary health care services improved cows' health, resulted in a good pregnancy rate and increased milk production. To obtain a satisfactory milk price, good bargaining power among the farmers group needs to be encouraged. Information generated from this study would help the policy planner to develop a future strategy for combating poverty and ensuring food security.

Sub-Sector: Crops

Thematic Area: Variety Improvement

11. C-VI-006 Collection, Conservation, Characterizations and Varietal Development of Garlic and Onion through Selection and Molecular Techniques

PI: Dr. M. A. Rahim, Professor, Dept. of Horticulture, BAU, Mymensingh

Garlic and onions are the two most important spice crops in Bangladesh. For domestic consumption, the demand of these crops is met largely through imports. Yield of both the crops in Bangladesh is generally low. This project was carried out to develop high yielding varieties through collection, evaluation and utilization of genetic resources.

25 accessions/germplasm of garlic and 18 accessions/germplasm of onion were collected from home and abroad. Out of collected materials, 25 accessions/germplasm of garlic and 11 accessions/germplasm of onion have been selected and conserved in BAU germplasm bank. 16 garlic germplasm and 6 onion germplasm were found promising in respect to yield and other yield attributes. Genetic variation and relationship among 25 garlic germplasm were analyzed using Random Amplified Polymorphic DNA (RAPD). Out of 25 primers screened, two were selected, which gave 10 clear bands, out of which 8 bands were considered polymorphic. The proportions of polymorphic loci were 79.16%. The UPGMA dendrogram based on genetic distance segregated the 25 garlic germplasm divided into three main clusters. Cluster II contained 17 germplasm, Cluster I contained 5 germplasm and cluster III contained only 3 germplasm. The highest genetic distance was 1.60

Among the selected garlic germplasm Garlic-49, an accession collected from Vietnam, gave the highest yield (9.36 t/ha) and registered as BAU Garlic -3 from National Seed Board, Bangladesh (Reg. No 05(14)-5/2011).Out of 11 onion germplasm 6 were found promising in respect to their growth and yield performance (10.66-15.6 t/ha). Field trials were conducted to determine suitable organic manure and appropriate planting date on the yield and quality of onion seed. The Results reveals that poultry manure (paragon compost) @ 10 t/ha and planting on 31, October gave the best for yield and quality of onion seed.

Sub-Sector: Crops

Thematic Area: High Value Crops

12. C-HV-194: Assessment of effectiveness of IPM practices for pest management in brinjal

PI: Kbd. Rafiqul Haider, Program Adviser, SEDA, Mashkanda, Mymensingh

Eggplant or brinjal is the most popular and widely grown vegetable in Bangladesh. Fruit and shoot borer is the most notorious insect pest that causes enormous damage to the crop. Farmers spray insecticides intensively to control the pest causing environmental degradation and posing threat to human health. A field trial was carried out in two locations (Gafargaon of Mymensingh district and Islampur of Jamalpur district) to evaluate the effectiveness of some

selected IPM methods on the pest management of brinjal. Thrirty farmers were selected, each having one bigha of land planted to brinjal administering five treatments, replicated three times. The treatments were : T1- Pheromone trap, sanitation and release of biocontrol agent, T2 – Barrier cropping (Dhaincha/Sesame) and perching, T3 – pheromone trap and spraying of tracer, T4 – Spraying of insecticide (Cartap) and clean cultivation, and T5- Control i.e., farmers' practice.

Results of two years' study showed that the both location and treatments influenced brinjal yield significantly. Higher average yield and BCR values were recorded for Gafargaon in both the years. Treatment T1 i.e. Pheromone trap, sanitation and release of biocontrol agent resulted in much higher yields than any other treatment in both the years and locations. Among the remaining four treatments pheromone trap and spraying of tracer (T3) produced higher yield. Farmers' adopted practice of pest management using repeated sprays of insecticides gave consistently lowest yields among the treatments tried. For achieving higher yield and environmental conservation, IPM technology using pheromone trap, sanitation coupled with the release of bio-control agent can be recommended for large scale adoption. Alternatively, pheromone trap and occasional spray of tracer may also be recommended.

Sub-Sector - Crops

Thematic Area: Hill Farming

13. C-HF-103: Validation of Improved Agricultural Technologies at Farmers' Field in Hill Farming System

PI: Dr. Md. Mohabbat Ullah, PSO, Hill Agricultural Research Station, BARI, Khagrachari

The agricultural productivity in the hilly region is generally low compared to the plain land agriculture in the country. Jhum cultivation is an age old agricultural practice of indigenous hill people. Technologies developed and practiced in the plain lands in most cases, are not transferable to the uplands because of differences in ecological conditions. Lack of modern production technologies suitable for hill farming, poor knowledge and skill of hill farmers, prevailing socio-political and cultural conditions hinder participatory approach for generation and on-farm validation of technology. Development, validation and upscaling of technologies through on-farm participatory trials and technology transfer through training and knowledge building can help adoption of improved technologies and thus enhance production and income in the hilly region.

The Project was implemented in three upazila (Khagrachari sadar, Dighinala and Panchari) of Khagrachari district aiming to increase cropping intensity and framers' income. On-farm variety trial of tomato, radish, bushbean, cauliflower, maize, mustard, potato and wheat was conducted in farmers' plots including homesteads involving 90 farmers in three upazila. Three packages including year round vegetable production were tested for standardization and adoption.

Among the patterns tested, Rai shak – Red amaranth – Panikachu, Red amaranth – Pumpkin shak - Red amaranth – Red amaranth, Radish shak-Gima kalmi-Radish shak, Rai shak – Red amaranth – Brinjal – Gima kalmi and Pumpkin shak – Ladys finger - Red amaranth – Spinach were found better considering agro-economic performance. Saplings of BARI Aam 3 (812), BARI Aam 4 (170), China

Lechu 3 (920), China Lechu 2 (870), Seedless lemon (950), BARI Passion fal 1 (175), BARI Misti Tetul (170) and BARI Malta 1(640) were distributed among the farmers for the development of their mixed fruit orchard in homestead. As a part of development program, 25,000 saplings of improved varieties of mango, litchi, lemon, malta etc. were distributed among 1500 families.

Home garden model with BARI Tomato 8, BARI Tomato 9, MARI Mula 1, BARI Jharsheem 1, BARI Fulcopi 1, BARI Hybrid Maize 5, BARI Sharisha 11, BARI Alu 21, BARI Alu 25 BARI Gam 21 and BARI Gam 23 performed better and gained farmers' acceptance. Raising these crops in a small parcel of land (5m x 5m) could supply vegetables sufficient for a family round the year. Farmers conducting the home garden model had significantly higher intake of vegetables (from 40 to 152 g/head/day).

14. C-HF-104: Ecological Determinants of Bamboo Flowering and Rodent Population Outbreaks in the Chittagong Hill Tracts

PI: Dr. Nazira Q. Kamal, AID-Comilla, Comilla Sadar, Comilla.

Gracious flowering and mast seeding of bamboo is an accepted phenomenon worldwide. Occurrence of rodent outbreaks following bamboo flowering is widely reported. However, the linkage between bamboo flowering and rodent outbreaks has not been proven and the causes of rat foods are mere speculation. It is assumed that the rodents eat the bamboo seeds that increase their breeding potential, and as a result expand their population. Rats feed on crops and rat flood causes widespread damage to crops often resulting in outbreak of famine. The study was carried out to gain an understanding of ecological and anthropological factors driving the temporal and spatial variation of bamboo masting events and to evaluate potential ecologically-based rodent management options to mitigate damage caused by rat floods. Such an understanding will not stop the entire process and prevent rat floods, but it may lead to effective prediction of rodent population outbreaks.

A total of 1857 rats (male 829 and female 1028) were captured in all habitats (bamboo forest, inside houses, outside around villages, jhum fields and community houses) in five different locations. Of rats captured and evaluated, *Rattus rattus* are the dominant rodent species followed by *Mus musculus* in the study area. A highest of 17 uterine scars was observed in a female *Rattus rattus* species, June to August is the peak period for breeding.

Melocanna bamboo flowering initiations were observed in the month of late September and October. These flower initiations may be related to altitude; higher the altitudes, earlier is the start of flowering. First bamboo seed developments were observed in the month of late December and bamboo seed fall started on the ground in the month of May. Seed germination was observed in the month of June and July. One third of seeds are rat damaged and rat damaged seeds can still germinate. Rats also continue to eat from germinated seeds. Percent germination of bamboo seed is very high (>90%). Seeds can germinate while still on the stalk.

All the captured rodent species were found to eat *Melocanna* bamboo seeds, and found one third gnawing mark by rodent incisor. *Rattus rattus* is dominant rat species in bamboo forest area too. Strong relationship between bamboo flowering and rodent population outbreaks was observed suggesting that rat floods do occur due to bamboo flowering.

Community trapping performance shows better results for preventing stored foods and other household materials. Both Trap Barrier System (TBS) and bamboo fence were effective against rats of Jhum fields. But TBS is much more effective than bamboo fence.

15. C– HV -202: Global market analysis for production of high-value export potential crops in Bangladesh

PI: Mr. Abdur Rashid, Senior Research Fellow, Agrarian Research Foundation, 5/48, Picicultural Housing Society, Dhaka.

The project was undertaken to identify high value crops grown or can potentially be grown in Bangladesh having demand in the world market, and potentially be exported. It also looked at identifying export markets for exporting high value crops from Bangladesh analyzing data and information collected from various sources. Updated information on demand and supply, production, and export volume of various crops was reviewed collecting literatures and information from different sources and organizations. Database of various international and national organizations relating to production, demand, supply and trade of crops and crop products have been collected and analyzed. Fifteen years' data relating to production, import and export of 30 crops have been analyzed. Crops that are being grown or potentially can be grown in Bangladesh were selected. For each of 30 major agricultural crops of world-wide importance, data on production, import and export for consecutive 15 years have been collated and analyzed.

Based on analysis of data, potential markets for Bangladesh crops have been identified. Some new crops presenting export potential and having potential growing environment in Bangladesh have also been identified. Strawberry and cashewnut are the two crops that seem to have been gaining ground in Bangladesh. These two crops have enormous potentiality for capturing export market. Barley has strong potentiality for export. Currently Bangladesh produces barley in about 600 ha. Given the export potential the country has the potential of growing barley in vast terrain of coastal districts. Strong demand for Banana in developed countries has also been identified. Likewise, Papaya and Pineapple are two crops having world-wide market demand. Tomato (fresh) is a short duration crop but expensive commodity having strong demand worldwide, especially in USA. Sesame is considered as a high value crop having world-wide demand. Potential exists for growing in and exporting sesame from Bangladesh.

Sub-Sector: Crops

Thematic Area: Post Harvest Technology

16. C-PHT-175: **Up-scaling and Adoption of Hybrid Dryer for Quality Grain Seed Production**

PI: Dr. Md. Ayub Hossain, SSO, FMP, Engineering Division, BARI, Joydebpur, Gazipur

Quality of seeds, particularly cereal seeds, depends largely on the seed moisture content at the time of storage. Most seeds that farmers retain and use are sun-dried and appropriate moisture content (<13%) is not maintained in most cases. This is more true in case of seeds processed during rainy season. Excess moisture results in loss of viability and invites insects and disease infestation. Using mechanical dryers for seed processing presents problems either due to excessive heat or low heat. This project was undertaken to develop and adopt hybrid dryer using electricity and solar energy in combination modifying available dryers for large scale adoption in seed drying.

A hybrid dryer was designed and constructed. Technical performance of the dryer was tested for drying grain seeds and seed quality evaluated. Reflector used in the dryer reflected 53% global solar radiation. Thermal efficiency of the collector was 28.7%. The dryer was tested for drying paddy, wheat, maize and groundnut.

The dryer takes 17 hrs to dry 250-300 kg rice seeds. Likewise, the time for drying 250 kg wheat, 350 kg maize and 200 kg groundnut seeds are 12, 16 and 20 hrs, respectively. Germination of the tested seeds was over 90% with vigor index of above 1.0.

17. C-PHT-179: Increasing storability of potato in natural storage and income generation through small scale processing of potato

PI: Dr. Md. Azizul Hoque, Associate Professor, Dept. of Horticulture, BSMRAU, Salna, Gazipur

Enormous loss of potato due to lack of adequate storage facility has been a problem for expanding potato production in the country. In order to minimize storage losses this project was implemented to develop improved agronomic practices and low-cost potato storage facility at the farm level. A series of experiments and on-farm trials were conducted to improve potato stability.

An improvised well ventilated thatch house, measuring 3.5m Lx 4mW x 4m H, was designed and developed with several stairs, 0.75m-1.0m between stairs. An amount of 200 kg tubers can be stored under natural condition in each stair staking cm in layers of 0.25 - 0.30 for 4 months without significant storage loss in such storage house. It takes about Tk 20,000 to construct such storage facility storing about 8,000 kg per house in each season. The house can be maintained for at least three years without repair. Results indicated that storage loss can be reduced to the extent of 60% compared to farmers' usual practices.

Several agronomic practices have been standardized to improve storage life of potato tubers. Hulm pulling at around 80-85 days after planting helps prolong tuber storability.

Potato requires irrigation for 2-3 times; but for the tubers to be stored under natural conditions, potato crop should not be irrigated beyond 60 DAE.

Sub-Sector: Crops

Thematic Area: Seed Production and Marketing

18. C-SPM- 092: Quality improvement of farmers stored seeds of mungbean, lentil, chickpea and its relation to diseases development in Bangladesh

PI: Dr. A.H.M Mahfuzul Haque, SSO, Pulse Reserch Sub-Station, BARI, Joydebpur, Gazipur

Farmers in most cases do not have the access to quality seeds of pulse crops; usually their own seeds are planted. Hence the quality of farmer's saved seeds is very poor giving poor germination and vigor. Very often seeds are infected with diseases. The present study was undertaken to improve quality of seeds adopting seed health management involving a series of activities.

Quality seeds alone improved average yield of pulse crops by 10% and reduced post harvest seed loss significantly (28-30kg/ha).

Farmer participatory assessment identified seed storage and production and use of good quality seed as the most successful technologies which brought positive impact to the livelihood of the poor farmers. The explanation is: through proper storage, the seed retained its quality and there is no

damage while in the storage thus farmers could save a significant amount of their seed by reducing the seed rate. Through production and use of good quality healthy pulses seed production increased .Another positive impact of using good quality seed is that the cost of both weeding and pest management has reduced significantly. Production of good quality seed and safe preservation was the best across all seasons.

19. C-SPM-096: Seed Production of Summer Onion Varieties: Determining Appropriate Method and Agro-ecological Condition for Optimal Production

PI: Dr. Md. Shawkat Ali Mallik, CSO, Spices Research Centre, BARI, Bogra

Seed production of summer onion requires cooler weather and shorter day length and hence cannot be produced in summer months. Seed setting rate of summer onion is much lower than winter type onion. Agro-ecological conditions also influence seed production significantly. Moreover, appropriate method(s) for summer onion seed production has not been determined. To address these problems both on-station experiment and farmers participatory trials were conducted in two consecutive years (during 2009--2011) to determine the appropriate method(s) of seed production of summer onion varieties (BARI piaz 2, 3 & 5) developed by BARI as well as to explore the seed production potentials under different agro-ecological conditions. Effect of time of production and storage period of bulblet on onion seed production was also studied. The methods of seed production studied were i) Seed to seed ii) Bulb to seed iii) Seed to bulblet to seed & iv) Seed to bulblet to bulb to seed.

Results showed that cooler weather is required during bolting and bursting of bolt and seed setting but at seed maturity warm and dry weather is needed. If warm weather prevails at the time of seed setting, thrips may cause damage to seed setting attacking the umbel and sucking the cell sap from the umbel. Cold weather prevailing even for shorter time during flower stalk initiation affects bolting resulting to formation of smaller umbels and eventually withering. Humidity is also an important factor. Low humidity decreases insect pests and disease infestation. Generally bulb is used for onion seed production. As the shelf life of summer onion is short, it cannot be stored for longer time and sufficient bulb would not be available during planting for seed production. In this aspect, alternate method of seed production has been identified. In this method bulblets instead of bulbs are used as an alternate source of planting material for seed production. Bulblets weighing 4-5 g can easily be produced in the seed bed and can be stored until planting in the month of October to November for seed production. Purple blotch and stemphyliam blight diseases are serious problems in onion seed production. Thrips also causes serious problem when temperature rises particularly at seed setting.

Sub-Sector: Crops

Thematic Area: Soils

20. C-S-144: Maximizing Yield of Tea in Some Selected Problematic Acidic Soils, though Improved Management Practices.

PI: Dr. Quamrul Ahsan, Senior Researh Associate, CASEED

From liming (Dolomite) experiment it was found that Dolomite @ of 1000 kg/ha gave the highest yield 1935kg made tea per hector and obtained the highest economic benefit Tk. 83,523/ha. Among the methods of fertilizer application in tilla tea soil, Half moon method gave the highest yield 2174 kg

green tea per hector which is 21.6kg, 42.2kg and 40.6kg more or 5.2% 10.7% and 10.2% more yield than furrow, Broadcasting and Ring method.

Pruning method/decentering including liming 200gm/plant lime (Dolomite) gave the highest number of branches, number of leaves, stem height, stem diameters etc. This method will help make strong and stout young plant with maximum number of plucking pints. The result of these experiments is very useful for tea industry and by the application of the above method the tea industry can increase their production. Consequently, more foreign currency will be earned. Socio-economic condition of the country will improve.

Application of Dolomite increased PH, reduced acidity, increased exchangeable Ca, Mg, K & P. Highest yield was obtained by application of lime (Dolomite) @1000kg/ha. But the change of nutrient status and PH are not significantly high in all cases as because release of Ca & Mg from Dolomite is slow. It is found from literature and experience that only 20% Ca & Mg is released in the 1st year of application. Due to slow release, uptake of these nutrients is also slow. So experiment should be continued for a longer period at least for a pruning cycle (3 to 4 years) in different locations and topographies of tea industry. Dolomite needs to be finely grounded and properly mixed with soil. Dolomite should be applied 1-2 months before application of normal fertilizer because it reacts with nitrogenous fertilizers and some amount of nitrogen is lost by volatilization from soil.

Dolomite is not toxic and can be handled safely. It is friendly to the environment. PH of soil is not raised sharply by use of Dolomite in tea. 1500kg/ha application of Dolomite in old tea soil of Bangladesh raised the PH from 4.1 to 4.3 after 3 years of application (Ahsan, 1995). Under field condition it is difficult to raise the PH in tea soil which is different from theoretical calculation. But benefit of increased crop is obtained form Dolomite application.

Dolomite@1000kg/ha is recommended for use in old tea soil of Brindabon, saif, and Mirzapur T.E and its adjacent tea areas. In order to control the loss and misuse of fertilizer form specially tilla, half-moon method of fertilizer application is recommended to be used for tilla tea soil. Pruning (D-centering) including liming (Dolomite 200gm/plant) is recommended for quick growth and good configuration of young clonal plant needed for that region of gardens.

Sub-Sector:

Thematic Area: Socio-Economics

21. CGP F-SE-290: Factors affecting shifting from food insecurity to food security: A study of selected monga-prone areas

PI: Dr. Ashoke Kumar Ghosh, Asstt. Professor, Dept. of Poverty and Development, SAU, Dhaka

Despite downward trend in income and food security situation, there are households in greater Rangpur region who are gradually moving up. It is assumed that the households achieved successes in improving their food security situation over the years used better knowledge, skills, information, practices/technologies, means and strategies that were different from those who went down. There exist a large knowledge gap regarding our understanding of the situation that helped these households moving upward both in terms of socio-economic conditions and food security. If we can identify the

underlying factors in the above areas that have made significant contribution in improving the food security situation of the households once considered as ultra poor and food insecure will be a real breakthrough in understanding the magic of changing own fates mainly by using own efforts and initiatives.

The present study is aimed at focusing light towards that direction. Specific objectives of the present study are to (i) identify the factors that enabled the food insecure households of *monga*-prone districts of greater Rangpur region shifted to food secure over the last 5-10 years period; and (ii) disseminating these factors among the similar food insecure households through GOs and NGOs engaged in improving the food security status of the food insecure families.

Landlessness is a single-most major and important cause of poverty and food security in the rural areas of Bangladesh. Households who could make access to land through purchasing and/or mortgaging (including share-cropping) have overcome food insecurity over a period of 5-10 years. Mortgaged-in/leased-in land is an important tool for the landless households to overcome food insecurity. Factors that were identified as positive contributors to increase land (i.e. decreasing landlessness) are experience of the household head, occupational diversity, meeting household food requirement from own production, selection of appropriate crop to be grown, adoption of improved crop production technologies and use of multiple sources of information. Factors that have been found to act negatively to land increase are loan taken, experiencing increased number of food insecurity causes and subsistence pressure. Avoiding/reducing the incidence of negative factors and enhancing/practicing the positive factors expected to help the food insecure households (who are mostly landless or near landless) to move into food secure status through increasing land.

22. F-SE-291: Assessment of techno-socioeconomic resources and development of strategies for promoting food and economic securities of ethnic communities in Bangladesh

PI: Dr. Md. Abiar Rahman, Asstt. Professor, Dept. of Agroforestry & Environment, BSMRAU, Salna, Gazipur

The ethnic people of Bangladesh have been characterized as hard-core, poor, marginalized, undeveloped, oppressed, illiterate and vulnerable groups. To improve their socio-economic condition and to ensure food security, it is necessary to evaluate the strength of the techno-socioeconomic resources and to develop strategies options for scaling up the traditional technologies and introducing modern technologies as well. This study aims to assess the techno-socioeconomic resources and development of strategies for promoting food and economic securities of ethnic communities in Bangladesh. The study has been conducting in three locations i.e. Ghorghat upazilla under Dinajpur district, Modhupur upazilla under Tangail district and Durgapur upazilla under Netrokona district where mainstream ethnic people live. Participatory rural appraisal (PRA), focal group discussion (FGD), monitoring, questionnaire survey and on-farm technology validation were done to satisfy the objectives. A total of 300 households (Garo 55%, Santal 34%, Koach 6% and Hajong 5%) were surveyed. Prior to the survey, the questionnaires were pre-tested.

Results showed that more than half of the respondents belonged to the middle aged group. About 43% respondents were illiterate among all the respondents whereas 33% respondents had primary education and 65% were engaged in agriculture as mail occupation. Most of the respondents were marginal (0.21 to 0.5 ha land owner). Various dominant

cropping patterns (Boro-T.aman-Fallow, Fallow–T. Aman-fallow; Boro-fallow- fallow; Fallow-turmeric/pineapple-turmeric/pineapple) have been identified in the study areas and rice was the dominant crop. Due to improper and traditional management, it was observed 38 and 52% lower yields in boro and aman seasons, respectively, compared to the potential yields. Many people are engaged in preparing handicrafts, bamboo basket, mate etc. There is severe shortage of drinking Agriculture was the main source of income, contributed 33%. October is the most food deficit time. Food security status was at satisfactory in June, July, December and January due to harvesting of rice. More than half respondents have been suffering food insecurity for 2-3 months. Lack of capital was the major problem in the study area followed by drinking and irrigation water.

The yields of vegetables i.e. bottle gourd, country bean, tomato, cauliflower and chili were appreciable and farmers were highly satisfied with the yields. Some prospects have been identified, which can increase crop production, improve livelihood, window for income generation and contribute to the food security.

23. C-S-132: Agricultural Land Loss and Food Security: An Assessment

PI: Dr. Md. Abul Quasem, Bangladesh Unayayan Parishad, Gulshan, Dhaka

It is claimed that every year Bangladesh is losing one per cent of its agricultural land to non-agriculture and if such high rate of conversion continues, the country's half of the land will be lost in the next 50 years. This is definitely disastrous and the country cannot afford such loss of farm land as Bangladesh is a land scarce nation. We are unfortunately not aware of the exact rate of land conversion. The present study in this regard is very useful and it plans to –

(i) estimate the amount of agricultural land converted to non- agriculture and consequent loss of agricultural production;

(ii) find out the non- agricultural uses of converted land;

(iii) determine the factors affecting such conversion ; and

(iv) suggest appropriate policy measures to arrest the high rate of conversion.

The study is based primarily on field survey carried out in mid-2009. It surveyed 24 villages of the country, four from each of the six administrative divisions. The selected villages are located at the outskirts of the metro city, district town, upazilla town and in the rural area of the same selected upazillas having adequate potentials for urban expansions and industrialization. In each village 25 land owner households were selected at random from the farmers' list, prepared earlier by the Sub-assistant Agricultural Officers of the Department of Agricultural Extension (DAE). In total 600 households were selected for interview. The interview was conducted following a structured questionnaire.

The study finds that the during the eight year period of 2001 to 2008 annual conversion of agricultural land amounts to 0.56 per cent against the earlier reported figure of about one per cent. Highest rate conversion was noted in Dhaka division (1.45%) and the least in Khulna (0.26%). In such conversion 42% of land owner households were involved. Among the different land ownership groups maximum rate of conversion was recorded among the functionally landless households (2.86% per year) and the least was in the large land owners group.

The main non-agricultural uses of converted land were identified to be housing, road construction, business establishment and educational and health organizations occupying 55,10,8 and 3 per cent of the converted land respectively with little variations among the five land ownership groups.

Based on the current estimated rate of conversion (0.56%) per year) annual loss of rice production in Bangladesh amounts to o.223 million tons or 0.86% of the country's annual rice production. Similar exercise using loss of paddy (0.8 maund) per land owner household, total amount of loss of rice comes to 0.302 million tons or about 1.16%.

Information available indicate that the conversion of land benefits the converter households in terms of higher household income and improved level of food security.

The regression exercise carried out finds the following factors that have significant effects on the rate of conversion of agricultural land are:

i) total land area owned by a household;

ii) homestead area owned;

iii) primary occupation of the households head, and

iv) disaster losses incurred during the study period.

The regression coefficient shows that 10% increase in total area owned by a household leads to rise in the conversion of land by 3.5%; while the increase in homestead area by the same level of 10% reduces land conversion by 1.4% which is contrary to our expectation. May be, the area under homestead is small and leaves little scopes for expansion. Non-agricultural occupation of the household heads also encourages land conversion.

Thematic Area: Marketing and Supply Chain

24. SE-MSC-266: Processing of Indigenous Fruits and Vegetables to Improve Livelihood of Rural Poor in Madhupur Region

PI: Dr. Md. Shams-Ud-Din, Professor, Dept. of Food Technology & Rural Industries, BAU, Mymensingh

The post harvest management and processing and preservation of indigenous fruits and vegetables may present an opportunity as they have potential to help attain food security. The organized training programs are highly appreciated by the trainees, local people and visitors, and likely to be adopted by the poor farmers, tribal people, women and other stakeholders. It is anticipated that these training programs will help encourage to develop micro/cottage scale fruits and vegetables processing units which will in turn provide alternative and/or additional income generating opportunities for the relatively poorer segments of the society.

The PRA survey in the project area has identified the needs and potential for training of rural poor in processing and preservation of indigenous fruits and vegetables to provide alternative and/or additional income generating opportunities in the Madhupur region.

The proximate composition and nutritional constituents of 28 indigenous fresh fruits and vegetables and 25 fruit and vegetable products have been determined and the results are presented in the tabular form. This information is essential for evaluation of local food consumption and for planning nutritional improvements and optimum utilization of local resources.

The technologies those have been developed through modification of indigenous methods shall definitely suit the need of rural poor for production of value added processed products from locally available fruits and vegetables.

Organized practical training for 80 poor farmers has definitely encouraged the participants to set up micro/cottage fruits and vegetables processing units to improve their income generating and livelihood activities. It is anticipated that poor farmers particularly poor tribal women will be largely benefited from these activities.

The project has developed year- round production schedule for value added fruits and vegetables products. This schedule shall help the trainees and other stakeholders to process various processed fruits and vegetables products depending on the readily available of raw materials in the locality area throughout the year.

The published training manual on "Processing of indigenous fruits and vegetables for the rural poor" has the advantage that the methodologies are presented in a simple and comprehensive manner, so that these do not require elaborate containers, equipment/machineries and chemicals for home-scale processing and preservation and can be used more effectively in rural areas. The published folder of 6 columns containing technical data will be useful to solve specific field problems.

The project was implemented in collaboration with the NGOs "Samannita Unnayan Seba Sangothan (SUSS)" f Madhupur, District Tangail, in research and extension activities. The SUSS is committed to conduct fruit and vegetables processing activities after the KGF fund stopped. We have assured the SUSS to provide consultancy service if required. Utilizing the existing facilities, support from Extension Department of the GoB and from us, the project has potential to continue in future.

25. SE-MSC-279: Promotion of Agricultural Marketing in Hills

PI: Mr. Md. Badrul Alam, International Development Enterprises (IDA), Gulshan-1, Dhaka

Five horticultural crops (brinjal, bean, papaya, cucumber and bottle gourd) have been selected through horticulture sub-sector study to work with in the 2 years project period. The constraints and opportunities have also been identified for these crops through the sub-sector study and value chain analysis. So, these identified constraints have been addressed through this project interventions accordingly.

The targeted farmers have acquired knowledge on improve production technology like, pest management, fertilizer application, importance of irrigation on production, quality seed, new high yielding variety seed, hybrid seed, benefits of early and late seasonal plantation, sorting & grading and crop rotation etc.

The farmers are practicing grading and sorting of the produces to get higher price for their products after gaining knowledge from training.Primary linkages developed among farmers, input sellers, input companies, DAE, and buyers for quality inputs and to get right price from the buyers (output market). Value chain study for 5 horticultural crops (brinjal, deshi bean, papaya, cucumber and bottle gourd) has been completed in the reporting period.

The neighbour farmers of the demo plots have already started cultivation of papaya and other crops after gaining knowledge from the training and demo plots/farmers with improved production practice. Twenty four farmers have already replicated papaya production after gaining experience from the demonstration plot.

IDE is introducing appropriate and affordable manually operated irrigation technology like drip system, mobile

treadle pump and pressure treadle pump for poor and marginal farmers to address the irrigation constraints according to the revised approved plan. The poor farmers can not afford for the mechanized one for high cost and also not feasible for small vegetable plots. There is another problem for irrigating the undulating land topography. Flood irrigation is not possible for such type of land topography. In this case, manually operated pressure treadle pump along with hand shower is suitable for irrigating the undulating crop field with canal or pond water. Mobile treadle pump is also suitable for small vegetable plot irrigation (50 decimal) with surface water from the natural canals or ponds. There are some natural canals and small nos. of ponds are available in the project areas.

One year demonstration far the technologies like manual irrigation pump is not enough to establish the supply chain for the product. Green Hill has shown interest to incorporate these technologies within their other projects implementing in Bandarban.

26. SE-MSC-285: Capacity building of the farmers through exporting comparative Advantaged Horticultural Products

PI: Dr. Md. Kamruzzaman Associate Professor, Dept. of Agricutlrual Economics, BSMRAU, Salna, Gazipur

There are no analytical studies so far which considered the influence of exporting agricultural products on capacity building of the farmers at individual level specially the farmer who produces horticultural products. Therefore, the present study is taken to explore comparative advantage of exporting horticultural products and its influence on capacity building performance of the farmers at individual level.

One district from each of Dhaka, Chittagong, Rajshahi and Khulna divisions selected for primary data collection. One hundred twenty farmers from each district was selected randomly who produces export oriented vegetable and flowers. The data were collected from the respondent farmers using an interview schedule. Some secondary data was also be used for the study.

The Domestic Resource Cost ratio was used to assess comparative advantage of different crops in Bangladesh agriculture. Capacity building ability of the farmers was assessed on the horticultural products which have comparative advantages of exporting. The indicators of different capitals in capacity building are technical, social, human, natural and financial capital. Different components of capitals were used to assess the capacity building ability of the farmers. Each type of capital has various components. In this study, technical capital is comprised of the effective use of land and family labor; the improvement of soil health, the application of technical information; the knowledge of insects and pests; and the adoption of new production technologies,. Social capital includes relations with social groups; communication with the government and non- governmental organizations; relationships with other farmers; wholesale markets; financial institutions; and participation in local government programs. Human capital has components including training, education and health-care (including purified drinking water, sanitation and medical facilities). Natural capital is comprised of cultivated land, irrigation water, other natural resources, and organic fertilizer. Financial capital is made up of savings and bank deposits, loans, and the effective use of money.

Each component described above for each type of capital has been assigned three possible categories. Rather than using quantitative data, each component is described as "high,"medium" or "low." High, medium and low categorizations were counted as three points, two points, and one point, respectively. Accordingly, technical, social, human, natural, and financial capital each can be rated a maximum value of 24,18,15,12, and 12, respectively. Net return, Benefit Cost Ratio, independent sample t-test, stochastic frontier production analysis, log likelihood ratio test was also applied to achieve the objectives.

This study found that the horticultural crop producers with producing exportable horticultural crops (PEHC) are more profitable in terms of net return and the benefit cost ratio than the same production with producing non exportable horticultural crops (PNEHC) farmers. Farmers in the PEHC area improved their individual capacities by effectively using their technical, social, natural and financial capital.

The improvements of the capacity building which enhanced the technical efficiency of the farmers with PEHC have occurred due to intervention of various experts from DAE others NGO's. Further improvements of capacity building of the farmers will help to reduce the inefficiency in farming and actual return can be obtained up to maximum level with the existing level of input use. Therefore, the activities of the intervention need to be strengthened in other areas. Other regions need to be brought under the similar kind of interventions to increases the efficiency levels and to minimize the gap between actual and maximum obtainable total return. It was found that the per hectare total loss due to inefficiency of farmer is Tk 24511 for the PEHC farmers and TK 36929 for PNEHC farmers. Therefore, there is a scope of increasing the said amount of money per hectare if the improvement of the capacity can be made

Comparative advantages of exporting horticultural products determined through this study. The result suggested that production of tomato has highest comparative advantage followed by production of onion, eggplant, potato and others. Therefore exporting of these horticultural products should get priority following international standard of exporting rules and regulations. There is a possibility of increasing total return per hectare by Tk 24511 for the PEHC and Tk. 36929 for PNEHC farmers. There is also an achievement of Tk.12418per hectare who produces exportable horticultural crops

27. SE-MSC-287 Linking Small Farmers with Supermarkets through Promotion of Peri Urban Agriculture

PI: Mr. Md. Moksedur Rahman, Program Officer, Social Upliftment Society (SUS), Savar, Dhaka

Nearly 30% of the country's total population is now in the cities. Over 12 million people live in Dhaka and there is a strong demand for high value specialty crops. The supermarket is an emerging business in Dhaka and large cities. Crop production responding to the demand of supermarkets in Bangladesh is new and farmers have not been linked with supermarkets so far. Association of small farmers or producers' organization is also absent. Formation of producers' organization linking with the supermarkets enables small farmers mobilize their resources in a secure environment, increase their efficiency and earn greater profit. The project aims to train and equip 200 farmers in Dhaka and Rangamati districts to grow 5 selected high value crops for which market demand is high.

Development of peri-urban agriculture for supplying quality food to urban centers is the goal of the project. In attaining the goal, the project seeks to develop and sustain the supply of high-value crops providing training to selected farmers in production and marketing of five specialty crops – broccoli, capsicum, cherry tomato, ginger and strawberry.

Two locations, Savar Upazila in Dhaka district and Sadar Upazilla in Rangamati district were selected for piloting the program. 100 farmers in each location were selected and trained on five high-value crops. A producers' organization, involving all the participating farmers in each location, was formed and made functional. Members of the producers' organizations have been trained on aspects of marketing high-value crops linking them with organized retailers like supermarkets.

100 smallholders at each of Saver, Dhaka and Rangamati Sadar were organized into producers, organization. For each producer's organization an Executive Committee has been constituted. The producers' organizations are functional and active in collective decision making in relation to production and marketing. Farmers of both the locations planted four high-value crops-broccolis, capsicum, cherry tomato and strawberry during winter season 2009-10. Unfavorable weather, however, damaged capsicum crop in Savar area.

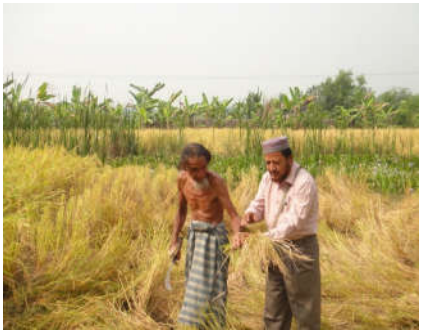
Contract was made between producer organizations and four supermarkets (chain stores), three at Dhaka and one at Chittagong. A transport company was contracted for carrying produces from production center (Savar) to sales center (supermarkets) in Dhaka. Whole of strawberry and most broccoli and cherry tomato produced at Savar was marketed through the contractual chain stores.

All the three crops successfully produced in Savar (broccoli, cherry tomato and strawberry) and four crops in Rangamati (broccoli, capsicum, cherry tomato and strawberry) earned a good profit. Broccoli and strawberry were more remunerative. A Successful market chain has been developed; however, sustaining the market chain requires steady supply of quality produce in huge quantity.

28. Project Title: C-VI-025 Rice germplasm collection and conservation from hilly, coastal, haor and other areas of Bangladesh

PI: Dr. Md. Khairul Bashar, Bangladesh Rice Research Institute, Joydebpur, Gazipur-1701

Bangladesh possesses abundant rice genetic resources. Rice germplasm have been collected so far from the accessible areas of Bangladesh. In several remote areas collection has not been yet carried on in many upazilas of Chittagong hill tracts, coastal districts, haor areas etc. The exploration in these areas was not properly done due to unavailability of logistic support and inaccessibility. Therefore, necessary attempts should have be taken to collect the rice germplasm from those areas, before they have been extincted. To collect these valuable genetic resources, systemic and mission oriented collection programs were done by the personnel from Genetic Resources and Seed Division of BRRI with the help of Department of Agricultural Extension (DAE), non Govt. Organizations and private sector.



The exploration and collection program was done during May, 2009 to November, 2011 in missions through directly by BRRI Scientists from the field and through DAE and Rice Seed Net partners of BRRI from the farmers stock. Twenty seven batches (609 personnel orientation trainings were conducted on importance and procedure of rice germplasm collection. A number of 1078 samples of in which 478 samples of Aus from 54 upazilas of 27 districts; 64 samples of Boro from 26 upazilas of

17 districts, and 536 samples of Aman rice germplasm from coastal, haor and other areas of 46 upazilas of 28 districts were collected. The target upazila for exploration was 100 under 20 districts which exceeded and reached to 113 upazilas of 35 districts. Six hundred and sixty seven new samples filled in passport data were registered. All the collected samples were dried, cleaned and stored in short term storage of BRRI gene bank. Sixty nine samples of Jhum rice of which 39 samples were in Boro 2009-10 and 30 samples in Aus 2010 seasons, were grown for seed increase and characterization. Sixty eight samples of Aman rice were grown in Aman 2010 and 25 samples in Boro 2010-11 seasons for seed increase and characterization. After sorting out within and among the collected samples from different upazilas and districts, finally these were checked with the BRRI gene bank accessions. This collection would be considered as new collection. The expected new germplasm collections would be around 400. This collection should be rejuvenated and characterized morphologically and molecularly for future use and safe keeping.

Sub-Sector: Crops

Thematic Area: Coastal Agriculture

29. C-CA-109: Development of appropriate irrigation and water management technologies for growing upland crops in selected saline area of Satkhira district

PI: Dr. Nazmun Nahar Karim, PSO, Agricultural Engineering Division, BINA, Mymensingh

In the coastal saline belt, more than one million hectares of arable land is affected by soil salinity to varying degrees. During the dry period (November – April) degrees of salinity increases substantially (often up to 24 dS/m) making the land unsuitable for growing crops. This has resulted in low cropping intensity (about 135 %) in the region. Farmers usually grow T. aman rice and after the harvest of T. aman, land remains mostly fallow during the Rabi and Kharif-I seasons due to excess soil salinity and lack of adequate fresh water for irrigation. The project aims to find the potentialities of using surface water and ground water for increasing yield, through the introduction of semi-salt tolerant different crops (sunflower, maize, soybean and mungbean) during fallow period.

Soil salinity decreased with increase of soil depth; the highest being observed in top soil (6.16 dS/m) followed by 15 cm soil depth (2.9 dS/m). At 45 cm soil depth Ec value decreased to 1.70 dS/m.

Irrigated crops performed significantly better than under non-irrigated condition. Source of irrigation water had significant effect on head diameter, seed per head, seed weight per head, 1000 seed weight and straw yield of sunflower. Highest seed yield of sunflower (2.88 t/ha) was found in crop receiving two irrigations with canal water. Irrigation with canal water also increased WUE. For maize, irrigation irrespective of source of water had no significant effect on yield and yield attributes except plant height.

30. C-CA-113: Adaptation of improved sesame varieties in Khulna district optimizing sowing time and nitrogen fertilizer management

PI: Dr. Md. Sarwar Jahan, Professor, Agrotechnology Discipline, Khulna University

Sesame is an important oilseed crop grown extensively in Khulna region. However, yield of sesame is generally low which is attributed to farmers' adoption of indigenous varieties under low management conditions. High yielding varieties have not been introduced and farmers hardly apply any fertilizers.

The project has been carried out jointly by Khulna University and Department of Agricultural Extension, Khulna involving 48 farmers in two unions of Batiaghata upazila. The project aims to introduce high yielding varieties and develop agronomic practices appropriate for increasing yield.

In the first year of project implementation, five varieties were tested planting in different times. Variety BARI Til 4 produced highest yield when planted in early February. Three on-farm trials were carried out in the second year. Yield performance of BARI Til 4 was compared with that of a local variety. BARI Til gave 450 kg produced more yield per ha than the local one. In the second trial, a moderate dose of fertilizers was applied to BARI Til 4 and local variety. Fertilizer application resulted in 200 kg and 350 kg higher yields compared with the varieties grown without fertilizers. Yield improvement due to fertilizer application was 20% and 30% in local and HYV, respectively. In another experiment sesame variety BARI Til 4 was grown under minimum tillage and optimum tillage conditions with and without fertilizer application. Minimum tillage drastically reduced sesame yield and the yield reduction was in the crop grown without fertilizer application.

31. C-CA-116: Improvement of cropping systems through introduction of pulse and spices crops during the fallow period in Khulna area

PI: Dr. Md. Sirajul Islam, PSO, On-Farm Research Division, Regional Agriculutral Research Station, BARI, Jessore

A large tract of salinity affected land in the southern part of Khulna region remains fallow during dry season due to soil salinity. Fresh water for irrigating crops is also scarce. Land remains mostly fallow during the post-rice dry season. The project attempts to intensify crop production introducing pulse crops and developing soil management and agronomic practices.

Screening trial was conducted with five varieties of Khesari (BARI Khesari 1, BARI Khesari 2, Madaripur local, Faridpur local and Khulna local) in Satkhira, and Dumuria (Khuna) during rabi (2009-2010) season. Seed yield ranged between 792 kg and 991 kg/ha in Satkhira. The highest yield was recorded for BARI Khesari 1 and BARI Khesari 2. In Dumuria site, seed yield ranged between 748 and 905 kg/ha with BARI Khesari 1 giving the highest yield.

Three cowpea varieties (BARI Felon 1, Patuakhali local and Noakhali local) were also tried in the same locations. Seed yield ranged between 722 and 780 kg across varieties and between locations. But the difference was not statistically significant.

Eight mungbean varieties (BARI Mug 2, BARI 4, BARI 5, BARI 6, BINA Mug 5, BINA Mug7, BU Mug 2, and BAU Mug 4) were tested in Satkhira and Dumuria. Average yield in Dumuria was significantly higher than in Satkhira. BARI Mug 6 (970 kg/ha) outyielded the other varieties in Satkhira while BARI Mug 5, BARI Mug 6 and BU Mug 2 produced the highest yield in Dumuria.

32. C-FM-173: Design and development of power tiller for dry and wet crop land cultivation in Bangladesh.

PI: Dr. Md. Abdus Satter, CASEED, House-59, Road-12/A, Dhanmondi, Dhaka-1209

Agricultural land preparation is a high power intensive operation to achieve deep tillage, good soil tilth for maximum crop yield. At present land preparation is done by imported power tillers with rotavetors as the only implement which do not serve the purpose of deep tillage, soil slice cutting and inversion unlike mould board or disc ploughs. About 5,00,000 (five lacs) imported power tillers are being used in the country. There is an increasing trend of power tiller population.

There are about 2,24,73,196 acrea gross cropped land area in Bangladesh (BBS, 2010). About 40,000 (forty thousand) new power tillers are being purchased from foreign countries annually. Huge foreign exchange is needed for the purposes. The problems with imported power tiller is high speed operation of rotavetor with curved tines those cut soil bed like combing mainly to small pieces of clods. Crop land requires to cut soil deeply and slice must be inverted which is possible only with mould board or disc ploughs.

This is an effort of introduce and facilitate availability of locally fabricated power tiller with two bottom mould board and ploughs. It is a collaborative approach of CASEED and MAWTS. Principal Investigator (PI) of CASEED has provided all services related to planning, design of components, testing, field evaluation, report preparation etc. MAWTS has provided skilled technical service in fabrication, physical modification as per evaluation for final improvement prototype power tiller with 8.5 HP. SIFENG engine was initially tested on MAWTS field for wet field condition in September 2010, with double bottom disc ploughs, soil slice cutting and inversion along with green grass was satisfactory. Field test on upland condition was tested in December 2010, January 2011, February, 2011 on the BJRI campus Manikgonj, Sailan village of Dhamrai, Moshurikhola of Savar. On the basis of field performance, necessary structural modifications were incorporated tine to tine for improvement.

Sub-Sector: Crops

Thematic Area: Varietal Improvement

33. C-FPE-033: Evaluation of herbicide use in Bangladesh agriculture with special reference to wetland rice

PI: Mr. Md. Nasimul Bari, Associate Professor, Dept. of Agronomy, BSMRAU, Salna Gazipur

A considerable portion of total production cost is involved in weed management. Chemical weed control has become popular due to labor scarcity and lower cost involved in herbicidal weed control. However, chemical weed control presents environmental problem affecting the biological equilibrium and threatening sustainability of agriculture. Professor M Nasimul Bari of BSMRAU evaluates weed control efficiency using herbicides and their effects on soil health.

A quick survey revealed that farmers use as many as 10 different herbicides any many farmers use herbicides in combination. Herbicidal weed management offered average BCR of around 2.30. Weed management with 2-3 hand weedings costs Tk 14,250 – 21375 per ha with BCR values around 1.93 - 1.67. Weed control efficiency of pre-emergence herbicide pretilachol was higher in the beginning but decreased gradually with time. Overall performance of Rifit was proved better.

34. C–FPE– 051: Validation and Up-scaling of Improved Varieties of Mungbean, Blackgram, Groundnut and Sweet potato in the Char Areas of Jamalpur and Sherpur Districts

PI: Dr. Mrityunjoy Biswas, Associate Professor, Dept. of Agronomy & Haor Agriculture, SAU, Sylhet

Much of char land in Jamalpur and Sherpur districts is single-cropped and lands not subject to monsoon flooding are used for double- or triple-cropping. Farmers usually cultivate local varieties of sweet potato, groundnut, blackgram etc. in the char areas as the flood and river waters recede during October-November. The varieties used by the farmers of the char lands are local and produce very poor yields. Mungbean is a very promising pulse crop and this crop can be introduced after harvest of potato, mustard, wheat, chili etc. which cover considerable areas in this region.

Trials are being conducted on groundnut, sweet potato, blackgram and mungbean with improved varieties.

35. C-FPE 052: Productivity Improvement of Acid Soil by Using Dolochun in Dinajpur and Thakurgaon Districts

PI: Dr. Md. Abdul Hakim, SSO, Wheat Research Centre, Dinajpur

Soil in Northern Bangladesh is mostly acidic. An attempt was therefore undertaken to minimize soil acidity of particularly in Dinajpur and Thakurgaon districts in order to raise soil productivity and improve farmers' livelihood. Correction of soil acidity was done by applying Dolochun (calcium magnesium carbonate). Three wheat varieties were planted with 0, 50, 75 and 100% recommended dose of P under 0 and 2 tons of lime ha^{-1}. Wheat yield and yield contributing traits were counted and compared with control. Soil

Wheat yield increased by about 29% in limed plot over the non-limed ones (irrespective of P doses). Variation in P doses also caused significant difference in wheat yield. Variety Prodip responded better to liming producing >3700 kg/ha. Compared with other two varieties, BARI Gom 26 was found yield better without applying lime. Mungbean produced around 40% higher yield in limed plots than control.

36. C-FPE-063: Determination of Factors Responsible For Yield Gaps in Rice and Wheat at Farmers' Field in Four Districts of Bangladesh

PI: Dr. M. Abul Kashem, Professor, Dept. of Agricultural Extension Education, BAU, Mymensingh

Farmers often obtain much lower than the achievable yield of a variety, although the research institutes of Bangladesh have developed and released a good number of crop varieties having high yield potentials. This means that there is a gap between the achievable yield and farmers' actual yield. But the factors behind this yield gap are yet to be identified.

In order to address the issue, a total of 18 research plots (9 for boro rice and 9 for wheat) were conducted in farmers' fields for determining the achievable yield of the varieties. The boro varieties were: BRRIdhan–28, and BRRIdhan–29; the wheat varieties were: Shatabdi, Shourav, and Prodip. The boro rice research plots were set up in Muktagacha Upazila of Mymensingh district and Nokla Upazila under Sherpur disatrict, while the wheat research plots were set up in Dinajpur Sadar Upazila under Dinajpur district and Gongachora Upazila of Rangpur district. The research plots were jointly conducted, monitored and supervised by the concerned farmers, SAAOs (DAE) and researchers.

Nine on-farm trials on BRRI dhan28 and BRRI dhan29 were set up in Muktagacha Upazila of Mymensingh and Nokla Upazila of Sherpur districts in order to know the achievable yield of these varieties. The findings reveal that yield gap of BRRI dhan28 and BRRI dhan29 is about 20 percent. However, the yield gap of BRRI dhan 28 varied from 18 percent in Nokla to 22 per cent in Muktagacha, while the yield gap of BRRI dhan 29 varied from 16 at Muktagacha to 22 per cent in Nokla. The yield gap of BRRI dhan29 was much higher in Nokla than Muktagacha.

Results demonstrate that farmers generally use overdose of urea and most farmers do not use gypsum BRRI dhan 29. Late sowing, use of lesser amount of micro-nutrient fertilizers and inadequate irrigation are the cause of lower yield in wheat.

Sub-Sector: Crops

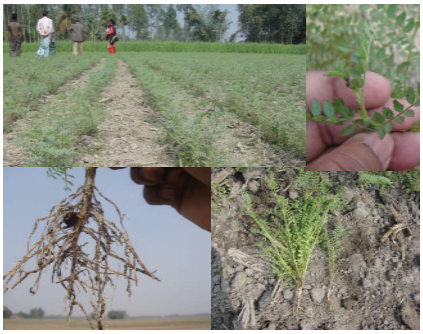
Thematic Area: Varietal Improvement

37. C-VI-010: Validation and dissemination of new varieties and advanced lines for increasing the productivity of lentil, chickpea, mungbean and blackgram in the northern region of Bangladesh

PI: Dr. Md. Jalal Uddin, CSO, Pulses Research Centre, Regional Agricultural Research Station, BARI Hathazari, Chittagong.

The area and production of pulses have decreased over decades. Lentil suffers from Stemphylium blight, Rust, Collar rot, Wilt etc. Chickpea cultivars are low yielding and disease like Botrytis gray mold disease and infestation of pod borer cause enormous damage. Most mungbean cultivars are highly susceptible to YMV and CLS diseases. Blackgram mainly suffers from YMV and leaf spot diseases. Delay in sowing enhances Severity of powdery mildew disease infestation increases with the delay in sowing the crop. The soils of the

northern region of Bangladesh are mostly acidic in nature. Adoption of pulse crops in the region requires varieties that are tolerant to above biotic and abiotic stresses. Under the project new varieties of blackgram, chickpea, lentil and mungbean developed by BARI are being evaluated for possible adoption in northern districts.



Large scale on-farm trials conducted in an extensive areas in North Bengal in 2010 cropping season revealed that recently developed two varieties of lentil - BARImasur-5 and BARImasur-6 and advanced line X95S-167(4) are resistant to Stemphylium blight and rust diseases. BARIchhola-5 and the advance line ICCV-95138 are suitable for growing after T. aman harvest in Barind area of Rajshahi and some other districts of north western Bangladesh. The short duration BARImung-6 resistant to YMV is suitable for cultivation in the fallow lands of northern districts in Kharif-1. BARImash-3 has tolerance to YMV, synchrony in maturity and high yielding ability. Validation and dissemination programs were undertaken with these modern and improved varieties and advanced lines of lentil, chickpea, mungbean and blackgram.

38. C-VI-015: Collection and Conservation of Indigenous Vegetable Germplasm

PI: Dr. Khaled Sultan, Director (HRC), BARI, Jodebpur, Gazipur-1701

Many of the ethnic group of people (farmers) use the products of indigenous vegetables during some of their social function. Besides, they also use some of the vegetables as medicinal purposes. During project operation period six training programs both for officers and farmers regarding vetetable cultivation practices, their harvesting and preservation were successfully completed at Khagrachari, Bandarban and Rangamati hill districts and Rajshahi and Chapainowabgong districts. Lateron, germplasm expedition teams with their full preparation went at all six aforesaid districts. They made survey regarding indigenous vegetable germplasms in various upazillas of all six districts by interviewing enthusiastic farmers in respect of cultivation practices of vegetable growing. Finally, rare indigenous vegetable germplasms wevee collected from serveral upazillas of all the six districts mentioned above. Of all the collected materials most of them were orthodox seeds. Some of the collected materials were under live plants. Some of the collected materials as seeds were regenerated in micro plots of PGRC, PARI. Afterwards, regenerated seeds were conserved in conservation unit of Plant Genetic Resources Center (PGRC) BARI for future research activity.

During project period under report concerted efforts have been imparted regarding survey and collection of indigenous vegetable germplasms. In these activities ethnic group of people have been included with much enthusiasm. Several germplasm expedition teams went to various upazillas of project side areas. A large no. of rare indigenous vegetable germplasms have been collected from each of the districts mentioned above.

39. SE-PP-262: Employment Generation and Food accessibility in the Monga region: An analysis of existing and improved technologies

PI: Dr. M. Mazharul Anwar, Senior Scientific Officer (Agricultural Economics) OFRD, BARI, Alomonogor, Rangpur.

Monga is seasonal food insecurity in ecologically vulnerable and economically weak parts of north-western Bangladesh, primarily caused by an employment and income deficit before Aman paddy harvest. It mainly affects those rural poor, who have an undiversified income that is directly or

indirectly based on agriculture. Nilphamari, Rangpur and Lalmonirhat districts under greater Rangpur region are severely affected by Monga. For increasing employment and food accessibility in the Monga regions this study was undertaken. The farm accounting data for this empirical application have been collected from three districts (Nilphamari, Rangpur and Lalmonirhat) of greater Rangpur through a farm management survey. A sample of 90 farms from two villages of one Upozella for each district has been surveyed taking 30 from marginal (farm size less than 50 decimals), 30 from small (farm size less than 150 decimals), and 30 from medium farm (farm size less than 250 decimals) groups using random sampling technique method. The elementary results of the study regions indicated that the farmers of the regions are less educated and poor. Most of them do not use/not optimally use their homestead land. Farmers get lower return due to lack of crop diversification.

At Gangachara, Rangpur, average farm size for medium, small and marginal farms were 0.77 ha, 0.49 ha, and 0.11 ha, respectively. At Jaldhaka, Nilphamary, average farm size for medium, small and marginal farms were 0.80 ha, 0.36 ha, and 0.12 ha, respectively. Again, At Hatibandha, Lalmonirhat, average farm size for medium, small and marginal farms were 0.75 ha, 0.38 ha, and 0.09 ha, respectively. Lack of HYV seed, lack of improved technology and cash money for buying inputs are major problems in the study areas. T.aman-Tobacco-Jute is a major cropping pattern in the three study areas and more than 80% farmers of the regions cultivated tobacco as a cash money. T.aman-Fallow-Boro is a second improtant cropping pattern in the three areas. Above 90 percent farmers use power tiller for cultivating land and Shallow-tube well for irrigation. Most of the farmers use organic fertilizer in crop production in the three locations. Many farmers do not use micronutrient (Zink and Boron) in their land. As a reulst, there is a yield gap between potential yield and average yield and average yield of their cultivated crops.

Linear programming model used to produce optimum farm plans for marginal, small and medium farms (i) by reorganization of existing resources (ii) by combination of improved technologies with existing technologies. The comparison between existing and optimum plans showed the required adjustments have been increased efficiency of the farming in the region. For increasing food accessibility and employment, optimum farm plans by reorganization of improved technology have been conducted among six farmers in the study village from Kharif, 2010. Improved cropping patterns T.Aman (Bina dhan-7) - Cauliflower/Cabbage-Onion-Jute, T.Aman (Bina dhan-7)- Potsato+Maize+ Mungbean and T.Aman (Bina dhan-7)- Maize+ Mungbean (developed by OFRD, Rangpur) have been selected to conduct as a trial in the study villages. A homestead vegetables production model (Rangpur Model) has been conducted among six farmers in the study villages for growing year round vegetables production and also to solve the nutritional problem and for employment generation. Data of the on farm demonstration of optimum farm plans were collected timely. Data were analyzed and incorporated in this report. By reorganization of existing cropping patterns (using L.P Model) gross output (7% to 21%), gross margin (12% to 20%) and labour employment (6% to 20%) and labour employment (6% to 20%) have been increased from plan1 (existing plan) to plan2 (by reorganization of existing lands). The cause of increase gross output, gross margin and labour employment was some cultivated land from less efficient cropping patterns has been transferred to more efficient cropping patterns. Again, by reorganization of existing and improved cropping pattern. As a result, gross out (17% to 31%), gross margin (27% to 32%) and labour employment (13% to 26%) have been raised from plan1 to plan3 (by combination of improved technologies with existing technologies).

Optimum farm plan was more efficient compared to existing plan and this result was firmly conformed to the result of on farm demonstration of the optimum farm plan. The result of on farm demonstration showed gross output, gross margin and labour employment have been increased 24% to 53%, 32% to 51% and 12% to 47% from plan1 to plan3, respectively. So, this study suggest, optimum farm plan with the combination of existing and improved cropping pattern will increase farm output and generate additional employment.

40. SE-PP-264: Impact Analysis of Spices Research and Extension in Bangladesh

PI: Dr. M. Serajul Islam, BSERT, BAU, Mymensingh

Spices and condiments are the important crops all over the world. These are the integral part of our daily diets. It is used to make our food palatable, attractive colour and good smell. Besides, almost all spices have medicinal values. Presently 109 kinds of spices are cultivated in the world (ISO list of spices) but in Bangladesh we use only 27 and produce 17. On the basis of area, yield, demand and availability, spices are divided into three categories viz. major, minor and exotic. Major spices are regularly used in daily diet at large amount such as chilli, onion, garlic, turmeric and ginger. Minor spices are coriander, fenugreek, black cumin, fenel, black pepper, dil, Joan etc. On the other hand, exotic spices included cumin, cardamom, cinnamon; clove, nutmeg, pistachio etc. and these are imported.

For the last two decades BARI has developed and also released 18 (major-12, minor-6) disease resistance improved variety of spices. Again, 18 technologies on production, soil and water management, disease and insect management and post harvest management have also been developed. BARI, BARC and DAE have strengthened their works to extend these technologies. However, with the cultivation of BARI improved varieties, farmers are now benefited by increasing their spices production. With this end in view, five major spices (onion, garlic, chilli, ginger and turmeric), commercially produced by large number of farmers were selected to determine the profitability, production potentials and resource use efficiency; estimating rate of returns of research and extension; and to determine the growth rate of area and production of these selected spices. Secondly, creating awareness among the farmers to use improved spices technology was attempted.

All the major spices (onion, garlic, chilli, ginger, and turmeric) produced by farmers are economic and highly profitable.Yield gap prevails at farmers' level and there is huge potentially to increases the yield of spices with better culture and management.

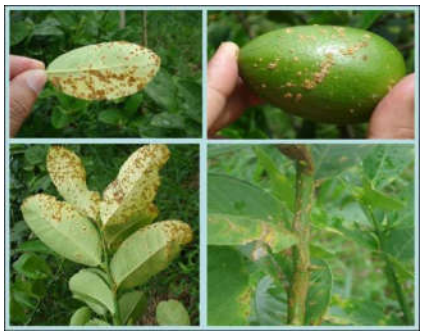
The variables such as farm size, seed, human labour, irrigation, inorganic and organic fertilizer, power tiller and draft power, age, education, and farming experience of farmers have positive and significant impact on the production of most of the spices crops, Secondly, the qusi-function coefficients show increasing returns to scale in the production process of almost all the selected spices. In estimating the returns of research and extension expenditure, producers' benefits were found much higher compared to consumers benefit. Considering the benefit cost ratios, results show that investment in research and extension of five major spices is highly profitable.

The growth rate of area and production of selected spices during the period 1975/76 to 2007/08 were determined. The results show thast, growth rate of area had increased tremendously for all the selected spices during the period III (1995-96 - 2002/08) compared to previous two periods (Period I: 1975/76 - 1984/85, Period II: 1985/86 -1994/95). Again, production of all selected spices increased significantly during the period III due to increasing area and adoption of improved management practices by the farmers and development of HYV, and dissemination of HYV seed. For the same reason, yield of all types of spices improved in period III. However, yield of almost all the spices had changed from negative in period I to positive in period III.

41. Project ID: C-FPE-01

Study of Canker Disease of Citrus and Development of Its Management Practices

PI: Dr. Tapan Kumar Dey, BARI, Joydebpur, Gazipur-1701



Citrus canker is one of the most feared of citrus diseases, causes production losses by reducing quality and quantity and pre-mature fruit drop. Outbreak of citrus canker is increasing day by day in Bangladesh. Commercially growers and exporters of citrus are facing impending production and exporting debacle. Considering the situation, this project is initiated with funding of KGF for two years to fulfill the objectives as to make an assessment of the extent and severity of citrus canker and to develop appropriate management technologies for controlling citrus canker disease in the country. During first year of the project, an intensive survey program was initiated. Survey and monitoring of citrus canker disease were concentrated in three major citrus growing districts namely Sylhet, Moulovibazar and Hobiganj. Near about all the areas were covered and 120 large gardens and arots (temporary market lot) were surveyed. Disease incidence was varied depending upon season, varieties of lemon and location of garden. A range of 43.7 to 68.8% incidence was observed in different upazillas under three districts that constituted 53.02% on an average. In case of market situation canker incidence was found 16.80% on harvested fruit. A total of 30 isolates were collected and characterized through testing nature of growth on YPSA medium, KOH test, Catalase test and Oixidase test. Three chemicals were found effective against the disease during *in-vitro* screening of the chemicals. For chemical control of the disease, application of fungicides belonging to the group of Copper Oxychloride viz. Cupravit 50 WP or Sunvit 50 WP was found effective for controlling the disease in both experimental plot and validation trial in field condition. After field experimentation, some important findings were observed that only fungicides can not control the disease successfully. Findings from field survey and on-station experimentation some cultural means were incorporated during the validation trial as integration with chemical treatments. From the observation of validation trial, integrated approach was found to be effective for controlling the canker disease and around 80% disease can be managed. Some important steps of integration for management of citrus canker were a) proper sanitation followed by eradication of infected plants, b) application of balanced chemical fertilizers and cow dung, c) pruning of older branches followed by application of Bordeaux paste, d) application of copper fungicide (Sunvit or Cupravit 50 WP at the rate of 7 gm/l water) with the initiation of disease at 15 days interval, and e) monthly application of Imidacloropid (Admire @ 0.5 ml/l water) for controlling leaf miner to reduce wounds for infection. In case of post-harvest treatment, healthy lemon soaked in the solution of Sodium Ortho Phenyl Phenate (SOPP) (@ 2.3%) for 1 minute reduced the bacteria from the skin surface of lemon. With judicious execution of such technology our Jara lemon export to Europe started again at November 22, 2011. From the project, to sum up, a package technology was developed to manage citrus canker disease for field condition and in post-harvest situation. The developed technologies were disseminated to different stake holders. A total of 100 SA/SAAO and 200 farmers were trained for one day on the developed technologies regarding management of citrus canker.

Citrus canker, as a non-curable disease, can be managed at lower level at field condition by following the developed package technology. It is tough enough to control the disease by using only fungicide or bactericide. From the project, to sum up, developed package technology was found effective to manage citrus canker disease in field condition and in post-harvest situation.

42. C-PHT-177: Reduction of Post-harvest Losses of Selected Horticultural Crops through Improved Handling and Packaging

Principal Investigator: Dr. M Abdul Baqui, Department of Agro-porcessing, BSMRAU, Salna, Gazipur-1706

During the baseline survey a total of 200 farmers were interviewed for collecting pertinent information on existing post harv3est management practices for banana and pineapple. The survey data indicated that 100% of the farmers used traditional post-harvest management practices both for banana and pineapple. The results also revealed that 55% of the banana growing farmers and 80% for pineapple growing farmers showed interest to use modern post-harvest technologies to reduce loss and to improve product quality. It is surprising that the entire respondent expressed their opinion towards the need for modern packaging, handling and storage systems of fruits and vegetables.

None of the nine traditional devices was found suitable for banana and pineapple handling. So a wooden crate was developed, fabricated and their performances were evaluated. Three practical trial runs with pineapple and banana were carried out for validating the technology at user level However, the new technology was found suitable for banana and pineapple handling after a series of modifications and refinements.

The newly developed wooden crate showed better performance during handling, packaging and transporting of banana and pineapple fruits. The damage percentage of fruits transported with newly developed crate was the minimum (0.0 -3.07% in banana and 0.0 to 12.50% in pineapple) compared to damage percentage in conventional practice (9.0 to 55.71% in banana and 10 to 100% in pineapple). The net profit for using new crate was higher (58.46% for banana and 87.77% for pineapple) compared to that of other practices of handling. The shelf life of pineapple increased up to 9 days. The use of crates prevented spoilage of fruits and keep the environment clean and healthy. These results reveal that there is a great potential to reduce losses of fruits and increase shelf life if it is handled and transported with newly developed packaging practice.

Altogether 80 farmers and 20 traders were trained on the improved post harvest management of banana and pineapple using new packaging crates.

The Messer's Safe Food Limited BGB Market Sector-7, Uttara, Dhaka-1230, were supplied to use the newly developed crates for handling, packaging and transporting of fruits and vegetables from primary markets of rural areas to Dhaka central markets. They procured pineapples form Madhupur, Tangail and transported the fruits using newly developed wooden crates. They appreciated the new nature-friendly crates for carrying fruits and vegetables and found it useful for both fruits and vegetables. The new packaging technology would minimize the losses at an acceptable level and increase availability of fruits and vegetables and found it useful for both fruits and vegetables. The new packaging technology would minimize the losses at an acceptable level and increase availability of fruits in the supply chain. Due to greater availability of fruits in the market the consumers can avail the opportunity of purchasing the fruits at lower cost. It may be recommended to use in handling, packaging and transporting at the stakeholders level.

Sub-Sector: Crops

Thematic Area: Soils

43. C-S-135: On-Farm soil fertility management through IPNS approach

PI: Mr. Dilwar Ahmed Chowdhury, SSO, On-Farm Research Division, BARI, Joydebpur, Gazipur

To increase agricultural production soil resources of Bangladesh have been exploited intensively without taking adequate care. The addition of organic materials to soil through FYM, composts and organic residues reduced considerably because the major portion of crop residues is used as fuel by the rural population.

To cope up with the situation application of Integrated Plant Nutrition System (IPNS) is critical. OFRD, BARI has generated a good number of technologies related to IPNS that need to be verified and validated in different AEZs for wider adoption and dissemination. This project is run to increase crop production per unit area through IPNS approach.

The project is implemented through OFRD at Rajshahi, Rangpur, Patuakhali and Sylhet. Experiments were conducted at farmers' field and 1-2 most dominant cropping patterns and dominant vegetable crops were selected for the trial. IPNS approach was tested along with inorganic fertilizers and existing farmers practice. Selection of farmers and dominant cropping pattern was done through consultation with DAE. Experiments were set with 3 treatments as T1 = Soil test based (STB) IPNS approach with OM @ 5t/ha, T2 = STB inorganic fertilizers and T3 = Farmers practice.

Results of first cycle of cropping showed that in IPNS treated plots crop yields increased by about 10-30% (varied from crop to crop) compared with crops grown with inorganic fertilizers alone.

44. C-S-149: Acid soil amendment through liming for imporving livelihood of farmers

PI: Mr. Md. Bodruzzaman, SSO, Wheat Research Centre, Nashipur, Dinajpur

The soil of high and medium high land of northern Bangladesh is light textured and acidic. Practice of intensive cropping with high yielding modern varieties and removal of crop residues renders the soil more acidic. Soil acidity reduces crop yields. Liming can ameliorate soil acidity and improve crop yields. This two-year project led by the Wheat Research Center aims to establish liming practice for crop production in acid soils.

Dolomite (liming source) was applied at variable rates at 8 locations in Sadar upazila of Panchagarh district. Variable liming treatments were imposed on lands covering wheat-mungbean-T.aman cropping pattern at 4 sites. In other locations maize-T.aman was the cropping pattern. Liming with dolomite has been done once prior the sowing of the 1st crop of each pattern in each site. Wheat (1st crop of the wheat-mungbean-T. aman pattern) and maize (1st crop of maize-rice pattern) were established in other four sites.

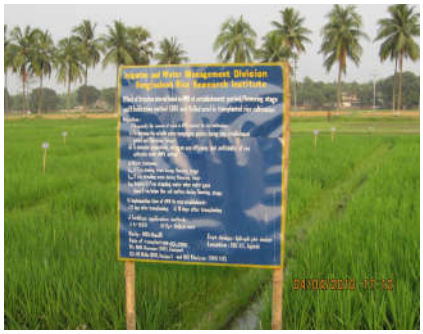
Trials were set up with and without dolomite to observe the effects (direct and residual) of dolomite on crops growth and

yields. After harvesting wheat, Mungbean was planted in all the plots after harvesting wheat or maize. Transplanting of aman rice followed the sequence as the third crop.

Yields of wheat, mungbean and maize were invariably higher in limed plots compared with unlimed control plots. Liming at 1 t/ha increased mean yield over no lime control by 29, 99 and 43% of respectively. Further increase of liming dose did not increase yields.

45. C-S-150: Validation, Refinement and Dissemination of Improved Water Management Technologies for Increasing Water Use Efficiency and Rice Production

PI: Dr. Md. Nazmul Hassan, PSO, Irrigation Water Management Division, BRRI, Joydebpur, Gazipur



In most of the irrigation projects, rice is usually cultivated under continuous ponding condition. As a result, huge amount of water is lost at farm level reducing irrigation efficiency. Optimal use of water resources in intensively irrigated area is imperative for sustainable crop production. And in doing so, water saving techniques are to be employed to reduce the losses. In rainfed areas, supplemental irrigation practice and rainwater management techniques can be used for growing T. Aman rice. The project was carried out to increase the irrigation efficiency and water productivity by using improved water management technologies developed by BRRI.

The project activities were conducted in Rajshahi (C&B road, Godagari Upazila), Rangpur (Sutrapur and Akkelpur village, Darshona, Sadar Upazila) and Kustia (Battal Takimara, Sadar Upazila)**.** Three STWs were selected at each site of Rangpur and Kushtia and one STW (Deep set) was selected at Rajshahi. Thirty farmers' plots (pilot) were selected under each site for field validation. On the other hand, fifteen farmers' plots (satellite) having traditional irrigation (continuous standing water) practice were monitored to compare with the AWD system. Check valves were installed with STWs to overcome the priming problem during the pump starting time at Kushtia site.

On-farm trials conducted in an extensive area covering Rajshahi, Rangpur, and Kushtia districts demonstrated that AWD method was suitable as water and fuel saving technology during dry season (Boro), water scarce period. It saved about 18 to 22% water by which farmers saved about Tk1978 to Tk2219 per hectare. AWD technology also increased yield benefit of Tk8924/ha for BRRI dhan28 and Tk. 5100/ha for BRRI dhan 29. Loss of additional weeding in AWD method was Tk. 2350 and Tk. 2425 per hectare for BRRI dhan28 and BRRI dhan29 respectively. Therefore the additional financial benefit of AWD method over farmer's management practice was Tk. 8345/ha for BRRI dhan28 and Tk. 4179/ha for BRRI dhan29.

In Bangladesh, about 1.2 million Shallow Tubewells (STW) are in operation. All these STWs require priming during initial starting. Every time it requires at least two persons for starting a pump. Moreover, it also requires water for priming and a vessel for carrying water from a distant place. Sometimes, even water is not found within a short distance. Hence, priming is a serious problem in STW operation. To mitigate this problem BRRI scientists developed a check valve. This check valve is installed at the suction pipe of the pump to avoid priming at starting pump. This newly invented technology reduced the drudgery of the priming in operation of STW.

Four Water Management Technologies – (i) Supplemental irrigation for T.Aman rice; (ii) Rain water harvesting and management; (iii) Proper transplanting date; and (iv) Use of short duration variety are now being piloted in farmers' fields in Takimara village, Sadar Upazilla, Kushtia, Palashi, Godagari, Rajshahi and Sutrapur, Darshana, Rangpur.

46. C-S-156: Effects of household wastes on vegetable production in monga area of Bangladesh

PI: Dr. G. K. M. Mustafizur Rahman, Professor, Dept. of Soil Science, BSMRAU, Salna Gazipur

Being ignorant about the utility of household waste as compost, rural people abandon the waste throwing haphazardly. This project was designed to study effect of household wastes compost on growth and yield of three vegetables viz. lal shak (red amaranthus), palong shak (spinach) and tomato and on soil fertility. The performance of household wastes compost in vegetable production was also compared with palli compost and quick compost.

Two sites were selected in two locations in Kurigram and Lalmonirhat. A quick base line survey indicate that most farmers do not have adequate information on preparation of household wastes compost, time of preparation of cow dung compost, doses of cow dung compost, benefits of using household wastes compost and usefulness of vegetables cultivation.

Five on-station field experiments were conducted (BSMRAU) using household waste, quick compost and palli compost in red amaranth, spinach and tomato. Yield data of red amaranth, spinach and tomato were gathered and ninety nine soil and 198 plant samples have been prepared for nutrient analysis. A total of thirty three soil samples and 3 compost samples have been analyzed for pH, OM, N, P, K.

All the treatments produced significantly higher yields of vegetables over the control. Impressive results were obtained in the residual studies of lal shak and palong shak where no fertilizer was used either organic or inorganic. Considering the availability and costs of different composts it is evident that household waste compost has all the potentials to be used as a soil amendment, improving soil fertility and crop productivity.

47. C-S-161: Water management practices for increasing crop water productivity and cropping intensity in Chapai Nawabganj district of Barind area

PI: Dr. Md. Asgar Ali Sarkar, CSO (CC), Agricultural Engineering Division, BINA, Mymensingh

Water is the most limiting factor for dry season cropping in the drought prone Barind area, especially In Chapai Nawabganj district. BMDA has developed irrigation facilities in certain areas. Water table is going down due to excessive withdrawal of groundwater for irrigating boro causing serious environmental damage. To address the problem an alternative cropping system is being tried with short duration, early maturing transplanted rice under rainfed condition followed by

rabi crops on residual soil moisture. It aimed to validate the AWD irrigation technique for saving the costly irrigation input in water scarce drought environment.

Experimental results showed that Binadhan-7 completed its life cycle in 112 to 115 days and was harvested by the 1st and 3rd week of November producing of 5.73 t/ha to 6.33 t/ha yield. After its harvest enough time and profile soil moisture were left for Rabi crop sowing. Thus, in site 1, having about 32 to 42% sowing time soil moisture, and with mulch and subsequent light supplemented irrigation, rabi crops (lentil and chickpea) produced yield to the extent of 741.67 kg/ha for lentil and 1290 kg/ha for chickpea and in kharif-1 season 870 kg/ha for sesame and 1320.30 kg/ha for mungbean. Evidently, crops using the profile soil moisture during its growing period without supplemental irrigation would produce a reasonable amount of yield of these crops, instead of remaining the lands fallow. Practicing AWD method for Bro rice cultivation saved about 35 to 45% irrigation water producing insignificant yield difference compared to farmers' practice of continuous ponding.

48. C-S-162: Up scaling alternate wetting and drying (AWD) reduce irrigation cost in high yielding rice production in Tangail Pabna and Sirajgonj district.

PI: Krishibid Md. Monir Uddin, Executive Director, CIRAD, Tangail.

The Project has implemented in 5 upazillas of Tangail, Sirajganj and Pabna districts during Boro season (2010-2011) and during T-Amon season (2010). In Tangail district, Tangail and Kalihati Upazillas were selected. Similarly in Sirajgonj district, Sirajgonj sador and Ullapara Upazillas were selected and in Pabna district Sujanagor Upazilla was selected. The study conducted for validation, demonstration and up-scaling of AWD practice by using 500 (five hundred) PVC pipes in Boro season. 10 numbers of Shallow tube well owner was selected under the study Upazila. In each shallow tube well command area 10-15 number of farmers was selected in each location.

On an average 11 number of irrigation required for AWD method and 13 number of irrigation required for farmers' practice in Kalihati Upazilla. The Pump wise cost also recorded and showed that Tk. 3285/acre required which indicates high consumption of electricity for irrigation during Boro season. In AWD practice, farmers used one additional weeding over farmer's practice which required Tk.450/acre. Therefore, on an average 2 numbers irrigation were saved by AWD method over conventional practice and yield benefit obtained Tk. 2340 from BRRI dhan 28 and Tk.2625 from BRRI dhan 29.

The cost and benefit of AWD vs farmer's practice of irrigation in Boro rice was conducted by field survey. The range of BCR values for AWD method were 1:1.6, 1:1.9 and 1:1.8 in Tangail, Sirajganj and Paban where as for conventional method BCR values was about 1:1.5 for all the study areas.

In T. Aman season (2010) the surveyed farmers those who used supplemental irrigation (1-3) by monitoring AWD they got yield benefit about 29-60 % compared to conventional method (rain fed method).

For up-scaling of AWD technology through field validation, training, workshop and providing Booklets for awareness development among the farmers of five selected sites A district level workshop was conducted in Tangail district with AWD farmers/field staff of DAE/NGOs and GOs in

presence of KGF and CIRAD official. The specific target of the workshop was to dissemination of AWD technology among the farmers/pump owners/SAAO of DAE. In the workshop AWD leaflet was distributed among the workshop participants.

In respect of up-scaling AWD method it is indeed impressive that, 80-100% respondents of Tangail, Sirajganj and Pabna opined their idea in favor of the proposition that AWD method saves water leading to reduction in irrigation cost. About 50-70% farmers reported that rice yield increased by adoption AWD method for all the locations. Adoption of AWD technology was monitored and evaluated in which it is observed that about 70 -80% farmers in the selected study STWs area are ready to use AWD in their next Boro season if the pump owners reduce the cost of irrigation fee .

Sub-Sector: Livestock

Thematic Area:

49. L-LM-227: Integrated rice- forage production and storage technology for increased milk yield of dairy cows of smallholder rural farmers

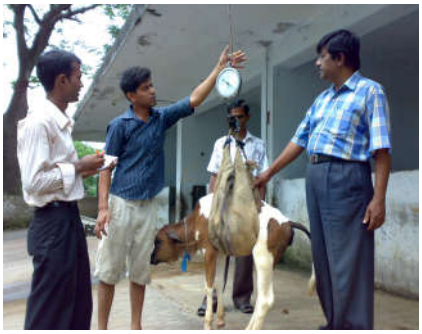
PI: Dr. Md. Jasim Uddin Khan, Professor, Dept. of Animal Nutrition, BAU, Mymensing

Increasing demand for human food production leads to intensive use of land for cereal crop production and therefore the rural farmers can not spare land for fodder production. Consequently there is a serious shortage of green grass and rice straw constitutes about 90 % of the feeds for ruminants. This situation has led to the low productivity of livestock. Moreover, intensive cropping system is resulting in degeneration of soil fertility as there is little time for regaining soil nutrient status. Under this situation, it is imperative to identify some methods or approaches to integrate fodder production into cropping systems of the rural farmers for increased livestock productivity and also improving soil fertility.

This project was undertaken in collaboration with an NGO (Proshika). During the first year of the project life some activities were performed and the results were reported. In the second year a total of 52 farmers in three sites (Mymensingh sadar, Delduar and Baghabarighat) having land and milking cows were selected for cultivation of Khesari (*Lathyrus sativus*) fodder in their rice fields. In total 6.3 hectares of land in rice field in three project sites were established for fodder production. The seeds of Khesari were sown in early November in standing T. Aman rice crop 15 days before harvesting. The fodders were kept in the field up to the next Boro rice cultivation. No fertilizer and irrigation were applied and no intercultural operations were done. After harvesting, about half of the quantity of green fodders was fed to milking cows of the farmers by mixing with rice straw at 3.0 kg per day per animal. The daily milk yield was monitored and recorded. The remaining half of the fodders were dried in the sun to make hay and box-baled to store for feeding the milking cows during fodder crisis periods. As outputs/results a total of 71.72 tones of fodder were produced in three project areas. The green yield of fodder was 12.5 t/ha in Mymensingh and Shahjadpur areas but in Delduar the production (8.5 t/ha) was relatively lower because of the heavy rain fall during the germination of seeds. On average, milk yield increased by 24% due to Khesari fodder feeding to cows in two areas of Mymensingh and Delduar.

50. L-FF-231: Development of low cost milk replacer with locally available feed ingredients for rearing calves

PI: Dr. Md. Nurul Islam, Dept. of Dairy Science, BAU, Mymensingh.



In Bangladesh, due to low milk production per cow there is serious shortage of milk resulting in high market price of the product and consequently the farmers are reluctant to feed whole milk to their calves. As a result calves become weak and emaciated during their early life resulting in poor performer in the production life. In order to overcome this situation attempts were made to develop alternate sources of food for calves that will act as replacer of milk. Calves fed with milk replacer (MR) containing 22% crude protein and 10% fat was found to perform as good as the calves fed with whole milk. Soymilk was also found to be good for using as milk replacer however, a mixture of 50% soymilk would be better than feeding with 100% soymilk. The experiment on village level calves showed that calves under MR feeding group perform better compared to control calves on traditional feeding in terms of weight gain (37.33/26.17 kg), increase in height (11.00/9.50 cm), increase in length (9.50/8.33 cm) and increase in heart girth (13.5/10.5 cm). The MR developed through this project was found to cost less than the whole milk. Cost of dry milk replacer was Tk 100/kg which was equivalent to 8 L liquid milk. Thus 1 L liquid milk replacer was calculated to cost around Tk 13-15 only whereas the same amount of liquid whole milk was found to cost about Tk 40-50.

51. C-PHT-186: Small-scale processing of functional fruit juices applying enzyme technology.

PI: Prof. Dr. M. Burhan Uddin, BAU, Mymensingh.

The project deals with technology development and adatpation in small-scale processing of selected tropical fruits into functional juices. Though mango, pineapple, guava and jackfruit juices processing have potential in Bangladesh Only few food processing industry in the country are processing these fruit juices. Due to in inherent character of the fruits, it is difficult to extract the juices from the pulps and sometimes wastage is very high. To facilities juice extraction, pactinase enzymes are being used in different countries. Since pectinase enzymes are not produced in the country and import of enzymes is not cost-effective this technology is not in practice in juice processing industries. To make the enzyme available in the country, the enzymes have been produced by fermentation. Pure culture of Rhizopus Oryzae was collected from abroad. The fungul culture was cultivated on potato dextrose agar (PDA) and incubation at 30^0C for 3 days. The fungal mother culture was used to produce pectinans enzyme using liquid medium containing dextrose and citrus pectin. The fermentation process was optimized for pH, temperature, and incubation time and heat stability. The enzyme activity was determined by measuring the amount of reducing substances liberated from citrus pectin. One unit of enzyme activity (U) was defined as 1 μ mole of galactouronic acid released per minute. The produced enzyme was used for liquefaction of mango, pineapple, jackfruit and guava pulps and extraction of juices. The effect of incubation temperature on liquefaction of pulps and extraction of juices were assessed. The laboratory produced and commercial enzymes ware applied for extraction of juices and compared with traditional process of juices extraction. The extraction rates of juices were increased by 4-5 folds when enzyme was applied. The juices extracted by enzymic process were analysed for pH, total soluble solid, alcohol insolube solids, rapid sedimentation, browning index and cloud stability that improve functional quality of juices. Forty stakeholders in two batches have been trained for 5 days in processing of fruit juices in Modhupur, Tangial.

LIST OF CGP PROJECTS OF 2ND CALL
UNDER NATP: PHASE-I

List of CGP Phase-I Projects of 2nd Call

Sl. No.	Project Code and Title	Name of the PI
01.	**C-1.12:** Rice Production in Drought Prone Areas of Bangladesh	**Coordinator:** Dr. Md. Safiul Islam Afrad, Associate Professor, Dept. of Agri. Extension and Rural Development. BSMRAU, Tel: 9205310-14 Ext.-2054(O), Fax: 9205333, Cell: 01712-584820, Email: afrad69@gmail.com/ safiulislamafrad@yahoo.com
02.	**C-1.21:** Yield gap minimization in rice using Integrated Crop and Resource Management (ICRM) practices at selected locations in Bangladesh	**Coordinator:** Dr. M. Safiqul Islam Mamin, PSO & Head Adaptive Research Division, BRRI, Gazipur, Phone:9256873, Cell: 01711-075486, Email: msimamin@yahoo.com
03.	**C-2.11:** Crop intensification in northern region of Bangladesh through up-scaling the production of short duration rice and mungbean	**PI:** Dr. M. Moynul Haque, Prof. Dept. of Agronomy, BSMRAU, Gazipur, Phone: 9205310-14, Fax: 9205333, Cell: 01711-908640, Email: moynul60@yahooc.com
04.	**C-2.20:** Development of Intensive Cropping System in Two Coastal Districts for Increasing Production	**Coordinator:** Prof. Dr. Md. Harun-or-Rashid, Agronomy Department, PSTU, Dumki, Patuakhali-8602, Cell: 01552-429714, Email: mhrashid_pstu@yahoo.com
05.	**C-3.1:** Validation and up-scaling of maize after T. Aman rice in two southern districts.	**Coordinator:** Dr. M. Jalal Uddin Sarkar, CSO and Head, OFRD, Joydebpur BARI, Gazipur-1701 Fax: 9261415, Cell: 0176-2010797, Phone: 9252085 Email: ofrdjoy@yahoo.com
06.	**C-4.1:** Intensification of rice based cropping system incorporating short duration oilseed mustard varieties	**Coordinator:** Prof. Dr. Lutful Hassan, Department of Genetics & Plant Breading, BAU, Mymensingh-2202, Tel: 091-52268, Cell: 01715-091096, Email:lutfulhassan@yahoo.co.uk
07.	**C-4.9:** Yield gap reduction through short duration rapeseed-mustard and sesame varieties under existing cropping system	**PI:** Dr. Md. Abdul Latif Akanda, SSO (Plant Bleeding), Oilseed Research Centre, BARI, Gazipur-1701, Cell: 01716-335626, Email: alatifakanda@gmail.com
08.	**C-5.5:** Variety Selection and Integrated Crop Management for Yield Gap Minimization in Mustard and Sesame in the High Ganges River Floodplains	**Coordinator:** Dr. Md. Sirajul Islam, PSO, On-Farm Research Division (OFRD), RARS BARI, Jessore, Cell: 01712-142042, Email: sirajpso@yahoo.com
09.	**C-6.8:** Validation and up-scaling of mungbean and lentil technologies in the rice based cropping system in Bangladesh	**Coordinator:** Dr. Md. Ashraf Hosain, PSO, Pulses Research Center, BARI, Joydebpur, Gazipur-1701 Cell: 01712-948871, Email: ashrafbd61@yahoo.com
10.	**C-6.9:** Validation and up-scaling of improved pulse production technologies for crop intensification	**Coordinator:** Dr. Md. Harunor Rashid Senior Scientific Officer Regional Agricultural Research Station Rahmatpur, Barisal Cell: 01915-345460, Email: md_harunor_rashid@yahoo.com
11.	**C-7.12:** Standardization of protocol, and in vitro production of BARI kala-3 & BARI kala-4 plantlets and their	**PI:** Mst. Dilafroza Khanam, PSO, Bio-technology Division, BARI Gazipur, Phone: 9261509, Cell: 01673-900311,

Sl. No.	Project Code and Title	Name of the PI
	validation trial at hilly areas	Email: khanammarry@gmail.com
12.	**C-9.6 :** Rhizome Rot Disease of Ginger and Its Management	**PI: PI:** Dr. Abdur Rahman CSO, Plant Pathology Division Bangladesh Agricultural Research Institute (BARI)Joydebpur, Gazipur
13.	**C-11.1 :** Management of coconut mite	**PI:** Dr. Md. Nazirul Islam, PSO Horticulture Research Station Mojlishpur, Shibpur, Narshingdi Cell: 01715-855239, Email: nazirhrc@yahoo.co.in
14.	**C-13.2 :** Selection and application of BPH management technologies in Sirajgonj	**PI:** Md. Mofazzel Hossain, SSO, Entomology Division, BRRI, Joydebpur, Gazipur,
15.	**NR-15.22:** Validation of drought management techniques for sustainable crop production in the high barind tract	**PI:** Md. Abdus Salam , SSO & Station In-charge, OFRD, BARI, Barind Station, Paramedical Road, Laxmipur, Rajshahi, Phone: 0721-812474 (O), Cell: 01712-092122, Email: salamraj67@yahoo.com
16.	**NR-16.15:** Testing, Validation and Up-scaling of Water Saving Technology in Rice Production(TWST)	**PI:** Dr. Md. Towfiqul Islam, SSO, Irrigation Water Management Division, BRRI, Joydebpur, Gazipu-1701, Tel: 9257401-5 Ext. 437, Cell: 01715-090879, Email: islam.towfiq@yahoo.com
17.	**L-17.4:** Development of cost-effective complete feed formula for the productive and reproductive performances of buffaloes	**PI:** Prof. Dr. Md. Ruhul Amin, Dept. of Animal Science, BAU, Mymensingh-2202, Fax:091 61510, Cel:01714-217157, Email: aminmr64@yahoo.com
18.	**L-19.2:** Investigation on calf diseases and development of mitigation measures	**Coordinator:** Prof. Dr. A. S. Mahfuzul Bari, Vice-Canceller, CVASU, Khulsi, Chittagong, Cell: 01740-642318, Email: bari.bau.bd@gmail.com
19.	**L-20.4:** Clinicopathological and serological surveillance of Foot and Mouth Disease (FMD) and Peste des Petits Ruminants (PPR) and adopt preventive measures against them at Shakipur and Madhupur Upozilla	**Coordinator:** Prof. Dr. Md. Abu Hadi Noor Ali Khan, Dept. of Pathology and Proctor, Bangladesh Agricultural University, Mymensingh-2202 Cell: 01724-203934 Email: hadikhan68@yahoo.co.uk
20.	**F-22.1 :** Diversification of Carp Polyculture Integrating Snail *(Viviparus sp.)* Shing, (*Heteropneustes sp.)* Culture in Cage in Ponds of Adviasi Households.	**PI:** Dr. Mohammad Mahfujul Haque, Associate Professor, Dept. of Aquaculture, BAU, Mymensingh, Cell: 01712-006293, Email:mmhaque@yahoo.com
21.	**CC-25.1:** Development of an integrated rice-fish production system in lower Meghna river floodplain of Noakhali and Lakshmipur districts.	**PI:** Prof. Dr. Mohammad Amin CSO, RARS, BARI, Hathazari, Chittagong-4330 Cell: 01819-803229, Email: csohathazari@gmail.com

CGP Project Phase-II (2nd Call)

Sl. No.	Project Code and Title	Name of the PI
22.	**C-1.2:** Testing, validation and upscaling of cotton-rice intercropping in Chittagong Hill districts. **Location:** Bandarban, Rangamati & Khagrachari District	**PI:** Dr. Md. Farid Uddin, Deputy Director (H.Q) Cotton Development Board (CDB) Khamarbari, Farmgate, Dhaka-1215 Phone: 8117728(O), Cell: 01711-020798 Email: mfarid08@yahoo.com
23.	**C-1.11:** Improvement of appropriate rice based cropping systems in Barind areas **Location:**3 upazilas of Bogra district:Sherpur, Shajahanpur and shibonj upazila and on station trial of RDA Demonstration farm at Sherpur upazila, Bogra	**PI:** Mr. Md. Feroz Hossain, Director (Project Planning & Monitoring), Rural Development Academy (RDA), Sherpur, Bogra, Fax:051-78615 Phone: 015-73601-2 Ext.-2..., Cell: 01711-587799, Email: firozrda@gmail.com
24.	**C-1.26:** Minimizing yield gaps in rice-based cropping systems three northern districts. **Location:** Rangpur, Kurigram and Bogra districts.	**Coordinator:** Dr. S.M. Mahabubur Rahaman Khan, PSO, OFRD, BARI, Gazipur, Phone: 9252085, Cell: 01712-598035, Email: ofrdjoy@yahoo.com, Fax: 9261415
25.	**C-1.27**: Productivity enhancement through improved management practices, tools and techniques **Location:** Dhamrai upazila of Dhaka & Singair upazila of Manikganj districts.	**PI:** Dr. Dilwar Ahmed Choudhury, SSO, OFRD, BARI, Gazipur, Phone: Cell: 01711-318685, Email: dilwar92@yahoo.com
26.	**C-2.19** Crop intensification through incorporating quick growing fruits and vegetables into existing cropping systems in Jhalakati and Patuakhali districts **Location:** Dumki and Patuakhali Sadar (Patuakhali) and Jhalakhati Sadar (Jhalakhati).	**PI:** Mr. H. M. Khairul Bashar, SSO (I/C), OFRD, BARI, Sabujbag, Patuakhali-8600 Phone: 0441-62431, Cell: 01716-599601, Email: basharlaboni@yahoo.com
27.	**C-4.5:** Maximization of crop yield in T. Aman-Mustard-Boro cropping pattern by Agronomic Manipulation **Location:** Dhanbari & Kalihati upazila of Tanigail district.	**PI:** Prof. Dr. M. Rafiqul Islam, Department of Soil Science, BAU, Mymenshingh Phone: 091-55695-7 Ext.-2436, Cell: 01711-985414, Fax: 091-55810 Email: mrislam58@yahoo.com
28.	**C-5.2:** Yield maximization of mustard and sesame through improved package of production practices in some selection areas of the country. **Location:** Jessore Narail, Jhenaidah, Faridpur, Kushtia and Chuadanga Districts	**Coordinator:** Dr. M. Raisul Haider PSO and Head, TC&P Division, BINA, BAU Campus, Mymenshingh-2202 Phone: 091-67834 Cell: 01715-372740 Email: haidertcp@yahoo.com
29.	**C-7.9:** Validation and up-scaling of year round pineapple production technology in hilly areas. **Location:** Maulavibazar, Rangamati and Khagrachari districts	**PI:** Dr. Madan Gopal Shaha, PSO (Horticulture), Polomology Division, HRC, BARI, Joydebpur, Gazipur-1701, Phone:....., Fax: 9261415, Email:
30.	**C-8.14:** Integrated management of major diseases of brinjal and tomato in Jamalpur & Sherpur districts.	**PI:** Dr. Biresh Kumar Goswami PSO,RARS, BARI, Jamalpur-2000 Phone: 0981-63147, Fax: 0981-63138 Cell: 01716-519187/01813-158197

Sl. No.	Project Code and Title	Name of the PI
	Location: Jamalpur & Sherpur districts.	Email: bkgbari@yahoo.com
31.	**C-12.1:** Development of Management Package for Powdery Mildew of BAU kul and apple kul **Location:** Satkhira, Jessore and Natore District.	**PI:** Prof. Md. Rejaul Islam, Agrotechnology Discipline, Khulna University, Khulna Phone: 041-733886, Fax: 041-731244 Cell: 01926-865086, Email: refa_bd@yahoo.com
32.	**L-17.1:** Least cost feed formulation for poultry through the production of fermented yeast product from locally available feed resources **Location:** Chittagong Veterinary and Animal Science University, Khulshi, Chittagong	**PI:** Dr. Kazi M. Kamaruddin Director, Poultry Research and Training Center, CVASU, Khulshi, Chittagong
33.	**L-19.7:** Calf mortality in large and small holder cross breed dairy Cattle: Epidemiological and Pathological investigation and mitigation **Location:** Muktagacha-Mymensingh, Sahjadpur-Sirajganj;	**Coordinator:** Prof. Dr. Emdadul Haque Chowdhury, Professor, Dept. of Pathology, Faculty Veterinary Science, BAU, Mymenshingh, Phone: 091-66049, Cell: 01712-017381 Email: emdad001@yahoo.com
34.	**F-21.20:** Adaptation of high valued fish species shing (*Heterponeustes fossilis)* culture technology for Maximizing prediction in three Agro-Ecological zones of Bangladesh. **Location:** Narsingdi, Hobigong and Sirajgong	**Coordinator& PI:** Dr. Md. Jahangir Alam, Professor & Head, Department of Fisheries Technology, BSMRAU, Gazipur-1706 Phone9205310, Cell: 01715-143521, Email:alammj_bfri@yahoo.com
35.	**CC-25.2:** Development of integrated crop-fish production system using ditch-and-dyke method in low lying areas of Jhalakati and Bogra region **Location:** Jhalakati & Rajapur upazila of Jhalakati and Gobtoli upazila of Bogra districts	**PI:** Dr. M. Mofazzal Hossain Director (Research) BSMRAU, Gazipur-1706 Phone: 9205310-4 Ext.-2151, Fax: 9205333 Email:

Impact of CGP Project (Sept. 2011 to Oct. 2014)

Sub-sector Crops

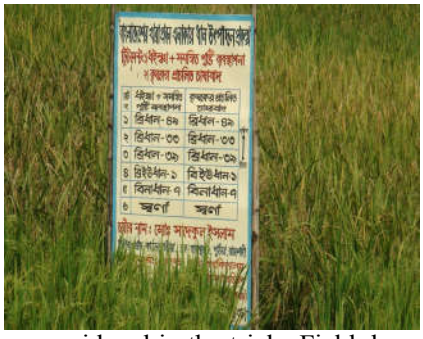
Temetic area - Drought prone area.

1. Project code with Title: C-1.12: Rice Production in Drought Prone Areas of Bangladesh

PI: Dr. Md. Safiul Islam Afrad,

Associate Professor, Dept. of Agri. Extension and Rural Development, BSMRAU, Mymensingh

A vast area of most of the char lands remains uncultivated or poorly cultivated with insignificant productivity due to various unfavorable or adverse conditions. BSMRAU, in collaboration with BRRI, SSURDA and PHKS has taken up this project, having the support of KGF, for identification of factors responsible for poor yield, rice varieties suitable for drought prone areas and to improve soil fertility, and to develop farmers' knowledge and awareness about drought management technologies. Irrespective of rice varieties green manure practice provided comparatively better yields at all the sites in all the seasons. BRRI dhan29 in Boro and BRRI dhan49 and BU dhan1 in T.Aman, short duration rice varieties, showed better performance in drought prone areas as compared to other varieties considered in the trials. Field days and training programs created farmers' awareness and knowledge on rice production technologies for drought prone areas.



2. <u>Project Code with Title:</u> C-1.21: Yield gap minimization in rice using Integrated Crop and Resource Management (ICRM) practices at selected locations in Bangladesh

PI: Dr. M. Safiqul Islam Mamin, PSO & Head Adaptive Research Division, BRRI, Joydebpur, Gazipur

The economic yield targets of mostly grown HYVs in Bangladesh are 8-10 and 6-7 t/ha in Boro and Aman seasons respectively. But this yield is not usually achieved in farmers' fields due to different inappropriate management practices. As a result, there remains a huge gap in the yield found from farmers' and researchers' managed plots. Adoption of Integrated Crop and Resource Management (ICRM) practices take care of those lackings which cause yield reduction. The project aims to minimize this yield gap implementing available rice production and resource management technologies in an integrated way in farmers' fields. A total of 270 on-farm farmers participatory trials, for minimizing yield gap, were conducted in 9 upazilas of 5 districts in Boro and Aman season of 2013.The average yield increase observed in fields having ICRM package over those of the farmers' managed fields of BRRI dhan 28, BRRIdhan 29 and BRRIdhan 36 were 0.9, 1.0 and 0.7 t/ha respectively. The straw yields of the mentioned varieties were also higher in comparison to those obtained from the farmers' managed fields. About 10 tons of seeds of BRRIdhan 28, produced in the experimental sites were retained by farmers. A higher net return of Tk. 17961.9 /ha was achieved over that found from farmers' managed field following ICRM practices in rice production. Similar results were also obtained from Aman trial fields having ICRM management package. Fields managed under

ICRM practices showed on an average higher yield of 1.0-1.5 t/ha and an increased net income of Tk. 16500 /ha in Aman season. A total of 120 farmers and 20 DAE field staffs were trained on rice production technologies. Nine field days were arranged in 9 Upazilas in Boro season where about 2200 people, coming from different sects of the society attended.

3. Project Code with Title: C-2.11: Crop intensification in northern region of Bangladesh through up-scaling the production of short duration rice and mungbean

PI: Dr. M. Moynul Haque,

Prof. Dept. of Agronomy, BSMRAU, Salna, Gazipur

An intensive cropping pattern with four crops, Aus (Parija)-Aman(Bina-7)-Potato(cardinul)/Mustard (BARI sorisha14)-Mungbean (BARI mung6) is tested against farmers cropping pattern, Boro (late)-Aman(late)-Potato, with minimum resource use in upland ecosystem of northern Bangladesh. The project aims to increase cropping intensity, system productivity and thereby create job opportunity at the jobless time of periodic famine of the region. It also aims to improve soil quality, minimize ground water use and to reduce cost of production applying need based chemical fertilizers. Introduction of short duration Mungbean and Aus rice in the alternative cropping pattern, Mungbean-Aus-Aman- Potato, increased cropping intensity, system productivity and benefitted farmers' providing a gross return of Tk 468960 against Tk. 257980. The BCR obtained was 3.02 against 1.42, used to be found with farmers existing pattern. The gross return was about 81.78% higher than that obtained with conventional pattern. Furthermore, balanced dose of fertilizer use in potato fields saved about 190 and 125 Kgs of TSP and MoP/ha for the succeeding Aus and Aman rice. Moreover, alternative cropping pattern produced 5.60 t/ha of additional food and saved about 8.917- 15.470 million liters of water which would otherwise be used in 12-28 irrigations required for Boro rice cultivation. Above all, the alternative pattern created job opportunity of 68-117 labors for each hectare of land during the time of seasonal famine which was an usual phenomenon of the northern region from long past. Similarly, Boro- Aus (early)- Aman (early) cropping pattern showing gross return of Tk.190720 and BCR 1.68, introduced in place of Boro- fallow- Aman pattern of Tangail having a Gross return of Tk. 122040 and BCR 1.47, was found more productive and economic for the area.

4. Project ID with Title: C-2.20: Development of intensive cropping system in two coastal districts for increasing production

PI: Prof. Dr. Md. Harun-or-Rashid, Agronomy Department, PSTU, Dumki, Patuakhali

Most of the lands of the coastal region of the country remains frequently inundated during the monsoon restricting the cultivation of most crops except local rice varieties. The short statured HYVs of Aman rice is not suitable for the area as the varieties cannot withstand the tidal flood. Production technologies developed and extensively adapted under irrigated condition elsewhere in the country are not generally suitable for tidal floodplains. Considering the problems, the project was implemented to increase production in tidal floodplains through improvement of cropping systems incorporating upland crops and adopting suitable T.Aman rice. BRRI dhan44 showed the highest yield (5.38t/ha) in the varietal trial conducted at all the locations. The traditional varieties, having 50% of the recommended fertilizers for HYVs, showed higher yield. Sadamota had the highest yield (3.4 t/ha).

Thirty day old seedlings of traditional rice varieties, planted at 30x30 cm spacing at the rate of 7 seedlings/hill showed the best performance. Among the non rice crops, Maize, Chickpea and Sesame tried at all the experimental sites, BARI hybrid maize at Jjhatra in 2011-12, BARI chola9 at Lebukhali in 2012-13 and BARI til4 at Jhatra in 2011-12 produced 14.8,2.87 and 2.07 t/ha respectively. Maize, Chick-pea and performed best when sown by 15th January, 15th December and 31st January respectively.

5. Project Code with Title: C-3.1: Validation and up-scaling of maize after T.Aman rice in two southern districts

PI: Dr. M. Jalal Uddin Sarkar, CSO and Head, OFRD, Joydebpur BARI, Joydebpur, Gazipur

About 30% of the net cultivable area is in coastal region. Salinity, late releasing of land, use of local varieties, and lack of irrigation water, low fertility status and exposure to natural calamities limit the agricultural production of the area. Fallow-Fallow-T.Aman rice is the dominant cropping pattern of the area. As a result, a huge amount of land remains fallow for most of the year. On farm Research Division of BARI having support of KGF has initiated a project to increase the productivity, cropping intensity of the area introducing new crop, HYVs and ideal management practices. The program was executed in 20 ha of land in two upazilas of Satkhira (Satkhira sadar and Kaliganj). Adaptive trials of 3 T.Aman rice varieties, BINA dhan 7, BRRI dhan 49 and Jamaibabu, were conducted at Satkhira sadar and Kaliganj during 2012-2013. BINA dhan 7 showed the highest yield at both the sites which were 5.06 and 4.90 t/ha at Satkhira and Kaliganj respectively. In T Aman 2013-14, BINA dhan7 and Jamaibabu produced 5.25 and 4.95 t/ha having soil salinity ranging in between 2.18-3.98 and 3.12-4.98 Ds/m at Satkhira and Kaliganj respectively. The adaptive trials of maize were conducted in the same lands of the two sites in 2011-12 and 2012-13. Out of the 3 HYV maize varieties, HM 8255 and BHM5 showed the highest yield at Satkhira and Kaliganj respectively in 2011-12. Similar result was also obtained in 2012-13. HM 8255 produced the highest yield (7.45 t/ha) at Satkhira Sadar. However, its yield was found the lowest amongst the three varieties tested at Kaliganj.

6. <u>Project Code with Title:</u> C-4.1: Intensification of rice based cropping system incorporating short duration oilseed mustard varieties

PI: Prof. Dr. Lutful Hassan, Department of Genetics & Plant Breading, BAU, Mymensingh

An attempt was taken to increase the cropping intensity accommodating a short duration, high yielding mustard variety in between the T.Aman and Boro rice of the existing pattern, Aman-Fallow-Boro. During the second year, 100% of the selected 400 farmers of the six Upazilas cultivated Boro rice harvesting mustard. Successful Boro crop could be cultivated after the mustard. The farmers of all the six Upazilas have shown keen interest and enthusiasm in the cultivation of mustard following the T.Aman-Mustard-Boro cropping pattern which increased cropping intensity of the project area. The pattern increased edible oil production and net income of the farmers.

7. <u>Project Code with Title:</u> C-4.9: Yield gap reduction through short duration rapeseed-mustard and sesame varieties under existing cropping system

PI: Dr. Md. Abdul Latif Akanda, SSO (Plant Bleeding), Oilseed Research Centre, BARI, Joydebpur, Gazipur

Bangladesh has chronic shortage of edible oil for long past. Around 30% is met by local production while the rest of the requirement is met by import. Rapeseed- mustard, sesame and groundnut are the

major oil crops of Bangladesh. However, cultivation of traditional, mostly degenerated, varieties and traditional management kept the average yield considerably low. Substantial increase in the yield of the crops might be achieved with the cultivation of the newly developed varieties having high yield potential. This project is taken to verify the yield potential of mustard and sesame varieties, developed by BARI and BINA. The participatory and up scaling trials of mustard and sesame were conducted at 10 upazilas of Sirajganj, Sherpur, Rajshahi and Chapai Nababganj districts during the last two years (2011-2013). BARI Sarisha 14 produced the highest seed yield (1782 kg/ha) followed by BARI Sarisha 15 (1765 kg/ha) and BARI Sarisha 9 (1209 kg/ha). BARI Sarisha 14 and BARI Sarisha 15 showed more than 95% higher seed yield than that of Maghi Sarisha and could be accommodated successfully in the existing cropping pattern, TAman- Mustard- Boro. Similarly BARI Til 4 showed the highest yield (1142 kg/ha) followed by BARI Til 3 (969 kg/ha) and BINA Til-1 (920 kg/ha) over the locations and which were 46, 36 and 33% higher than that of T-6, the traditional variety used as check. All the farmers involved with the trials of mustard and sesame were trained before the commencement of the respective season.

8. Project Code with Title: C– 5.5: Variety selection and integrated crop management for yield gap minimization in mustard and sesame in the high Ganges river floodplains

PI: Dr. Md. Sirajul Islam, PSO, On-Farm Research Division (OFRD), RARS BARI, Jessore

The national mean yields of mustard and sesame are very low. New varieties having high yield potentials have been developed by this time and are producing higher yields in researchers' managed plots. However, there remains a big gap in the yield of the crops managed under farmers' and researchers' practices. The project was implemented to minimize the yield gaps observed for mustard and sesame. Screening trials of 8 varieties of mustards having short, medium and long duration of growth developed by BARI and BINA, were conducted in 5 locations of gangetic flood plains involving 155 local farmers. BINA sarisha 4 followed by BARI sarisha 15 among the short duration and BARI sarisha 11 followed by BARI sarisha 16 belonging to long duration varieties, produced the highest yields,1.5, 1.35, 1.76 and 1.64 t/ha respectively. About 30-50% yield gap was minimized in the trials. BARI til4 produced the highest yield (1.68 t/ha) among the 4 varieties tested in the screening trial. It showed the same performance in the adaptive trials conducted in 2013. BARI til4 showed the highest yield (1.74 t/ha) and reduced about 30-50% of yield gap.

9. Project Code with Title: C-6.8: Validation and up-scaling of mungbean and lentil technologies in the rice based cropping system in Bangladesh

PI: Dr. Md. Ashraf Hosain, PSO, Pulses Research Center, BARI, Joydebpur, Gazipur

Majority of the population in the charlands developed along the rivers Dharala and Tista, are marginal and poor farmers. The chars have been forming due to siltation from upstream and erosion of Tista and Darla rivers. The soils are mostly sandy with poor water holding capacity having poor nutrient status. Because of water scarcity and lack of irrigation facility, farmers do not grow crops during the dry season. Therefore, large area remains uncultivated or poorly cultivated with insignificant productivity. With the support from Krishi Gobeshona Foundation, Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU) has been testing the yield performance of lentil variety BARI

mushur6 in around 60 bighas in Kurigram sadar upazilla and Nageshwary for three years. The performance of both lentil and mungbean during post-aman dry season was found appreciably good in the charland. It was also noticed that BARI mung6 and BU mung4, and lentil (BARI mushur6) performed satisfactorily with a production range between 800 – 1500 kg/ha. In the summer of 2013, three short duration aman rice varieties namely BRRI dhan56, BU dhan1 and BINA dhan7 were also tested in the farmers' fields of Kurigram sadar and Nageshwary. Polythene water delivery pipe of 700 feet were supplied to irrigate the fields to solve the irrigation problem. However, some fields being relatively lowland were inundated with flash flood. Despite 7-10 days of inundation, the three varieties recovered well from the flooding shock, though they had variations in the performance. BU dhan1 produced 3.6 - 4.40 t/ha, while BRRI dhan56 and BINA dhan7 had 3.5 - 4.0 t/ha yield. The three rice varieties matured within 120 days from seed to seed. The crop duration sequence was BRRI dhan56< BU dhan1<BINA dhan7. BRRI dhan56 recovered from flood injury better than the other two varieties. Harvesting the rice, lentil was sown timely by November 15. Therefore, even the land type of the char is not suitable for harvesting potential yield of agricultural crops; the farmers can easily increase their farm income by adopting lentil-mungbean-short duration aman rice pattern.

10. <u>Project Code with Title:</u> C-6.9: Validation and up-scaling of improved pulse production technologies for crop intensification

PI: Dr. Md. Harunor Rashid, Senior Scientific Officer, Regional Agricultural Research Station, Rahmatpur, Barisal

The project has been initiated to identify disease resistant high yielding pulse varieties, validate and upscale improved production technologies of pulse crops and thereby to achieve diversification in crops and improvement in total pulse production. A total of two hundred Entries have been screened against insect pests and diseases of pulse crops of which eight were found promising. Chickpea sown in the first week of December produced higher yield than those sown in January. About 27 and 47% higher yields were obtained in 2012 and 2013, respectively, from 'December sowing'. Out of the three Chickpea varieties included in fertilizer trials of 2012 and 2013, Bari sola9 showed the highest yield, 937 and 1156 kg/ha in 2012 and 2013 respectively. Interplanting of BARI sola9 with local rice produced half of its normal yield. The BARI mosur7 showed better response to fertilizer applications and produced 1500 and 1100 kg/ha in 2012 and 2013 respectively. More than 3000 personnel including farmers, SAAO, SA and SSA were trained on modern production technologies of pulses during the last two years.

11. <u>Project code with Title:</u> C-7.12: Standardization of protocol, and in vitro production of BARI kala-3 & BARI kala-4 plantlets and their validation trial at hilly areas.

PI: Mst. Dilafroza Khanam, PSO, Bio-technology Division, BARI, Joydebpur, Gazipur

Bunchy top disease propagated by infected suckers, has decreased the area of BARI kala3 and BARI kala4, the two most popular banana varieties of Chittagong hill districts. Tissue culture is the only option that can produce sufficient number of disease free planting material within limited time and space. Moreover, about 10-15% higher yield can be obtained from the saplings produced by tissue culture. The project was therefore undertaken to standardize the protocol for in vitro plantlet production of BARI kola3 and BARI kola4 and to evaluate their yield and economic performance in Chittagong hill districts. BARI Biotech lab standardized the protocol and Plant Tissue Culture Lab of Mustafa Group of Industries, Nagirhat, Chittagong, produced the disease free quality plantlets. The on-farm validation trials on tissue cultured banana production were carried out in 36 farmers' fields, each being 30 decimal in size, selected from 8 Upazilas of Khagrachari and Rangamati. BARI kola3 produced about 45 t/ha which was about 1 t/ha higher than BARI kola4. BARI kola4 matured about one month earlier than BARI kola3.Two field days involving 100 neighboring farmers at the time of harvesting banana and training on banana production for 72 farmers and 8 SAAO of 8 Upazilas were arranged during the period.

12. <u>Project Code with Title:</u> C-9.6: Rhizome Rot Disease of Ginger and its Management

PI: Dr. Abdur Rahman, CSO, Plant Pathology Division, BARI, Joydebpur, Gazipur

Several diseases limit the cultivation of Ginger in Bangladesh. Rhizome rot caused by *Pythium aphanidermatum* seemed to be the devastating one. The project aims to identify the microorganisms associated with rhizome rot, to develop appropriate management technologies for controlling the disease in Bangladesh and to validate the developed technologies in farmers' field. Research showed 46.7, 38, 34.5, 78 and 35.5% disease incidences in Nilphamari, Rangpur, Bogra, Tangail and Khagrachari respectively. The causal pathogens of Rhizome rot of ginger were *Pythium aphanidermatum, Fusarium oxysporumand, Sclerotium rolfsii* and *Ralstonia solanacearum* and considered to be involved for developing disease complex. Observation revealed that damping off caused *by Phythium* sp. and wilt caused by *Ralstonia solanacearum* cumulatively incurred severe damage to the crops throughout the vegetative period of ginger. Severity of wilting was observed at the time of the germination and at the later part of the rainy season of the year. Seed treatment with Clorox, Ridomil gold and soil disinfection were found partially effective against rhizome rot of Ginger caused by fungi.

13. <u>Project ID with Title</u>: C–11.1: Management of Coconut Mite.

PI: Dr. Md. Nazirul Islam, PSO Horticulture Research Station, Mojlishpur, Shibpur, Narshingdi

The coconut cultivation of southern Bangladesh was about to be abandoned due to severe mite infestation. Ignorance and inappropriate measures taken against the pest made the farmers frustrated and hopeless. At this situation a project "Management of coconut mite"was taken to address the issue. Two years endeavor developed an effective management package for the control of coconut mite which is undergoing validation trials at present. Out of the 6 treatments, the treatment of Cleaning of coconut crown including young infested nuts (2-6 months old), followed by spraying of omite @ 2 ml/lit of water and incorporation of 250 g of Neem Cake at the root zone of a tree, was found most effective. On an average 77 healthy coconuts were found from each of the coconut plant having the above mentioned treatment which initially produced almost no healthy nuts (indicated by baseline survey). Application of Neem Cake increased edible portion without influencing dry matter content of the kernel.

14. <u>Project Code with Title:</u> C-13.2: Selection and application of BPH management technologies in Sirajganj.

PI: Md. Mofazzel Hossain, SSO, Entomology Division, BRRI, Joydebpur, Gazipur,

Brown plant hopper (BPH) is a menace pest of rice and a threat to rice production. A considerable crop loss of both T.Aman and Boro crop is incurred by the pest every year in Bangladesh. Farmers' ignorance, failure to take timely measures, above all, methods of applying pesticides lead farmers to miserable failure protecting their crops. In this situation the project was taken to develop an effective management package against BPH. Use of double nozzle sprayer applying pesticide brought about the most effective protection of the crops against BPH. Plots having pesticide application by double nozzle sprayer showed yield increases of 14.46 and 8.38 % over those of the untreated control plots and 11.43 and 3.27 % over those of the farmers' managed plots in T.Aman and Boro seasons respectively. However, the yield differences observed in response to different treatments in different fields varied extensively depending on the extent of infestation levels of BPH. A total of 137 farmers, NGO and Extension personnel were trained on "BPH management technologies" during the reporting period.

15. <u>Project Code with title:</u> NR-15.22: Validation of drought management techniques for sustainable crop production in the high barind tract

PI: Md. Abdus Salam , SSO & Station In-charge, OFRD, BARI, Barind Station, Paramedical Road, Laxmipur, Rajshahi,

The major part of the high Barind tract, a drought prone area, largely depends on rainfed agriculture. Adoption of appropriate drought management techniques can help improving the agriculture of the area. With this view, the project was implemented in three Upazilas of Rajshahi, Chapai Nawbabganj

and Naogaon districts to validate the drought management techniques. A total of 180 validation trials of short duration T.Aman rice (BINA dhan 7), Chickpea (BARI chola 9) Wheat (BARI Gom 26) and potato (Cardinal) were conducted at Nachol, Godagari and Shapahar (Barind Tract) during 2011-2012 and 2012-2013. Cultivation of Chickpea using residual moisture and potato with mulch and minimum tillage after T-Aman harvest showed promise in the drought management (for the area). The short duration BINA dhan 7 helped successful establishment of Chickpea, wheat and potato. The trial plots of potato and wheat produced 23.4 to 24.2 and 4.85 t/ha of tuber and grain, respectively, and which were 15-20% and 30-40% increases in yield over those of the farmers' plots. Inclusion of Mungbean (BARI Mung6) in wheat-Mungbean-T-Aman cropping pattern increased the cropping intensity by 1.88-2.30%. About 500 farmers, 60 SA/SAAO and NGO personal were trained on the techniques of drought management.

16. <u>Project Code with Title</u> NR-16.15: Testing, validation and up-scaling of Water Saving Technology in Rice Production (TWST)

PI: Dr. Md. Towfiqul Islam, SSO, Irrigation Water Management Division, BRRI, Joydebpur, Gazipur

Drought is one of the major concerns of T.Aman farmers of Northern part of our country. Occurrence of light to moderate drought at the later part of the T.Aman crop is a regular phenomenon of the region. Use of excess rainfall collected in 'on-farm reservoirs' is a solution of the problem which makes farmers capable of providing supplemental irrigation and thereby help increasing production, water use efficiency and income. T.Aman fields of BRRI dhan49 having supplemental irrigation with harvested rain water showed 21.33% higher yield (5.52 t/ha) than that (4.33 t/ha) of the fields receiving no supplemental irrigation. The benefit was of Tk. 11948/ha. PVC Pipe water distribution system (PWDS) saved about 99% of conveyance loss of irrigation water which helped increasing irrigated area by 20% at Dhamurhat. Development and use of iron made shutter facilitated single plot irrigation solving the problem of 'end cap detachment'. Check Value user saved Tk. 3000 for each of the STW operation per season.

17. <u>Project Code with Title:</u> L-17.4 Development of cost-effective complete feed formula for the productive and reproductive performances of buffaloes

PI: Dr.Md.Ruhul Amin, Professor, Department of Animal Science, BAU, Mymensingh

Healthy growth, sound reproductive performance and increased milk and meat production from buffalos can assure a sustainable supply of animal protein to meet the huge ever increasing requirement of the country and this can only be achieved if proper ration for the animal is provided. This research program was implemented to formulate cost effective rations for improving the productive and reproductive performarces of buffaloes and to make the rations available to the buffalo farmers in absence of commercial feeds. Four types of diets were developed on the basis of protein and energy requirement of milking and growing buffaloes. Eighty buffalo farmers received the formula diets. On average milk production was found to be increased by 2.08 and 2.46 L/day with Diet 1 and Diet 2, respectively, in all the locations. Diet 2 showed better performance in respect of

milk production. Higher body weight gain was achieved for buffalo bull calves that was recorded to be 156.2 kg and 149.8 kg with the Diet 3 and Diet 4 respectively, on average. Diet 3 showed better performance in respect of body weight gain.

Healthy growth...in absence of commercial feeds. Among the different diets tried following two diets was found to perform best for milking and growing buffaloes:

Composition of Formula diets for milking and growing buffaloes

Feed ingredients and other nutrients	Milking Buffaloes	Growing buffaloes
	gm/kg	
Crushed Maize	150	400
Rice polish	300	200
Broken Rice	250	250
Wheat bran	270	120
Urea	---	5
DCP	20	15
Salt (NaCl)	10	10
Total	**1000**	**1000**
Vitamin-A (IU)	75,000	24,000
Vitamin-D (IU)	21,000	9,000
Vitamin-E (IU)	545	240
Calcium %	0.64	0.47
Phosphorus %	0.69	0.48

With the above mentioned diet for milking buffalo the milk production was found to be increased by 2.46 L/day and with the diet for growing buffaloes body weight gain was found to be achieved by 156.2 kg. In terms of milk production the benefit was found to be 53.61% more with formula diets compared to control. And in terms of body weight gain the benefit was found to be 352% more with formula diets compared to control.

18. <u>Project Code with Title</u>: L-19.2: Investigation on calf diseases and development of mitigation measures

PI: Prof. Dr. A. S. Mahfuzul Bari, Vice-Chanceller, CVASU, Khulsi, Chittagong

An endeavour was taken to identify the major causes of calf diseases and to determine important risk factors related to calf diseases in order to develop mitigation measures and improve knowledge and skills of the farmers about management of calf diseases through training programs. Diarrhea, FMD, Pneumonia, Naval-ill and skin diseases were found to be the predominant calf diseases in the study areas. Analysis of 316 fecal samples from apparently healthy calves revealed a very high percentage (62.91%) of calves were suffering from various parasitic and protozan infection. The rate of infection was found to be very high for *B.coli (18.48%) followed by Eimeria sp.(3.92%) Taenia sp. (10.76%), Toxocara sp. (9.17%), Moniezia sp. (7.91%), Strongyloides sp. (4.74%) Parmphistomum sp. (4.74%) Trichuris sp (3.76%)* and *Fasciola sp*.(2.53%). Diarrhea one of the major causes of mortality of calves, was found to be caused mostly by *E. coli* (73.5%) and by *Salmonella E. Coli mixed* infection (20.5%). Diarrhea due to parasitic and protozan infection was found to cause mainly by *Eimeria sp*. (26%) followed by *Toxocara sp*. (20%) and then by *B. Coli* (12%). The questionnaire survey revealed that the calf population of the target village received better care in terms of deworming, vaccination, vitamin and mineral supplemented balanced ration in comparison to those of the control villages. The important risk factors releted to calf diseases were identified to be (a) Inadequate de-worming and

vaccination (b) Faulty feeding practices (lack of vitamine & minerals in the ration) (c) Unhgienic calf health management practices (d) Poor housing and (e) Lack of knowledge about calf diseases. A total of 1616 calves and cattle were dewormed and vaccinated and about 1572 farmers attended training programs and field days during the period.

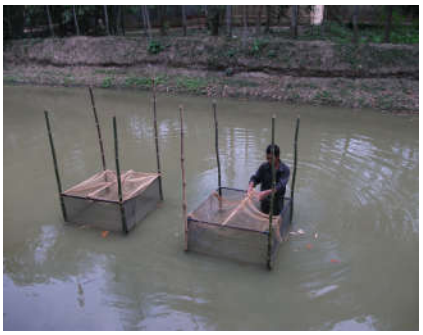
19. Project Code with Title: L-20.4: Clinicopathological and serological surveillance of Foot and Mouth Disease (FMD) and Peste des Petits Ruminants (PPR) and adopt preventive measures against them at Shakipur and Madhupur Upozilla

PI: Prof. Dr. Md. Abu Hadi Noor Ali Khan, Dept. of Pathology and Proctor, Bangladesh Agricultural University, Mymensingh

Foot and mouth disease (FMD) for cattle and Peste des Petits Ruminants (PPR) for goats are the most important infection diseases of causing high level of morbidity and mortality in the animals each year in Bangladesh. The research effort therefore was taken to adopt technologies for detection of field infection of FMD & PPR, standardization protocols to measure vaccine response against the disease and to determine doses and protection level of the vaccines. The research was undertaken at Shakhipur and Madhupur Upazila under Tangail district. The study revealed that FMDV serotypes "O" and "Asia 1" is in the circulation in cattle and buffaloes in the study areas. PPR was found to be endemic in goats there. The Occurrence of FMD in un-vaccinated animals was about 17% in cattle and 12% in buffaloes with 7-10% calf mortality. However, using trilent vaccine ("O" "A", "Asia1") with a booster dose at 21 day reduced the morbidity to 1-2%. The occurrence of PPR in unvaccinated goats was about 24% with 43% mortality that was reduced to 4.4% for morbidity and 37% for mortality after vaccination with a booster dose at 21 day. Deworming of cattle thrice in a year helped increasing body weight to 20-25% and milk production to 25-35%. FMD virus serotype "O" and "Asia1" have been adopted in BHK21 cell culture that could be used as seed for vaccine production. Finally, it was concluded that in the endemic areas cattle and buffaloes should be immunized with trilent FMD vaccine twice in a year with booster doses at 21 day Goats should be immunized with PPR vaccine once in a year. However, re-vaccination at 21 day interval will bost immunity level with better protection.

20. Project Code with Title: F-22.1: Diversification of Carp Polyculture Integrating Snail (*Viviparus sp.)*, and *shing* (*Heteropneustes sp.*) Culture in Cage in Ponds of *Adivasi* Households

PI: Dr. Mohammad Mahfujul Haque, Associate Professor, Dept. of Aquaculture, BAU, Mymensingh



The project aims to increase income of Adivasi people through fish culture using diverse resources including poor human capital (*adivasi* people), natural resources (pond), and biological resources (fish and snail). The endevour is to increase production of Carps in polyculture pond, Shing in cage system and to increase farmers' knowledge and skill about Shing and carp culture. The average productivity of the carps was found better in the experimental ponds (Tk. 3682 kg/ha) in comparison to that found in traditional pond poly culture (Tk. 2500 kg /ha). However, the growth of Shing was not at the expected level as the fingerlings used there was of poor quality. Use of better fingerlings in the following year improved the situation. The average Shing production with formula

and Snail mixed feed were found 3.14 and 3.06 kg/Cage respectively. However a similar experiment (check) carried out at University showing an increase in the production of Shing (3.81kg/ha) indicated a poor management aspect of the experimental sites. The productions of Snail in ponds increased and were used in the feeds for the Shing which reduced the feed cost by Tk.29/kg and ultimately the operation cost for Shing culture.

21. Project Code with Title: CC-25.1: Development of an integrated rice-fish production system in lower Meghna river flood plain of Noakhali and Lakshmipur districts

PI: Prof. Dr. Mohammad Amin, CSO, RARS, BARI, Hathazari, Chittagong

Project was implemented in collaboration with Noakhali Science and Technology University (NSTU). Rice production was conducted by OFRD, BARI, Noakhali and fish production by NSTU in rice-fish production system from May, 2011 in the four upazilla's of Noakhali district and one upazilla of Laxmipur district. Rice variety BRRI dhan40 in aman variety and BRRI dhan29 in boro pattern was cultivated and fingerlins of (Rui, Catla, Mrigel, Sharputi, Silver Carp Grass-carp, Shrimp and Common carp) from recognized hatchery farmar was supplied among the 40 locations/doggi covering 12162 decimal and 297 farmers following participatory approach. Among the 40 locations 21 locations were T.Aman rice+fish culture and other 19 locations were tested Fish-Boro pattern in the farmers' field. The doggis were prepared (i.e. land preparation, ail/road binding etc.) were done in the month of April. The yield of HYV Aman ranged from 4.11 t/ha to 4.42 t/ha, and average yield was 4.21 t/ha. In T.Aman rice based pattern, yield of fish ranged from 2.06 t/ha to 2.55 t/ha. The average yield was 2.23 t/ha considering 21 locations. In boro based pattern, the yield of boro rice (var. BRRI dhan29) ranged from 5.68/ha to 6.45 t/ha and the average yield was recorded 6.19 t/ha which was 3.5% higher than existing variety (Hybrid Heera). Also, in the boro based pattern due to adoption of improved fish culture yield of fish increased 262% than the existing farmers practice. The average gross margin was Tk. 1,11,611 and Tk. 1,42,070 higher in the Aman based and Boro based pattern respectively.

22. Project ID with Title: C-1.2: Testing, Validation and Up-scaling of cotton-rice intercropping in Chittagong Hill districts

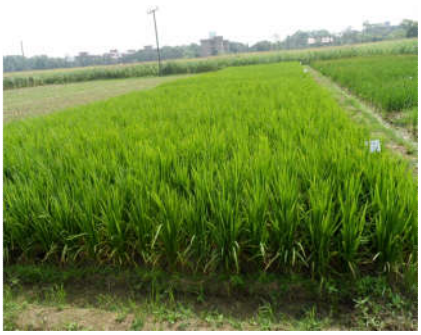
PI: Dr. Md. Farid Uddin, Deputy Director (H.Q) Cotton Development Board (CDB) Khamarbari, Farmgate, Dhaka

Cotton is an important crop to the tribal people not only for their source of income but also in their religious rites. Hill cotton is a long duration crop and generally hilly farmers grow cotton in Jhum system. The project was taken to test, Validate and Upscale Cotton-Rice intercropping technology in place of traditional Jhum cultivation to improve system productivity and to reduce soil erosion. Intercropping of Rice and Cotton with two rows of rice with one row of cotton showed the maximum benefit in terms of REY (Rice Equivalent Yield). However, the yield of cotton and rice showed variations with the planting systems. The Jhum system showed the lowest yield of both the crops. Both the American upland cottons (Rupali 1 and CB -12) performed better than the hill cotton. Rupali 1 showed the highest yield (1060 kg/ha). However in terms of economic return, CB-12 was found better than Rupali 1 as Rupali 1 incurred higher seed cost.

23. <u>Project Code with Title:</u> C-1.11: Improvement of appropriate rice based cropping systems in Barind areas

PI: Mr. Md. Feroz Hossain, Director (Project Planning & Monitoring), Rural Development Academy (RDA), Sherpur, Bogra

Farmers in the northern districts of Bangladesh have adopted intensive cropping systems in recent years. Majority farmers do not follow recommended management practices for the cultivation of the crops, neither have they used modern varieties. Consequently, the average yields of most of the crops remain stumpy. The project aims to improve system productivity by increasing the yield of different component crops grown in the major cropping patterns of three Upazillas of Bogra District. Use of quality seed, balanced fertilizer, high yielding varieties and proper pest management helped achieving higher yield and greater benefits even from the cropping patterns existing in the area.

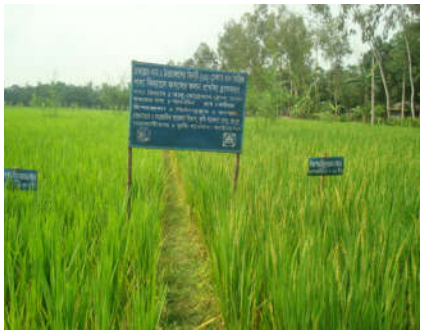


HYV Yard long bean produced 16.68 t/ha which was 16.67 % higher than that obtained in farmers' plots. The gross margin over farmers' practice was Tk 52153/ha. Snake gourd yield of trial plots (21.89t/ha) was 36.38 % higher than those obtained in farmers' plots. Gross margin was about Tk 96779/ha over that of farmers plots. Similarly, higher yield of potato (25.10 t/ha), maize (8.5 t/ha) and Aman rice (4.24 t/ha) providing higher gross margins of Tk.127068, 17045 and 10188 respectively were obtained over farmers practice from the existing cropping pattern (potato-maize-T.Aman) of Shibganj. About 25.69%, 27.69% and 18.46% higher yields and gross margin of Tk. 23398, 11469 and 14381 over farmers' practice were obtained from the trial plots of Boro, Aus and T.Aman rice respectively.

24. <u>Project Code with Title:</u> C-1.26: Minimizing yield gaps in rice-based cropping systems of three northern districts.

PI: Dr. S.M. Mahabubur Rahaman Khan, PSO, OFRD, BARI, Joydebpur, Gazipur

Majority farmers of the selected locations (Ulipur, Mithapukur and Shibgang) do not follow the recommended management practices for the cultivation of their crops. Access of these farmers to agricultural inputs including credit is also very limited. Due to these limitations, the average yields of crops of these farmers are much lower than those of the farmers who use modern varieties and improved management practices. The project aims at improving system productivity by increasing yields of rice and other component crops of the existing major cropping patterns through selection and validation of improved methods and technology packages for increasing yields of rice, potato and mustard in major rice–based patterns. Focus Group Discussion (FGD) revealed that mustard and potato were planted late due mainly to late harvest of previous T.Aman rice. Likewise, boro rice was planted late because of late harvest of earlier potato. Farmers applied imbalanced and low doses of fertilizers that finally resulted in low yields of the crops. Mustard, Boro and T.Aman rice produced 1.55, 5.76 and 4.95 t/ha in trial plots of Shibganj which showed 49.7, 16.67 and 17.37% increases

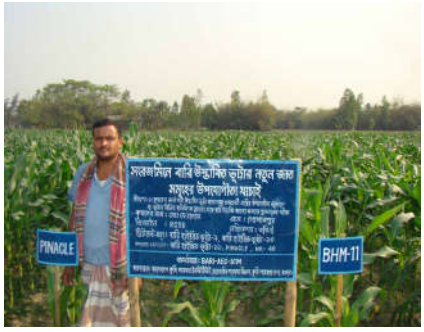


over those found from farmers' plots respectively, following the existing Mustard-Boro-T.Aman pattern in 2011-12. Similar result was also obtained in 2012-13. Yield increases of 50.64 and 17.95% for Mustard and Boro rice were obtained in trial plots. The same trend was also achieved in Mithapukur and KurIgram. About 37.66, 22.03 and 20.21% of yield increases for potato, Boro and T.Aman rice, respectively, were obtained in 2011-12. Potato and Boro rice of 2012-13 showed 42.12 and 23.50% increases over those of the farmers' plots. About 33.96, 17.61 and 23% increase in yields for potato, Boro and T.Aman rice of 2011-12 and 45.10 and 19% for potato and Boro rice of 2012-13, respectively, were obtained at Ulipur.

25. <u>Project Code with Title</u>: C-1.27 Enhancement of Crop Productivity through Improved Management Practices, Tools and Techniques

PI: Dr. Dilwar Ahmed Choudhury, Pso, On-Farm Research Division, Bari, Joydebpur, Gazipur

There remains a gap in the yield of the crops obtained from farmers' field and research stations. A number of factors like time of planting, quality of planting material, fertilizer management, variety of the crops, tillage depth, use of organic manures etc are responsible for low yield crops. There is an ample scope of increasing crop yield by 20-30% over existing yield level adopting improved production technologies/practices. The project was designed to increase individual crop yield and system productivity by changing variety and adopting improved production packages. OFRD of BARI in collaboration with NGO SUS conducted on-farm trials on selection of short duration varieties of T.Aman and mustard, effects of Tillage depth, integrated nutrient management and improved management practices in 20 farmers' fields, selected from two Upazilas, Dhamrai and Singair of Dhaka and Manikganj districts, respectively.



Deep tillage increased 15-20% of higher seed yield of Mustard, Maize, Boro and T.Aman. BARI sarisha15 and BARI sarisha14 showed 30-35% higher seed yield over that of the local variety Tori 7. Yield of Mustard, Wheat, Maize, Boro and T.Aman rice and Jute increased by 10-20% with IPNS based fertilizer application. BINA dhan7 matured about 20 days earlier which facilitated timely planting of Rabi crops. About 14-36% higher net return and higher BCR were obtained with deep tillage, a greater net return (33-60%) was found with nutrient management.

26. Project Code with Title: C-2.19: Crop intensification through incorporating quick growing fruits and vegetables into existing cropping systems in Jhalakati and Patuakhali districts

PI: Mr. H. M. Khairul Bashar, SSO (I/C), OFRD, BARI, Sabujbag, Patuakhali

About 41 – 60% of arable lands of Patuakhali and Jhalakathi remain fallow during Rabi and Kharif 1 seasons due to adverse agro-ecological conditions of the region. Moreover, traditional agronomic practices of the people has made the lands less productive with least diversification of crops, consequently, low productivity and low cropping intensity of the region has made the people poor. At this situation the project has been taken up for the improvement of the cropping system of the region and thereby to improve the livelihood of the people of

the area. A number of experiments on selection of suitable crops, varieties of the suitable crops and planting methods have been carried out during the period in 6 villages of Dumki, Patuakhali Sadar and Jhalakathi Sadar upazilas of Patuakhali and Jhalakathi districts respectively. Out of 4 vegetable crops, Brinjal, Tomato, Okra and Spinach, Tomato performed the best producing 72.66 t/ha and which was followed by Brinjal, Spinach and Okra in terms of yields. Hybrid tomato, 'Safal' collected from local market produced the highest yield (95.66 t/ha) in comparison to those of BARI tomato2, BARI tomato3, BARI tomato14 and BARI tomato15 undergoing the varietal trial. Out of the two hybrid summer tomato varieties, BARI hybrid tomato4 showed better yield (39.19 t/ha) in 2012. Crop performance was found better in bed planting system.

27. Project Code with Title: C-4.5 Maximization of Crop Yield in T. Aman-Mustard-Boro Cropping Pattern by Agronomic Manipulation

PI: Prof. Dr. M. Rafiqul Islam, Dept. of soil science, BAU, mymenshingh.

Late harvesting of long duration High Yielding T.Aman rice followed by Boro cultivation makes it difficult to accommodate mustard in the cropping pattern. Consequently, area under mustard has been decreased widening the gap between the production and consumption of edible oil with ever increasing population. However, the development of short duration varieties of T.Aman rice and mustard has facilitated the establishment of mustard in between Aman and Boro rice. The present research project was designed to grow mustard in between T.Aman and Boro rice and with Boro rice as mixed crop to increase cropping intensity and system productivity and thereby farmers' income. On-farm participatory adaptive trials to develop alternative cropping pattern (BARI sarisha14-BRRI dhan29-BINA dhan7) were conducted in 18 farmers' fields of Dhanbari and Kalihati Upazila in the 1st year. In the second year, adaptive trials in 3 blocks, each with about 5 acres of land involving 45 farmers, were established in the two Upazilas. BARI sarisha14 was established successfully both as sole and mixed crop with direct seeded Boro rice which showed an yield of 1462 and 1383 kg/ha at Dhanbari and Kalihati respectively. Direct seeded Boro rice mixed with mustard, showed higher yield of 458 and 416 kg/ha than those obtained from transplanted Boro rice grown at the two sites. The mean rice equivalent yield of the T.Aman –Mustard-Boro pattern of all three block was 15.74 t/ha compared to 12.54 t/ha, obtained from the existing Aman-Fallow-Boro pattern. About 32% (Tk154, 646/ha/yr) higher net income was found from the alternative pattern. The new pattern required 16% higher number of labourers.

28. Project Code with Title: C-5.2 Yield Maximization of Mustard and Sesame through Improved Package of Production Practices in Some Selected Areas of the Country

PI: Dr. M. Raisul Haider, PSO and Head, TCP Division, BINA BAU Campus, Mymensingh

The national average yields of mustard and sesame are very low compared to the potential yields of the two crops. Use of traditional varieties and inappropriate management practices keep the yield low. Development of short duration HYVs of Aman rice created opportunities for cultivation of high yielding mustard and sesame varieties in proper time. The projct is therefore designed to select appropriate rice varieties allowing the cultivation of high yielding mustard and sesame varieties in rice based cropping patterns of the target locations under six

districts (Jessore,Faridpur, Jhenaidah,Chuadanga,Narail and Kushtia) of Bangladesh. The project was implemented by BINA in collaboration with two NGOs namely Jjagoroni Chakra Foundation and Muslim Aid Bangladesh Field Office. On-farm trials were conducted to select proper varieties of the crops and validate the relevant production packages. Efforts were also made to include Mustard replacing Wheat in T.Aman-Wheat-Jute pattern. Based on the performance, BINA sarisha4, BARI sarisha14, BRRI dhan28, BINA til1, BINA til2, BINA dhan7, BINA masur5 and BINA masur6 were selected from the tested varieties for upscaling three cropping patterns: BINA sarisha4/BARI sarisha14- BRRI dhan28-BINA dhan7, BINA sarisha4/BARI sharisha14- Jute-BINA dhan7 and BINA masur5/6-BINA til1/2-BINA dhan7. Boro rice based pattern showed the highest profit (105.1%) followed by the jute and lentil based patterns having 36.4 and 29.4% profit over the farmers' practice. On-farm participatory demonstration trials were established at six locations involving 454 farmers' in T.Aman season 2013. Seven hundred and Thirty seven numbers of farmers and SAAOs were trained on improved crop cultivation technique and six field days were organized during the period.

29. Project Code with Title: C-7.9: Validation and up-scaling of year round pineapple production technology in hilly areas

PI: Dr. Madan Gopal Saha, CS0, BARI, Joydebpur, Gazipur

Pineapple is one of the major seasonal fruits of Bangladesh. Despite a year round market demand, the fruits become available in the market in large quantity at a particular period of the year which deprives the farmers from the expected price. At this situation, an attempt was taken to grow pineapple throughout the year and to increase production with better varieties to make farmers more benefitted. Between the two varieties of Pineapple, undergoing the validation trials conducted at Moulovibazar, Khagrachhari and Rangamati, the Giant Kew, having larger fruits weighing in between 450-2300 g, performed better compared to Honey Queen in respect of yield and BCR (Tk.3.52). Moreover, higher number of slip suckers produced by Giant Kew made farmers economically benefitted. However, fruit quality and shelf life of Honey Queen were better than those of Giant Kew. Both the varieties responded to Ethrel, a growth regulator, and produced fruits throughout the year.

30. Project Code with Title: C-8.14: Integrated Management of major diseases of brinjal and tomato in Jamalpur and Sherpur districts

PI: Dr. Biresh Kumar Goswami, PSO,RARS, BARI, Jamalpur

Different diseases incur about 35-40% of yield loss of Brinjal and Tomato every year. Sometimes the yield loss reaches even up to 90-95%. At this context the project was undertaken to develop effective technologies for controlling major diseases of the two vegetables and, to evaluate and upscale the technologies in farmers' fields of Sherpur and Jjamalpur and to upgrade the knowledge and skill of the beneficiaries on disease management. Current status of the two vegetables and their diseases were documented through a survey conducted in the area. Bioassays of the collected pathogens causing different diseases were done in the laboratory. A technology packages were developed and evaluated conducting on-station experiments and on-farm trials in 25 farmers' fields of Jamalpur and Sherpur. Two cost effective packages were developed which reduced 80-90% and 75-85% disease incidences

of Brinjal and Tomato respectively. The bacterial wilt disease of the two vegetables reduced even up to 95-98%. The benefit cost ratios found under the packages were 5.1 and 3.82 compared to 1.63 and 1.78 obtained with farmers' practice for Brinjal and Tomato respectively.

31. <u>Project Code with Title</u>: C-12.1: Development of Management Package for Powdery Mildew of BAU Kul and Apple Kul

PI: Prof. Md. Rejaul Islam, Agrotechnology Discipline, Khulna University, Khulna

Jujube cultivation is increasing day by day in our country and has been established as a profitable business. Unfortunately, the powdery mildew, a devastating disease has been appeared in recent years as a threat of the jujube Orchards. Powdery mildew, *Oidium ziziphi,* causes considerable losses of BAU kul and Apple kul of our country. A project was taken to develop a "management package" for the control of the disease. The project continued for two years and developed a package which controlled the disease and thereby reduced the loss and increased the production of BAU kul and Apple kul in the project area. Six sulphur containing fungicides (Gaivet 80% DF, MYSULF 80 W6, McSULPHUR 80 WP, Greensul 80 WG, HAYSULF 80 DF and Genivit 80 DF) were found effective against the disease. Application of fungicide at 15 days interval from the date of 1st visible appearance of the disease and pruning at the end of March helped BAU kul and Apple kul producing about 25 and 20% higher yield than those of the untreated controls, respectively. BCR obtained for BAU kul and Apple kul were 10 and 10.67 respectively.

32. <u>Project code with Title: L- 17.1:</u> Least cost feed formulation for poultry through the production of fermented yeast product from locally available feed resources

PI: Dr. Kazi M. Kamar Uddin Director, Poultry Research and Training Center, CVASU, Khulshi, Chittagong

An endeavor was taken to establish least cost rations for poultry from locally available feed resources (maize, rice polish, wheat and rubber seeds where available) fermenting with Baker's yeast (*Saccharomyces cerevisiae*), as a fermented protein source and *Trichoderma viridae,* to reduce fiber content of rice polish. Rations for broiler (starter and finisher) were prepared using the formulae as shown in the following ration charts:

Formula for broiler rations (with rubber seeds)

Starter ration										
Maize (kg)	Rice-polish (kg)	Soybean oil (kg)	Soya meal (kg)	Rubber seeds (kg)	Meat & bone meal (kg)	Lime (kg)	Vitamin (kg)	Methionine (kg)	Salt (kg)	Total (kg)
48.3	14	_	20	10	6.5	0.5	0.25	0.2	0.25	100
Finisher ration										
50	12	4	16	10	6.2	1.0	0.25	0.3	0.25	100

Formula for broiler rations (without rubber seeds)

Starter ration										
Maize (kg)	Rice-polish (kg)	Soybean oil (kg)	Soya meal (kg)	Rubber seeds (kg)	Meat & bone meal (kg)	Lime (kg)	Vitamin (kg)	Methionine (kg)	Salt (kg)	Total (kg)
54	12	1	27	_	4	1.3	0.25	0.2	0.25	100
Finisher ration										
59	11.5	4	18.3	_	5.5	1.0	0.25	0.2	0.25	100

For all the ration charts, yeast was added at the rate of 10 gm/kg (1%) of total feed and Trichoderma was added at the rate of 25 gm/kg (2.5%) of rice-polish. The feed mixes were fermented for 13 days before feeding broilers. The cost of fermented feed (29.2 BDT/kg) was about 1.8 BDT/kg less compared to the cost of conventional feed (31.0 BDT/kg). Profit margin from the sale of birds fed with treatment feed was 20.15 BDT/bird compared with the birds on control feed.

33. Project code with Title: L-19.7: Calf mortality in large and small holder cross breed dairy cattle: epidemiological and pathological investigation and mitigation

PI: Prof Dr. Emdadul Haque Chowdhury, Professor, Department of Pathology, BAU, Mymensingh

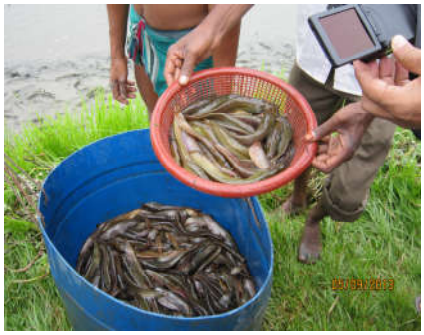
Gastrointestinal and Respiratory diseases cause about 9 and 13.4% of calf mortality under rural and farm condition, respectively, in Bangladesh. Exotic and crossbred cattle are highly susceptible to diseases in comparison to local zebu cattle. Considering these facts, the project was designed to determine the etio-epidemiological factors associated with calf morbidity and mortality under farm and rural conditions in Bangladesh. Ten risk factors influencing calf mortality and morbidity, directly or indirectly, have been identified. Those are farmers' occupation, education, new introduction of animals into herd, production purpose, parturition hazard, age at first grazing or calving, herd size, milk feeding practice, kacha-floor and poor physical condition. Fourteen types of helminthes, four types of protozoa, two types of virus and two types of bacteria have been identified. The overall mortality of calf was reduced from 24.6% to 1.84% in Muktagacha and from 44% to 2.23 % in Shajadpur. Health status of cow and calves improved and morbidity and mortality reduced due to early diagnosis of diseases and treatment, routine de-worming, vaccination and improved health management practices. Seventy five farmers of the project sites have been trained on calf health management.

34. Project Code with Title: F-21.20: Adaptation of High Valued Fish Species Shing (*Heteropneustes fossilis*) Culture Technology for Maximizing Production in Three Agro-Ecological Zones of Bangladesh

PI: **Prof. Dr. Md. Jahangir Alam, Dept, of Fisheries Technology, BSMRAU, Salna, Gazipur**

Shing farming is largely confined in Mymensingh region due to the easy availability of hatchery bred seed and technological interventions in the area. The success in developing captive breeding and pond culture indicates the potentiality of shing farming throughout the country. However wider adoption of shing farming requires refinement and standardization of the technologies for different agro climatic regions and which can be achieved through on-farm participatory adaptive trials. The present research has been undertaken to standardize the Shing culture techniques for wider adoption, building awareness and improving knowledge and skill on Shing farming as well. The first year trials conducted in 9 farmers' ponds of Narshingdi district, indicated that 500 fingerlings/decimal was the

best out of the 3 stoking densities in terms of production and economic return. However, the Feed Conversion Ratio (FCR) was not up to the desired level as the fingerlings were released in pre winter months. The trial is being repeated in the second year to verify the Feed Conversion Ratio (FCR) and other parameters with same stocking density. Collected data indicated satisfactory FCR ranging in between 2.99-3.17 having a net production of 3.93-5.43 t/ha. The average net return and BCR ranged in between Tk. 441738-872762/ha and 1.48-1.76 respectively.



35. <u>Project Code with Title: CC-25.2:</u> Development of integrated crop-fish production system using ditch-and-dyke method in low lying areas of Jhalakati and Bogra region

PI: Professor Mofazzal Hossain, Director (Research), BSMRAU, Salna, Gazipur

There are some low lying areas in the country which usually remain under water for 6-8 months. Year round crop production is neither feasible nor profitable in those areas. As a result the productivity of the area is considerably low. At this situation an attempt has been taken to increase the resource productivity of these areas introducing ditch and dyke system of crop and fish culture. Out of Seven vegetables, tried in first year (2012), Indian spinach showed the highest yield (49.4t/ha). The yield of tilapia was 9.9 t/ha/120 days where as the monoculture of Shing and polyculture of carps and other fishes produced 2.0 and 7.4t/ha/120 days respectively. The monoculture of tilapia showed the highest gross income and BCR. Egg plants grown in 2nd year showed the highest yield and BCR, 55t/ha and Tk 5.16 respectively. Results indicated that the Ditch-Dyke system would be profitable for the area and farmers' income could be increased by 10 -12 times than that obtained by conventional production system.

LIST OF PILOT PROJECTS

List of Pilot Projects CGP 1st Call & 2nd Call

CGP 1st Call

Sl. No.	Project Code and Title	Name of the PI
1.	C-HF-103: Validation of Improved Agricultural Technologies at Farmers Field in Hill Farming System.	Dr. Md. Mohabbat Ullah, Principal Scientific Officer, Hill Agril. Research Station, Bangladesh Agricultural Research Institute, Khagrachhari Mobile: 01550605727
2.	C-CA-113: Pilot Project for Large-Scale Adoption of Improved Sesame Varieties in Khulna.	Dr. Md. Sarwar Jahan, Professor, Agrotechnology Discipline, Khulna University, Khulna-9208. Mobile: 01712813106
3.	C-S-161: Up-scaling of improved water management practices for increasing crop water productivity and cropping intensity in Barind area	Dr. Md. Asgar Ali Sarker, CSO (cc), Agriculture Engineering Division, BINA, P.O. Box-04, Mymensingh-2202. Mobile: 01715998145
4.	C-PHT-179: Piloting for up-scaling the technology of potato storage under natural condition.	Dr. Md Azizul Haque, Former in charge, Tuber Crops Research Sub-center, BARI Munshiganj-1500. Currently Professor, BSMRAU. Mobile: 01711488619

CGP 2nd Call

5.	P-1: Crop intensification in Barind area through effective drought management	Dr. Md. Abdus Salam, Senior Scientific Officer On-Farm Research Division, Bangladesh Agricultural Research Institute, Rajshahi Mobile: 01712092122
6.	P-2: Management and control of mites in coconut through farmers' capacity enhancement	Dr. Md. Nazirul Islam, Principal Scientific Officer Regional Horticultural Research Station, Shibpur, Narshingdi. Mobile: 01715855239
7.	P-3: Increasing production adopting improved production Practices in tidal floodplain.	Professor Dr. Md. Jafar Ullah, Department of Agronomy, Sher-E-Bangla Agricultural University, Dhaka. Mobile: 01552331605
8.	P-4: Upscaling improved jhum cultivation introducing intercropping rice with cotton	Prof. Dr. Md. Farid Uddin, Additional Director Cotton Development Board Khamarbari. Mobile: 01711020798
9.	P-5: Upscaling of mungbean-rice pattern in the Charlands of Kurigram.	Professor Dr. Md. Abdul Karim, Department of Agronomy Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706 Mobile: 01716752414
10.	P-6: Integrating crops and fish culture through land conversion into-ditch-dyke system	Professor Dr. Md. Mofazzal Hossain, Department of Horticulture, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706. Mobile: 01819433225
11.	P-7: Upscaling and validation of a proven technology on management of the major diseases of Bringal and Tomato.	Dr. Biresh Kumar Goswami, CSO, TCRC, BARI, Gazipur-1701. Mobile: 01716519187

Impact of Pilot Projects

1. Project code with Title: C-HF-103: Validation of Improved Agricultural Technologies at Farmers Field in Hill Farming System.

PI: Dr. Md. Mohabbat Ullah, Principal Scientific Officer, Hill Agril. Research Station, Bangladesh Agricultural Research Institute, Khagrachhar

The crop production technologies developed for the plain land are generally not suitable for the hilly farmers due to the unique form and topography of the area. At that context, 'Khagrachhari model'- a model for year round vegetable production, was developed for the improvement of the livelihood of tribal farmers, having a financial and technical support from KGF during 2009-2011. The pilot project on up-scaling of "Khagrachhari Model" is running for the last two years. One fifty small and marginal farmers from different upazilas of Khagrachhari and Rangamati districts got involved with the project and are capable now to fulfill their yearly requirement of vegetables from their own homestead gardens. The pilot project helped the farmers increasing vegetable consumption rate from 40 to 152g/head/day.

2. Project code with Title: C-CA-113: Pilot Project for Large-Scale Adoption of Improved Sesame Varieties in Khulna.

PI: Dr. Md. Sarwar Jahan, Professor, Agrotechnology Discipline, Khulna University, Khulna

Sesame is one of the important oil crops of Bangladesh and has a long history of cultivation for its oil. However, the farmers grow one or two local cultivars with poor yield which remain far below the national average. At this context, a pilot project was implemented to evaluate the performance of BARI Til4 and standardize production practices for growing the modern variety in the existing cropping pattern of south west part of Bangladesh having saline soil. In the first year of pilot project, trials were conducted to verify the performance of the selected modern variety and to speed up the dissemination of BARI til4 involving 150 farmers of four locations of Batiaghata and Dumuria upazilas. Data were collected on various growth and yield parameters. In all four locations BARI Till4 produced more than 225% extra yield compared to local variety. The recorded maximum and minimum yields of BARI Till4 were 2.95 and 1.40 t/ha, respectively, with an average of 1.915 t/ha which was about 236% of the yield of the local variety.

3. Project code with Title: C-S-161: Up-scaling of improved water management practices for increasing crop water productivity and cropping intensity in Barind area

PI: Dr. Md. Asgar Ali Sarker, CSO (cc), Agriculture Engineering Division, BINA, P.O. Box-04, Mymensingh.

Cultivation of Long duration T.Aman rice, normally grown in Barind area (Shorna, Sumon etc), hinders the cultivation of following rabi crops as it keeps fields occupied till December. By that time the soil moisture, required for the germination of the subsequent rabi crops is totally depleted. Consequently, vast area remains fallow in the region. At this context, the project aims to upscale the recommended water saving techniques, management practices for higher yield of rice and other crops and thereby to increase system productivity, cropping intensity and farmers' knowledge and skill about the potentialities. Result of year round block farming with different crops indicated that maximum net economic benefits were obtained from the cropping patterns of BINA dhan7-BINA

dhan4-BINA mung8/BINA til2 (Tk. 54,285 with BCR of 1.32-1.34) followed by BINA dhan7-BARI gom26-BINA mung8/BINA till2 (Tk 44,865 with BCR of 1.28-1.29), and were higher than that of the check cropping pattern (Tk. 34,345 with BCR of 1.21) by 58.06 and 30.63%, respectively. The new patterns required only one tenth of the supplemental irrigation water needed for the existing pattern (Sharna-Boro). All together 80 farmers and extension personnel were trained on water saving alternative cropping patterns during the period.

4. Project code with Title: C-PHT-179: Piloting for up-scaling the technology of potato storage under natural condition.

PI: Dr. Md Azizul Haque, Former in charge, Tuber Crops Research Sub-center, BARI Munshiganj-1500. Currently Professor, BSMRAU

Thousands of tons of potato grown in the country are either sold at lower price or spoiled every year in absence of adequate storage facilities. At that context low cost potato storage technology has been developed by a project supported by KGF. At present for up-scaling and disseminating the technology to wider areas of the country a pilot project has been taken up and being implemented in potato growing areas. A total of 39 store houses have been made in Bogra, Munshigang and Rangpur area with the help of TCRC, RDRS or DAE personnel. These have been established in farmers' home following the model developed by the Tuber Crop Research Center of BARI. A total 120 stake holder farmers have been trained on "Post harvest handling and storage of potato " and about 300 farmers have attended 3 field days arranged by the pilot project. Booklet and folders having the relevant information have been distributed among the farmers.

5. Project Code with Title: P-01: Crop intensification in Barind area through effective drought management.

Principal Investigator: Dr. Md. Abdus Salam, Senior Scientific Officer, OFRD, Barind Station, BARI, Rajshahi.

Barind tract covers most of the greater districts of Dinajpur, Rangpur, Rajshahi, Pabna and Bogra. Livelihood of the people of Barind tract depends largely on agriculture. Despite expansion of irrigation facilities, agricultural production in major parts of High Barind tract is dependent on rainfall. Crop production in the dry season is severely constrained due to drought resulting in low productivity. However, productivity can be enhanced through effective drought management. Three proven technologies (i) growing chickpea using residual moisture, (ii) growing potato with minimum tillage and using straw mulch and (iii) adopting wheat/potato-mungbean-transplanted aman cropping system with minimum irrigation were tested in the barind tract through a KGF funded CGP project. Success of the CGP project strongly suggest that agricultural productivity can be enhanced if the validated technologies are extensively adopted in the Barind area.

Based on the success of the CGP project, an up-scaling program was implemented during January-September 2014 for expanding wheat/potato-mungbean- T. aman cropping system in the High Barind tract of Rajshahi, Chapainowabgonj and Noagaon districts.

One thousand farmers were involved covering 1000 bighas of land in three Upazilas (Godagari of Rajshahi, Nachole of Chapainowabgonj and Shapahar of Noagaon district). Selected farmers were trained on different drought management activities. Short duration mungbean vty. (BARI mung 6) and T. aman rice (BRRI dhan 57) were selected for timely planting of rabi crops. Mungbean was sown from 20 March to 05 April and harvested between 25 May to 15 June 2014. The average yield of mungbean was 3.14 t/ha. with BCR of 3.47. Short duration aman (BRRI dhan 57) was transplanted between 10 to 30 July 2014 and harvested between 10 to 20 October 2014. The average yield was about 4.0 t/ha.

With the introduction of a new crop (mungbean) the cropping intensity of the area has been increased from 180-230%. Cultivation of BRRI dhan 57 created scope in timely establishment of rabi crops with residual soil moisture. As a result of project intervention, family income and livelihood of farmers of this area will be increased, considerably.

6. Project Code with Title: P-02: Management and Control of Mite in Coconut Through farmers' capacity enhancement.

Principal Investigator: Dr. Md. Nazirul Islam, Principal Scientific Officer, Horticulture Regional Research Centre, BARI, Gazipur-1701.

Coconut is an important cash crop of Bangladesh but its production has been found declining rapidly causing serious loss to the coconut palm/orchard owners. Widespread attack of mite has been identified as the major cause of such yield decline. The pest attacks on coconut fruits at the early stage resulting in deformed, small fruits. Mite, being a very small insect, remains unnoticed and effective control measures against this enemy was not known to the farmers. A group of BARI scientists working with the support of a CGP project funded by KGF, identified the mechanism of mite control and determined the extent of coconut damage due to mite attack. They also standardized an effective management option for controlling mite infestation in coconut. Application of management treatment successfully controlled mite that helped increasing coconut productivity in the project areas.

Based on the results of the previous project, this Pilot project has been designed to take forward the success of the CGP project to major coconut growing districts- Khulna, Bagerhat, Gopalganj, Jhalakathi and Pirojpur through farmers training and campaigning. Thirty five upazilas of 5 districts have been covered. A total of 1250 farmers were selected from the project area for imparting training. PI of the project prepared necessary action plan and modules for the training program. Scientists involved in the previous project, experienced experts from BARI and DAE were invited as resource speakers for conducting the training. The daylong training program conducted in the selected districts included lectures along with practical demonstration on formulation of miticides (mite control chemical) and spraying of crown and trunk of coconut palms. Handouts and leaflets in Bengali on mite control techniques were prepared and distributed among the farmers. Leaflets, booklets were distributed to the general farmers for creating awareness. Participating farmers were provided with mite management equipment and miticide, as training materials.

The treated palms of Gopalgong, Bagerhat Sadar, Mollahat and Fakirhat were found to produce nuts without any sign of mite infestation.

7. Project Code with Title: P-03: Increasing production adopting improved production Practices in tidal floodplain.

Principal Investigator: Prof. Dr. Md.Jafar Ullah, Dept. of Agronomy, She-e-Bangla Agricultural University, Dhaka.

In order to increase system productivity, cropping intensity and farmers income, a CGP project (C.2.20) titled "Development of intensive cropping system in two coastal districts for increasing Production" was implemented in two upazilas of Jhalakathi by Agrarian Rresearch Foundation (ARF) in association with Patuakhali Science & Technology University. Through two years (2012 & 2013) project intervention, some viable technologies appropriate to the tidal floodplain ecosystem was developed.

In view of the success of the above project, this pilot project was undertaken to up-scale the technology in 6 upazilas of Jhalakathi and Perojpur districts (Sadar, Rajapur & Nalchiti of Jhalakathi district and Kaokhali, Mothbaria and Bhandaria of Perojpur district) for increasing production of local varieties of aman rice followed by maize in dry season. Improved technology developed and validated in the ecosystem were used for growing local variety of aman rice (sadamota) using moderate dose of fertilizers followed by maize as new crop.

Maize was planted between 20-01-2014 to 31-01-2014. Area covered under maize was 81 bigha involving 128 farmers. Four hybrid varieties were tested. Harvesting of maize ended on 30-05-2014. Average yield was recorded as 5 t/ha.

Local aman (sadamota) was transplanted in 700 bighas involving 700 farmers between Aug-24 to Sep-30. Harvesting of T. aman was completed in January 2015. Recorded yield per hectare was 3.64 tons which is 18% higher than the farmers' practice.

8. Project Code with Title: P-04: Up-scaling improved jhum cultivation introducing intercropping rice with cotton.

Principal Investigator: Dr. Md. Farid Uddin, Executive Director, Cotton Development Board (CDB), Khamarbari, Dhaka.

Most of the farmers in Chittagong Hill Tracts grow crops in hill slopes following traditional jhum system. The system essentially follows slash and burning prior to dibbling seeds of several crops (3-11) into a single hole immediately after first shower of the year. Replacement of jhum was attempted in many ways but system persists widely in the hills. Scientists of CDB implemented a CGP project involving 40 farmers, compared productivity of intercropping of rice and cotton with the traditional multi-crop jhum system. It appears that growing two rows of rice after every row of cotton gives better yield and substantially higher (30%) return than any jhum production system. Traditional local varieties of rice (Cokrow, Shere, Galoon, Manthon) performed better in terms of yield, quality and farmers' preference compared with HYVs.

Based on the success of the earlier project, this Pilot project seeking up-scale rice-cotton intercropping to replace traditional jhum practices was undertaken. Seven upazilas from three hill districts (Rangamati Sadar of Rangamati district, Khagrachari Sadar, Matiranga of Khagrachari district and Bandarban Sadar, Rowangchari, Thanchi and Ruma upzilas of Bandarban district) were selected for project intervention. The technology was demonstrated in 700 plots (one bigha each) involving 700 jhum farmers. Farmers training and input distribution was confirmed well ahed of sowing time. Pick sowing was done in June-July and continued up to August due to late on set of monsoon in the hill

districts. Condition of both the crops was good in most of the plots though the hills experienced drought at the beginning of sowing season. Rice was harvested in September/October 2014. Average rice yield was 2.13 t/ha, which is much encouraging in hill ecosystem. Harvesting of Cotton was completed in January 2015. Average yield of cotton was about 900 kg/ha as compared to 250-300 kg/ha of hill cotton planted in indigeous jhum system.

9. Project Code with Title: P-05: Up-scaling Mungbean-Rice pattern in the Charland of Kurigram.

Principal Investigator: Prof. Dr. M. Abdul Karim, Dept. of Agronomy, Bangabandhu Sheikh Mojibur Rahman Agricultural University (BSMRAU), Gazipur-1706

In order to improve the system productivity, cropping intensity and livelihood of the people of the Charlands, a validation program on lentil-mungbean-short duration T. aman rice production technology was undertaken in the Charlands of Kurigram district in 2012 under CGP project. Two chars from two upazilas-Kurigram Sadar and Nageshwari was selected. Sixty farmers, 30 from each site having one bigha land each were involved with the program. Evaluation of two years results of the validation program proved the technology to be most appropiate for the Charlands.

Based on the success of the above project, an up-scaling program for testing the technologies in wider areas 1000 farmers from Kurigram Sadar, Nageshwari and Burungamari was selected. Farmers' training, necessary inputs, irrigation facilities, etc. was provided in time. Mungbean (vty. BARI Mung-6 and BU Mung-4) was sown between March 10 to April 05. Serious drought and high temperature (49-59^0) in April/14 damaged the crop of most of the sites. However, the damage was low in the chars of Burungamari and 30% crop could be harvested. Recorded yield was 0.9 t/ha as against 1.5 t/ha in 2012.

After mungbean, short duration T. aman rice namely BU dhan 1 and BRRI dhan 56 was transplanted in the same land in the last week of July, 2014. But two waves of floods during 15 August to mid September damaged the crop. Rice crop in Burungamari upazila, however, recovered and harvested. Recorded yield was 3.5 t/ha as against 4.5 t/ha in 2013.

Despite damage of mungbean due to severe drought and un-usual flood damaging standing rice field, the farmers got updated knowledge on modern production technologies of two new crops. Plantation of short duration aman rice like BU dhan 1 and BRRI dhan 56 will enable the farmers to cultivate rabi crops in time, after harvesting of rice at the end of October.

10. Pilot Project No. 06: "Integrated crops and fish culture through land conversion into ditch-dyke system"

Principal Investigator: Prof. Dr. M. Mofazzal Hossain, Dept. of Horticulture, BSMRAU, Gazipur-1701.

Medium low land and low land in the tidal flood plain ecosystem is subjected to submergence due to tidal flood in the costal districts rendering the ecosystem unproductive or less productive. In most of the lands local low yielding varieties of aman rice is planted. About 50% land remains fallow during rabi season. In order to increase the system productivity in the area, a CGP project was implemented in three upazilas (Sadar & Rajapur of Jhalakhati district and Gabtali upazila of Bogra district) from 2012 for two years. In the Project 10 participatory farmers converted their land, (33 decimal per farmer) into ditch-dyke system. Vegetables were planted on the dykes and the ditches used for fish

culture. Evaluation of the results revealed that system productivity increased three folds compared with traditional single crop T. aman rice.

To create greater impact, an up scaling program was undertaken at the adjoining areas (Jhalakhati Sadar and Rajapur upazila) of the above project targeting 20 more units involving 30 farmers. After completion of ditch-dyke system, summer vegetables and papaya were planted on the dykes and mono sex tilapia was released in the ditches. A good harvest of vegetable crops was obtained from which Indian spienach, bottle gourd, ash ground and papaya performed better. Average net income of each unit (one bigha) from summar vegetabls (including Papaya) and mono-sex-tilapia was recorded as Tk.41,000 which is 3.58 times higher than the farmers practice in Jhalakhati Sadar upazila. However, this income is 7.3 times higher in case of the farmers of Rajapur upazila.

The ditch-dyke system has been proved as an appropriate technology for unproductive and less productive low lying areas of southern region of Bangladesh. This technology, if extensively disseminated to this area, is expected to help increse cropping intensity, yield potentiality and farmers income by 4-7 times compared to existing single crop production practice.

11. Pilot Project No. 07: Up-scaling and validation of a proven technology on management of the major diseases of Brinjal & Tomato.

Principal Investigator: Dr. Biresh Kumar Goshwami, CSO, Spices Research Centre, BARI, Shibgonj, Bogra.

Brinjal and Tomato are the two most important vegetables of Bangladesh. Farmer of some specific areas of the country like Jamalpur, Sherpur, Jessore and Rajshahi produce huge quantity of these two vegetables every year. But major diseases like Bacterial Witt Foot and root rot, white mould and Root knot in Brinjal and Bacterial witt virus, Late blight, Early blight and Root knot nematode in Tomato are becoming a threat causing yield loss upto 35-40% every year. Sometimes yield loss goes upto 90-95% which affects farmers income and livelihood.

In order to address the problem a CGP Project entitled "Integrated Management of major diseases of Bringal and Tomato in Jamalpur and Sherpur districts (C-8.14)" was implemented during 2011-2013. Both on-station and on-farm trials with improved management practices showed a dramatic result in controlling these major diseases of Brinjal and Tomato, producing higher yield. Two years results demonstrated that the disease incidence was reduced upto 85%. As outcome of the project two packages of disease management practices (one for Brinjal and one for Tomato) was developed. The packages include an integrated approach with seed treatment, seedling raising under net-house, soil treatment, seedling and plant spraying in the field with different chemicals at different times.

Based on the success of the earlier project (C-8.14), this pilot project was undertaken to upscale the technologies in wider areas of Jamalpur and Sherpur districts involving more farmers & local extension personnel and validate the technologies in new areas of Rajshahi and Jessore districts. Under up-scaling program 720 farmers from (area 90 ha) 9 upazilas of Jamalpur & Sherpur districts was covered. Validation program for Brinjal was conducted in Jessore district involving 20 farmer and validation of technologies for tomato was implemented in Rajshahi district with equal number of farmers. Results of the pilot project (PCR) are yet to be received.

KEY LESSONS LEARNED (2010-2014)

Implementation and management of the Competitive Grants Program (CGP) is the main task of the Krishi Gobeshona Foundation (KGF). Fifty one sub-projects in 1st call under CGP started implementation from May, 2009 upon signing of the MOU between KGF and the authorized persons of the implementing organizations. In 2nd call 35 sub-projects have also started implementation from Nov/10 for 3 years. KGF professionals have identified some pertinent and basic weaknesses which was corrected for successful implementation to get desired outputs from CGP Sub-projects. The lessons learned from some key aspects related to CGP implementation are given below:

1. **Priority Setting**: BARC led priority setting exercise in 2008 identified some thematic areas which are too broad and non-focused. As a result, many of the proposals could not be properly prepared to address the real field problems. Again, thematic areas were not properly identified for CGP research and thus some sub-projects are less likely to deliver needed outputs as expected from CGP sub-projects. To our judgement, it is the researchable problems/issues under the thematic areas but not the thematic areas are to be prioritized for focused research agenda. Now priority setting process by BARC in collaboration with KGF were done since November, 2009 under new directions. Immediately after this exercise, KGF professionals selected appropriate priority researchable issues under the thematic areas in line with CGP concept and objectives for invitation of research proposal.

2. **Quality of Research Proposals**: Research proposal writings in the form of Concept Notes or Full Proposals are, in general, weak. Project title, problem statements, specific objectives, planned activities and expected outputs are not clearly stated and not linked to each other. These suggest that skill development of the researchers in proposal as well as report writings through training program is essential.

3. **Review of the Research Proposals**: Some of the research proposals were not critically reviewed although relevant and qualified expert reviewers were engaged for that purpose. Proposed budget was not rationalized with the volume of works. Perhaps those reviewers were not serious and did not give enough time for reviewing the proposals. Again KGF could not do any mentoring in the review process due to lack of professionals at that time. These suggest that concerted efforts were made by KGF professionals for mentoring at different stages of the review process along with orientation of the reviewers.

4. **Sub project number and duration**: According to PAD, more number of small sub-projects (54) with less duration (maximum of 2 years) are less likely to generate sustainable technologies for creation of an impact in the farming community. Less number of relatively bigger project with three (3) years duration involving more location and partners to be considered for CGP funding in future to create a visible impact in the society

5. **Priority Setting**: In 2008, the first BARC-led priority setting exercise was hurriedly done and identified some thematic areas which were too broad and non-focused. As a result, some of the CGP research proposals could not be properly prepared to address the real field problems. Again, some of the thematic areas identified by BARC in 2008, were not appropriate for CGP research concept and thus some sub-projects are less likely to deliver needed outputs as expected from CGP sub-projects. To our judgement, it is the researchable problems/issues under the thematic areas (but not the thematic areas) that were to be prioritized for focused research agenda.

   However, under new directions, the second priority setting process initiated by BARC with active collaboration of KGF started in November, 2009 and completed by December, 2010. Immediately after that exercise, upon guidance of the Board, the KGF professionals selected

appropriate priority researchable issues under the thematic areas in line with CGP concept and objectives for invitation of research proposal in January, 2011. Thus the 2nd call for research proposals under CGP was made based on 2010 research priority finalized by BARC.

6. **Quality of Research Proposals**: Research proposal writing capacities in the form of Concept Notes or Full Proposals are, in general, weak. Project title, problem statements, specific objectives, planned activities and expected outputs are in some cases, not clearly stated and not linked to each other. So skill development of the researchers in research proposal designing as well as report writings through training program/workshops is essential.

7. **Review of the Research Proposals**: It seems that in some cases, the research proposals were not critically reviewed although relevant and qualified expert reviewers were engaged for that purpose. Reviewers were not serious abat active as & budget and did not give much time for reviewing the proposals and their skill improvement was necessary.

8. **CGP sub-projects number, duration and coordination**: Experience suggest that fewer number of relatively bigger coordinated sub-projects with three-years duration involving more locations and partners/organizations need to be considered for CGP funding in future to create more visible impact in the farming community. However, the coordinating and supervisory roles of the lead organization, in most cases, are not adequate for effective implementation of the projects. Under such situation, a contractual full time coordinator for the project period, linked directly with KGF is likely to deliver better output of the larger projects.

9. **Technology Transfer Strategy:** A good number of the project outputs of the completed CGP projects were identified as potential technologies which need to be transferred to the end users (farmers) for adoption and impact creation. But mere generation/validation of a technology, preparation of leaflets on it and handover the leaflets to the extension agencies, commonly being practiced are not enough for technology transfer to the end users. An appropriate strategy would be to undertake a pilot project involving relevant stakeholders to upscale the benefits of newly generated technology and motivate the farmers adopting it. KGF may engage small study team(s) for assessment of the success and constraints of the adoption process for future impact.

10. **Proposal Submission:** Project proposals were invited in two stages (Concept Notes and Full Research Proposal) during the 1st and 2nd calls. Screening of a large number of concept notes, then invitation for full research proposals and their review process require longer period of time to complete the selection of proposals for awarding grants. On the other hand, quality of the proposals design did not improve much. Under such situation, invitation for submission of full research proposals only with rigorous review and mentoring may be an alternative option for improvement. This has been adopted under KGF BKGET funded CGP projects. Capacity improvement of proponent research programs has been undertaken, through conducting training workshops on research proposal preparation and report writing.

11. **Proposal Review Process:** Review and evaluation process of research project proposals, though follow a number of steps, yet the quality of the selected proposals in some cases for awarding grants seems not up to the mark. In order to strengthen the review process further and to ensure the selection of quality proposals, a Technical Advisory Committee (TAC) is important. Accordingly, upon approval of the Board, a 12-members TAC was formed in the review process as a final step of selection of R&D programs.

12. **Rationalization of Audit:**

    Annual audit for NATP used to done by four agencies, viz. FAPAD, PCU appointed Audit Firm, World Bank audit team and KGF appointed audit firm. This caused unnecessary harrasement of the scientists/PIs of CGP research projects through repeated visits by audit

teams at different times of the year. Realizing the situation World Bank mission suggested for rationalization of audit to CGP research locations.

In order to allow the CGP scientists to concentrate on their research activities, it is suggested to rationalize the annual audit visits in the field level by only one agency namely FAPAD. Different audit firms could only investigate and examine auditable accounts in KGF office.

13. **Improvement in NATP fund release and financial management system:** Under the existing financial management system, the PIU are solely responsible for GoB fund release and PA fund authorization by Ministry of Agriculture (MoA) and the Ministry of Finance (MoF). PCU plays no positive coordinating role. As a result, GoB fund release and PA fund authorization and availability of fund took place at different times for the PIUs.The weaker PIUs suffer in getting fund timely. PCU can take a positive role in coordinating the fund release and PA authorization process for all PIUs.