

10th Conference
Bangladesh Society of Agronomy

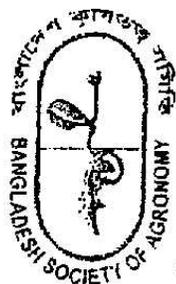
**Crop Production under Unfavorable Ecosystems in
Bangladesh**

- 1) *Crop production in Chalrand ecosystem*
- 2) *Crop production in Coastal ecosystem*
- 3) *Crop production in Hill ecosystem*
- 4) *Drought/water log prone ecosystems*

ABSTRACTS

Date: Sturday, 8 October 2011

Venue: BARI Auditorium
Bangladesh Agriculture Research Institute
Joydebpur, Gazipur



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1. LOW INPUT RICE PRODUCTION

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The demand of water for agriculture, municipal, and industrial purposes will be increased in the future; less water will be available for domestic use. BRIS (>90% of sand) soil is commonly known as problematic soil in Malaysia. To justify less input rice production, rice was grown under low water input and sandy soil condition. We found that saturated and 1 cm flooding condition did not affect rice yield, bioavailability of nutrients and soil pH. But redox potential in soil was retained from +100 to -150 mV which indicates less CH₄ emission from rice field. On the other hand, BRIS soil condition significantly decreased rice yield but composting of BRIS soil increased rice production. Composting also increased chlorophyll content in leaves and soil pH which indicates improvement of soil physical and chemical properties. Our results suggest that rice can be grown under less input but more care should be taken in terms of agronomic practices.

2. IMPACT OF WATER DEFICIT STRESS ON VARIOUS PHYSIOLOGICAL AND AGRONOMIC TRAITS OF THREE RICE (*Oryza sativa* L.) CULTIVARS

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Scarcity of water for irrigation is an alarming issue limiting crop production worldwide and is becoming increasingly severe with the passage of time in Pakistan. Rice production in Pakistan like several other countries of the world is thus, being adversely hampered by the shortage of water. This study was therefore, contemplated to determine the effect of water deficit stress on some physiological and agronomic parameters of three rice cultivars naming Basmati-Super, Shaheen-Basmati and Basmati-385. The field experiment was laid out in split plot design with randomized complete block arrangement, keeping cultivars in main and water stress (40 acre inches irrigation) stages viz; panicle initiation, anthesis and grain filling along with control (normal irrigations of 52 acre inches) in sub-plots. Cultivar Shaheen-Basmati exhibited comparatively more tolerance to water deficit stress at all the three growth stages under study with minimum diminution in maximum quantum yield of PSII (Fv/Fm), less reduction in Photo synthetically active radiation (PAR), photosynthetic rate, stomatal conductance, water use efficiency (WUE), tillers per hill, panicles per hill, panicle dry weight, shoot dry weight, number of total grains per panicle, fertile grains per panicle, 1000-grain weight and paddy yield. Similarly, less increase in transpiration rate and sterile tillers per hill were observed in

Shaheen-Basmati under water deficit stress at all the three stages. Amongst the growth stages, panicle initiation was the most sensitive one exhibiting the more adverse effects on all the physiological and agronomic parameters under study. Photo synthetically active radiation, photosynthetic rate and stomatal conductance showed strong and positive correlation with WUE whereas; transpiration rate expressed negative correlation with WUE. Similarly, all the physiological and yield components under study except transpiration rate and number of sterile grains per panicle had a strong and positive correlation with paddy yield.

Key Words: *Oryza sativa*, Water deficit, PAR, Photosynthetic rate, Transpiration rate, Stomatal conductance, Water use efficiency, Panicle, Anthesis, Grain filling, Hill, Physiological traits, Agronomic parameters, Yield components, Pakistan

3. EFFECT OF FOLIAR ABSCISIC ACID APPLICATION ON COLD TOLERANCE IN CHICK PEA (*Cicer arietinum*)

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A series of field experiments were undertaken at three locations in Khyber PukhtunKhw Province, Pakistan to assess the effects of low temperatures and phytohormone applications on chickpea (*Cicer arietinum* L.) growth and yield. These trials showed that ABA application (10⁻⁴ M) to 40 day old plants (before the first seasonal frost) offset low temperature-induced growth and yield depression at harvest (200 day old plants) by up to 17%. These yield improvements were mainly due to an increase in the number of seeds pod⁻¹.

Growth room experiments were conducted at the University of Glasgow, UK. Growth room experiments were carried out under controlled environmental conditions to establish how foliar application of 10⁻⁴ M ABA to 40 day old plants might improve seed production at harvest. The foliar application of 10⁻⁴ M ABA had no detectable effect on endogenous shoot or root ABA levels four-days after spraying or on biomass when plants were maintained in warm conditions. When exposed to night temperatures of -2°C, however, the endogenous ABA levels increased dramatically in both control and ABA-treated plants, but this rise was more rapid after ABA application (p<0.01); after 14 days, these plants had gained significantly more biomass than the unsprayed controls (p<0.5). No evidence was found to suggest ABA affected the osmotic or water balance of plants, but parallel experiments have shown ABA reduced low temperature-induced cell damage.

Analysis of the proteome of the shoot tissues of ABA treated and untreated plants by 2-Dimensional Gel Electrophoresis identified several proteins that are induced by low

temperatures and / or by ABA application in chickpea and which may be involved in conferring cold tolerance. Attempts were made to establish the identity of these proteins using mass spectrometry but in all cases the results were ambiguous; a more complete protein data base for legumes is required before the function of these proteins can be inferred.

Key Words: Chickpea; *Cicer arietinum*; ABA; cold tolerance.

4. DEVELOPMENT OF COASTAL AGRICULTURE IN BANGLADESH

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The coastal area is mainly used for agriculture. The gross area of the coastal zone is 4.72 million ha of which the net cultivable area is 1.95 million ha. The paper shows the development constraints and possibilities of coastal agriculture. This study reveals that 96 upazilas are intensively (50-60%) used for agriculture. Present per capita agricultural land of 0.056 ha will be decreased to 0.025 ha by 2050. In coastal districts Aman is the dominant crop, covering about 70% of the total rice cropped area, Aus covers 16% and Boro 14%. About 60% of the paddy cropped area is planted with local varieties, adapted to poor water management. Coastal area produces a relatively high portion of the pulses, oil seeds, betel nuts and leaves, winter vegetables and potatoes. On the other hand, the share of the coastal zone production of cereals (including paddy), sugarcane and jute is relatively low. Irrigation coverage is low (<25%) in the districts of Bagerhat, Barguna, Jhalakathi, Patuakhali and Pirojpur. Water and soil salinity are the major problem restricting crop cultivation in the coastal zone. The high land area is well drained but drainage in medium and the low-lying areas is congested because of silting of old river channels, khals and unplanned construction of village roads. Rainfall variability and drought especially restrict Aus and Aman cultivation in almost every year. In the low-lying areas flood is a major problem causes damage to crops. Potential exists for cultivating salt-tolerant modern varieties, expanded coconut cultivation, floating or soil-less agriculture and bio-saline agriculture. 'Coastal agriculture' needs a distinctive recognition to facilitate its development.

5. PHYSIO-MORPHOLOGICAL PARAMETERS OF WHEAT GENOTYPES INFLUENCED BY WATER STRESS

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A pot experiment was carried out for morpho-physiological studies of wheat genotypes selected from the performance of previous year trial. The study was conducted at BARI, Joydebpur, Gazipur during 2005-06. A total of 7 genotypes were grown with different soil moisture regimes viz. 50% field capacity, 75% field capacity and 100% field capacity. Variation among the genotypes in respect of plant height, tillers plant⁻¹, leaf area, TDM plant⁻¹, harvest index, root characters, RWC, CGR, RGR, NAR and yield was significant. Soil moisture stress caused

significant reduction in above mentioned parameters. The extent of reduction of different plant parameters increased with the increase of drought severity and the highest reduction was found at 50% FC. Genotypes V42 and V16 appeared to be drought tolerant indicating the least reduction of morpho-physiological parameters and grain yield under water stress condition. Drought tolerant genotypes showed higher CGR and RGR and TDM compared to susceptible genotypes which contributed higher TDM plant⁻¹ under water stress condition. The drought susceptible genotypes, V29 and V47, had the highest reduction in grain yield and TDM. Genotype V56 also performed better under moderate and severe stress conditions with comparatively less reduction in grain yield, TDM and other parameters.

6. EFFECT OF IRRIGATION SCHEDULING ON THE YIELD AND YIELD COMPONENTS OF TWO WHEAT (*Triticum aestivum* L.) VARIETIES

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An experiment was conducted to investigate the effect of irrigation scheduling on yield and yield components of two wheat cultivars were carried out at the Agronomic Research Area, University of Agriculture, Faisalabad, (31o.25N, 73o.09E) during the year 2006-07. Two cultivars (Inqlab-91, AS-2002) and five irrigation scheduled (Irrigation at crown root stage + booting, Irrigation at crown root stage + anthesis, Irrigation at crown root stage + grain development, Irrigation at crown root stage + booting + anthesis + grain development, Full irrigation. Maximum plant height was recorded in AS-2002 (91.00 cm) which was more than Inqlab-91 (76.33 cm). Maximum numbers of grain spike⁻¹ (47.86) were produced by AS-2002 followed by Inqlab-91 (45.53). AS-2002 had highest grain yield (5323.80 kg ha⁻¹ and Inqlab-91 had lowest grain yield (5003.80 kg ha⁻¹). I5 (1. crown root stage 2. tillering stage 3. booting stage 4, earing stage 5. milking stage 6. dough stage) and I4 produced more grain yield (6159.16 kg ha⁻¹, 5923.33 kg ha⁻¹) than all other irrigation treatments. Genotypes AS-2002 had highest TDM (14254 kg ha⁻¹) than Inqlab-91 (13428 kg ha⁻¹). I5 had the highest TDM (15801 kg ha⁻¹) while I1 (Irrigation at Crown root stage + booting) had the lowest TDM (9284 kg ha⁻¹). More harvest index (38.97 %) was calculated at I5 (1. crown root stage 2. tillering stage 3. booting stage 4, earing stage 5. milking stage 6. dough stage) and lowest (32.97 %) at I1 (Irrigation Crown root stage + booting).

Key Words: Yield, Yield components, Irrigation Scheduling and wheat

7. EFFICACY AND ECONOMICS OF INTEGRATED WEED MANAGEMENT PRACTICES IN AUTUMN PLANTED MAIZE (*Zea mays* L.)

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Weeds are known to cause enormous losses due to their interference with the crops. Field experiment was conducted at Agronomic Research Area, University of Agriculture, Faisalabad during growing season of 2009 to evaluate integrated weed management for autumn planted maize. Randomized complete block design (RCBD), having three replications was used in the experiment. All weed management strategies under study reduced weed growth and increased yield and yield components of maize to a varying degree. Maximum grain yields of 4.90, 4.83, 4.76 and 4.73 t ha⁻¹ were obtained in plots treated with manual hoeing + metolachlor @1110 g a.i.ha⁻¹ + atrazine @ 740 g a.i.ha⁻¹, two manual hoeings, earthing up + metolachlor @1110 g a.i.ha⁻¹ + atrazine @ 740 g a.i.ha⁻¹ and manual hoeing + earthing up, respectively. These treatments were statistically at par with each other. Maximum net benefit of Rs. 14028 was obtained from the crop plots which were treated with manual hoeing + earthing up.

8. ADAPTATION OF CHINESE CMS LINES INTERACTION WITH SEEDLING AGE AND ROW RATIO ON HYBRID SEED PRODUCTION OF RICE (*Oryza sativa* L.)

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Regarding the hybrid seed production potentiality of rice in Bangladesh, three migrant CMS lines were introduced from China and the field experiments were conducted during Rabi 2006/07 at Bangabandhu Sheikh Muzibur Rahaman Agricultural University-Gazipur. Hybrid seed production potentiality depends on productivity of CMS lines and the corresponding Restorer (R-lines) for this reason three CMS lines were tested for genotypic adaptation. Among the three introduced CMS lines, CMS 2 showed more suitable in hybrid seed production of rice. Seedling age of 43 days old is better performer than the seedlings of 25 and 34 days. Among the row ratios of CMS and R line, there should be maintained 12:2 for obtaining maximum hybrid seed production. Considering two factors, of CMS 1 and CMS 2 interaction with 43 days old seedlings, CMS 1 and CMS 2 interaction with row ratio 12:2 exhibited the best combinations. Finally, considering three factors, 43 days old seedlings of CMS 1 with the row ratio 12:2 (4.20 t ha⁻¹) and 43 days old seedlings at CMS 2 with the row ratio 12:2 (4.21 t ha⁻¹), was the best adapted combination for maximizing the hybrid seed production. The significant genotype (CMS lines) environment interaction (seedling age and row ratios) values indicated the wider genotypic adaptation as well as environmental adaptation among the genotypes (CMS lines). So, the specific genotypic and phenotypic adaptation is signified that there is a wide possibility of better hybrid seed production in Bangladesh environment.

9. INTEGRATED FERTILIZER MANAGEMENT FOR WHEAT- JUTE-T. AMAN CROPPING PATTERN

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A field experiment was conducted in medium highland of FSRD site Palima, Tangail (AEZ-8) during 2002-2004 to find out the optimum and economic fertilizer dose for the cropping pattern viz. Wheat–Jute–T. Aman rice. Six nutrient management packages including farmers' practice and one fertilizer control were tested such as; T1 = Estimated mineral fertilizer dose for moderate yield goal (ED1), T2 = Estimated mineral fertilizer dose for high yield goal (ED2), T3 = Integrated nutrient management (IPNS), T4 = Recommended fertilizer based on FRG'97(RF), T5= Farmers' Practice (FP) and T6 =Absolute control. Two years average results showed that higher yield from Wheat, Jute and T. aman as well as gross margin was recorded from IPNS (T3) and T2 for HYG treatment. But marginal benefit cost ratio (MBCR) over control was higher in AEZ based fertilizer recommendation (FRG'97). In IPNS treatment due to cost of organic manure MBCR was less compare with T4 and T5 treatment. Recommended fertilizer based on FRG'97 (T4) was most economic dose for Wheat–Jute–T. Aman rice cropping pattern in AEZ-8.

Key words: Cropping pattern, IPNS, fertilizer management

10. DIRECT SEEDED COARSE RICE (*Oryza sativa* L) AS AFFECTED BY DIFFERENT SOWING DATES

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A Field experiment was conducted to evaluate the effect of different sowing dates on yield and yield components of the direct sown coarse rice during the Kharif season of 2010, at Agronomic Research Area, University of Agriculture, Faisalabad. Experiment comprised of six sowing dates i.e. 31st May, 10th June, 20th June, 30th June, 10th July and 20th July. Data on agronomic parameters and economics of coarse rice were recorded. Results revealed that direct seeded rice sown on 20th June proved to be the best for obtaining maximum grain yield and net return. 20th June sowing also gave maximum number of productive (panicle bearing) tillers, number of kernels per panicle, 1000-grain weight and benefit-cost ratio.

11. PERFORMANCE OF CABBAGE ON IPNS WITH COWDUNG BIO-SLURRY IN SURMA KUSHIARA FLOOD PLAIN

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The experiment was carried out in medium highland at South Surma, Sylhet during rabi season of 2010-2011. The aims of this study were to study the effect of bio-slurry on the performance of Cabbage grown in AEZ-20 and to observe the comparative performance of integrated use of bio-slurry along with inorganic fertilizer. The experiment was laid out in a randomized complete block design replicated thrice with four treatments viz. T1: Soil test basis inorganic fertilizer dose for high yield goal (HYG), T2: Cowdung @ 5 t ha⁻¹ + Integrated Plant Nutrient

System (ipns) basis inorganic fertilizer for HYG, T3: Cowdung bio-slurry @ 5 t ha⁻¹ + IPNS basis inorganic fertilizer dose for HYG and T4: Farmers practice (average of 20 farmers). Results showed that individual head weight, head diameter and head yield of Cabbage significantly influenced by the treatments. The highest head yield (73.50 t ha⁻¹) was obtained in Cowdung bio-slurry @ 5 t ha⁻¹ + IPNS basis inorganic fertilizer dose (T3) followed by T1 (58.74 t ha⁻¹), where in farmers practice (T4) produced lower yield (54.77 t ha⁻¹). Economics analyses revealed that the gross (Tk. 2, 57,250) and net return (Tk.1, 94,628) were higher in T3. The BCR was also higher (4.10) under the same treatment.

Key words: Cabbage, CD bio-slurry, IPNS, head yield, BCR

12. IRRIGATION WATER SAVING, YIELD PERFORMANCE AND COST-EFFECTIVENESS OF DIFFERENT RICE CULTIVATION SYSTEMS IN BORO SEASON

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Water scarcity during boro season poses threat to the sustainability of rice production using conventional transplanting system. The present study was undertaken with a view to evaluating the water saving potential and yield performance of different rice production systems. The experiment included two rice varieties viz. BRRI dhan29 (Long duration variety, 155-160 days) and BRRI dhan45 (Short duration variety, 134-140 days) and five systems of cultivation viz. puddled transplanted rice with conventional irrigation (PTR-CI), puddled transplanted rice with alternate wetting and drying irrigation (PTR-AWD), system of rice intensification (SRI), wet direct seeding (W-DSR) and dry direct seeding (D-DSR) in a split plot design with three replicates. The result revealed that dry direct seeding saves the highest amount of irrigation water (>60%) followed by AWD which saves only 20% compared with conventional transplanted rice. Dry direct seeding gave higher yield than AWD and conventional transplanted rice. Economic analysis revealed that dry direct seeding required least input cost but gave the highest economic benefit among different rice cultivation systems for both rice varieties BRRI dhan29 and BRRI dhan45. Thus, dry direct seeding could be practiced as the highly productive and cost-effective irrigation water saving rice cultivation system in boro season.

Key words: Transplanting, variety, yield, economics, yield components

13. IMPROVING PRODUCTIVITY AND SUSTAINABILITY IN DROUGHT PRONE AREA THROUGH RESOURCE CONSERVING TECHNOLOGIES: SAVE WATER AND REDUCE GLOBAL WARMING

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A 3 years study was conducted at the Regional Wheat Research Centre, Rajshahi as drought prone ecosystem to compare the effects of four tillage/straw treatments (30% straw retention (SR)+permanent raised bed (PRB), 30% SR +conventional tillage (CT), 0% SR + PRB and 0% SR + CT) and five N levels (0, 40, 80, 100 and 120% of recommended) in a intensified RW systems by adding a third pre-rice crop of mungbean. Permanent beds with straw retention produced the highest productivity for all three crops in the sequence. Within each N rate total system productivity was higher with 30% SR on PRB and least in CT with zero straw retention. At 100% of recommended fertilizer N rate, mean system productivity was 12.5 **t ha⁻¹** for PRB with 30% SR and 10.3 **t ha⁻¹** with CT without straw. The results suggest that N fertilizer rates can be reduced when straw is retained. Water use efficiencies improved 25, 27 and 29% in wheat, rice, and mungbean crops, respectively in 30% SR with PRB system. Resource conserving technology required 119 litre/ha/year fuels compared to conventional method 213 litre/ha/year. PRB systems saved 94 litre/ha/year of costly diesel fuel and produced 44% less emission of CO₂ into the atmosphere.

Keywords: Productivity, Sustainability, Drought, RCTs and N uptake and efficiency

14. MINIMUM TILLAGE IN UNPUDDLED TRANSPLANTING OF AMAN RICE IN DROUGHT PRONE NORTH WEST BANGLADESH

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The experiment was conducted at Bangladesh Rice Research Institute, Rajshahi during June to November 2009 in order to investigate the minimum tillage effects on crop growth, yield, physical properties of soil, task time, fuel consumption, labor and water productivity. Rice variety BR11 was transplanted in puddled-conventional tillage (CT) and Bed planting (BP1); unpuddled-bed planting (BP2) and strip tillage (ST) in drought-prone northwest Bangladesh to assess establishment methods. Time required for transplanting was almost double in unpuddled condition relative to puddled. Weeding cost was higher in unpuddled field compared to puddled field. Bed planting and strip tillage under unpuddled condition saved fuel and water usage by 31-76 % and 25-26 % compared to conventional tillage, respectively. Unpuddled transplanting could not provide yield advantage over puddled transplanting. Bulk density, porosity and soil compactness were not changed significantly with tillage treatments. Bulk density was under 1.47 g cm⁻³ while porosity was over 50 % in 7.5-15 cm depth for all treatments. Significantly higher benefit cost ratio was observed in treatments BP1 (1.83) and CT (1.81) followed by BP2 (1.60) and ST (1.55). Rice grown in unpuddled condition could be an emerging technology required herbicide application for weed control.

Key words: Strip tillage, bed planting, yield, harvest index, water productivity, benefit cost ratio.

15. AN OVERVIEW ON SHIFTING CULTIVATION WITH REFERENCE TO BANGLADESH

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Shifting cultivation is a form of land use among resource poor communities with a rotation of cultivation and fallow in the same unit of land. Millions of indigenous people are dependent on shifting cultivation practice, with majority households for subsistence living. This practice is in transition these days with rising population of shifting cultivators and demand for more food. Bangladesh like other neighboring countries has hills which are subjected to degradation due to deforestation enhanced by shifting cultivation. There has been a continuous debate on shifting cultivation. Soil erosion is in large extent in Chittagong Hill Tracts due to faulty cultivation in hill slopes, shifting cultivation, change in land use and reduction of land cover. This paper provides a review on shifting cultivation practice in the world with reference to Bangladesh, with an insight on emerging land use transition, its impacts and future priorities.

Key words: Shifting cultivation, biodiversity, fallow, climate change, Bangladesh

16. FOLIAR SPRAY OF SODIUM ANTAGONISTIC ESSENTIAL MINERALS ON SOYBEAN- A TECHNIQUE TO ENHANCE SALT TOLERANCE

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Experiments were carried out at the environmental stress research site of Patuakhali Science and Technology University, Dumki, Patuakhali during November, 2010 to March 2011 to investigate the effect of foliar spray of KCl (500 ppm) and NH_4NO_3 (500 ppm) alone or in mixture on salinity tolerance of soybean (*Glycine max*) cv. Shohag. The crop was grown in pots inside a vinylhouse and exposed to 50 and 100 mM NaCl salinity and tap water as a control. The salt solutions were applied both at vegetative and reproductive stages. The plants were harvested at 30 days after sowing and segmented to different plant-parts to determine the treatments' effects at vegetative growth stage. Whereas, at maturity the plants were harvested to compare the treatments' effects on different growth parameters including yield and yield contributing characters. All the plant's characters were affected by the salinity and the affect was greater at high concentration. However, foliar spray of KCl and NH_4NO_3 lessened the salinity effect on plants. Moreover, the mitigation effect of KCl and NH_4NO_3 was much higher when the two compounds were sprayed in combination than that applied individually. Comparative performance of various vegetative and reproductive growth parameters under non-saline and saline conditions remained same, such as: no spray < water spray < KCl < NH_4NO_3 < KCl + NH_4NO_3 . It was concluded that foliar spray of KCl (500 ppm) and NH_4NO_3

(500 ppm) may mitigate the salinity effect of soybean both at vegetative and reproductive growth stages.

17. MECHANISMS OF SALINITY TOLERANCE IN SOYBEAN

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The growth inhibition of plants by salinity is caused primarily due to osmotic effect and/ or ionic imbalance, acting on biophysical and/ or metabolic components of cell expansion. Salt tolerance is the ability of a plant to grow and complete its life cycle in saline substrates that contain high concentration of salts. The mechanisms of salt tolerance are complex and mostly depend on anatomical, biochemical and physiological changes occur due to the stress at the whole plant level rather than in a single cell. Tolerant genotypes very often maintain better water relations for osmotic adjustment, lower amount of toxic ion Na⁺, higher photosynthetic activity, and higher cell membrane integrity than the susceptible one. To elucidate the salt tolerance mechanisms in soybean, a susceptible genotype Shohag and a tolerant genotype AGS 313 were grown in saline and non-saline conditions. The magnitude of changes in synthesis of osmotica, water status, photosynthesis ability, cell membrane stability (CMS) and chlorophyll content in leaf were analyzed. It was concluded that the high salt tolerance of AGS 313 was associated with better water relations, salt dilution by succulence, better osmotic adjustment by accumulating more proline, less chlorophylls degradation, higher photosynthetic efficiency and higher cell membrane stability than those of Shohag.

Key words: Salt tolerance mechanisms, biochemical and physiological changes, soybean.

18. ENHANCING THE PRODUCTIVITY OF FLOOD PRONE AREA THROUGH ADOPTION OF LATE T. A MAN -BASED TECHNOLOGY ADOPTION

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Delayed transplanting of Aman rice in flood prone area under medium highland phase-2 and medium lowland due to late recession of flood or rain water resulted low system productivity. The present study was aimed to intensify and or increase the system productivity of the single Boro and Boro-Fallow-late planted T. Aman cropping patterns through the adoption of newly released late planted T. Aman variety, BRRI dhan46 with associate agronomic management practices in 60 farmers' fields in nine blocks under three Upazilas of Gazipur and Mymensingh districts during 2009-2011. Results revealed that 60 to 100 % participating farmers could grow BRRI dhan46 after Boro rice in the periphery of MLL which had potentially increased the cropping intensity which substantially increased the system productivity from 52 to 56%. The replacement of local T. Aman varieties by BRRI Dhan46 in Boro-Fallow-late planted T. Aman cropping patterns increased the grain yield by 25%. A total of 282 farmers of own or neighbouring villages adopted the technology collecting seeds from participating farmers.

Moreover, encouraging the participating farmers to distribute 2 kg seeds to new interested farmers by the extension personnel (SAAOs) in presence of local elites increased the adoption of the technology.

19. EFFECTS OF SOWING DATES AND SEED RATES ON DUAL PURPOSE WHEAT

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A field experiment was carried out in randomized complete block design with split plot arrangement having three replications. Sowing dates (20th October, 5th November, 20th November and 5th December) were kept in the main plots, whereas the combination of cutting (cut and no cut) and seed rates (100, 150 and 200 kg ha⁻¹) were allotted to sub plots. The results indicated that fresh and dry fodder yields, spikes m⁻², grains spike⁻¹, thousand grain weight, grain yield and biological yield were higher at sowing on 5th November but significantly decreased with delay in sowing beyond 5th November. Fresh and dry fodder yields, spikes m⁻², grains spike⁻¹, thousand grain weight, grain yield and biological yield increased with increase in seed rate from 100 to 150 kg ha⁻¹ but decreased with further increase in seed rate to 200 kg ha⁻¹. Cutting had a depressive effect on yield and yield components of wheat and spikes m⁻², grains spike⁻¹, thousand grain weight, grain yield and biological yield were higher in no-cut plots as compared to cut plots. The relative increase in income (RII) indicated that cut plots resulted in 13% higher RII as compared to no-cut plots.

Key words: Dual purpose wheat, sowing dates, seed rates and economic analysis

20. EFFECT OF SEEDLING AGE AND NUMBER ON TRANSPLANTED SEEDLING MORTALITY AND YIELD COMPONENTS IN RICE IN THE COASTAL SALINE ENVIRONMENT

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Unfavorable coastal saline environment enhances transplanting shock of rice seedlings which generally increase the seedling mortality. Considering this observation, experiments were conducted to find the seedling mortality in saline environment and how this could be minimized. A preliminary trial during boro, 2006 was done in the replicated plots with the transplanting of 30-, 40- and 50-d-old seedlings at one seedling per hill in the saline infected fields. In boro, 2007, forty and sixty days old seedlings were transplanted with 2, 4 and 6 seedlings hill⁻¹ in the same field. Field water salinity at transplanting ranged from 5-7 dS/m in the field plots. Dead hills were counted at 15 days after transplanting. Yield components and plot yield were recorded at maturity. Both susceptible (BR28) and resistant (BR47) varieties were used in both the experiments. Preliminary trial revealed that survival seedling increased with the increase of seedling age and 30-d-old seedlings produced the highest significant

mortality. In the second trial, irrespective of the seedling ages, dead hill (%) decreased with the increase in seedling number per hill in both the varieties. Irrespective of the varieties, increase in the number of seedling decreased the seedling survival per hill in 40 d seedlings but such effect was not observed in 60 d seedlings. Hill mortality (%) per plot was lower and seedling survival per hill was higher in BR47 than BR28. These results suggested that comparatively aged seedling might have better influence on seedling mortality in saline environment. And transplanting using 60 d seedlings could be done with maximum 4 seedlings per hill. The panicle number per hill and grain per panicle did not varied much among the treatments. However, the percentage of unfilled grain was higher in 40 d seedling compare to 60 d seedling. As a result yield was higher in the 60 d seedling in both the varieties. Therefore production of good quality seedling with comparatively older age might be effective for seedling survival against transplanting shock in saline ecosystem.

21. EFFECT OF Zn ON THE SEEDLING SURVIVAL IN DIFFERENT SALINITY LEVEL

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The experiment was conducted during Aman, 2007 to investigate the seedling criterion against transplanting shock in the saline environment with Zn treatment. Three salinity level eg., >1.00 dS/m, 6.4-7.7 ds/m and 8.27-9.78 dS/m was considered as low, medium and high respectively. For each salinity level two trays were transplanted with 30 and 55 days (d) old seedling of BRRI dhan41 alternatively among rows with three replications each. One tray in each salinity level was transplanted with Zn treated seedlings dipped in 0.2% ZnSO₄ solution for 30 minutes and other without Zn treated seedlings (control). Trays were filled up with the soil collected from the saline shrimp gher land prior to transplanting and no fertilizers applied in the trays. Data was taken on the number of leaf exist, the number of leaf fired and the number of new leaf emerged at 7 days after transplanting. In the younger seedling (30 d), the rate of leaf fired was lower in the Zn treated seedlings compared to the untreated ones irrespective of the salinity level except for low salinity. Similar results were also observed in the older seedlings (55 d). Irrespective of seedling age, the leaf emergence rate in the seedlings varied significantly among the salinity level. Leaf emergent rate was highly significantly lower in the high salinity level. The difference in leaf emergence between Zn treated and untreated ones was observed in medium and low salinity level. Probably Zn treatment was effective to a certain level of salinity and thus the difference in leaf emergence rate was not observed between treated and untreated seedlings in high saline environment. In conclusion, Zn treated seedlings might have positive effect on leaf survival which tends the higher seedling survival rate. Moreover, new leaf emergence was found greater in the medium salinity level indicates the increasing seedling vigor in the Zn treated seedlings.

22. PERFORMANCE OF CHEWING SUGARCANE IN HOMESTEAD UNDER FARMERS FIELD IN SOUTHERN REGION

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Sugarcane crop is currently facing severe crisis in the country. However, one third of the total production is used as chewing purpose. Sugar cane was originally grown for the sole purpose of chewing in southeastern Asia and the Pacific. Cane juice gives energy directly and it has medicinal value for treating jaundice affecting people. The experiment was conducted with three chewing clones namely Amrita, Rangbilash and Bonpara gandary at farmer's field of Kaligonj, Satkhira and Sarankhola, Bagherhat, Bangladesh during cropping season 2009-2010 to find out the suitable clones for chewing purpose in southern region. The experiment was setup in a RCB design with five replications where each farmer treated as a replication. Both the location has significant effect on yield contributing characters like tillering, number of millable stalk, yield of cane and brix percentage. In farmers field at Kaligonj, Satkhira the highest cane yield was obtained from Amrita (132.65 t ha^{-1}) followed by Rangbilash (105.34 t ha^{-1}) where the lowest was found in Bonpara gandary (78.92 t ha^{-1}). On the contrary, farmers field at Sarankhola, Bagherhat highest yield was obtained from Amrita (116.44 t ha^{-1}) and the lowest on with Isd 24 (73.53 t ha^{-1}). In case of brix percentage the highest was obtained from Rangbilash which 21.25% and 20.85% in both Kaligonj and Sarankhola locations. In the context of benefit cost ratio (BCR) Amrita and Rangbilash gave the highest values of 2.55 and 3.35 respectively in Kaligonj, Satkhira where 2.17 and 2.95 in farmer's field at Sarankhola, Bagherhat.

Key words: Chewing cane, southern region, homestead

23. EFFECTS OF DIFFERENT PLANTING MATERIALS PLACED IN PIT AND TRENCH ON SUGARCANE YIELD

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A new method of sugarcane cultivation, called pit method or ring pit method, which is cost-effective and at the same time helps farmers to get a higher yield is slowly catching on. Pit method, recommended for commercial cane cultivation in India to ensure higher yield. It can be increased to two or three times compared to the normal row-to-row planting technique but this method is not in practise in Bangladesh condition. The planting method is very important to obtain optimum mother plants. So a trial has been under taken to find out the yield performance of different planting materials of sugarcane in this method at BSRI Farm in 2008-2009 cropping season. The salient result of the experiment was that there were significant difference in germination, tiller, millable cane and cane yield but no significant effect was found in pol % cane in this experiment. In case of germination, the highest germination 59.67 % was found in treatment (3 budded setts end to end in trench) followed by treatment (3 budded 20 setts in trench in same area) while the lowest 39.73 % was in treatment (1 budded 60 setts in each pit). The highest tiller $220.60 \times 10^3 \text{ ha}^{-1}$ was found in (1 budded 60 setts in trench in same area) treatment followed by (2 budded 30 setts in trench in same area) treatment while the lowest was in (3 budded setts end to end in trench) treatment. The maximum millable cane $160.90 \times 10^3 \text{ ha}^{-1}$ was obtained from (1 budded 60 setts in trench in same area) treatment while the lowest was in (3 budded setts end to end in trench) treatment. In case of cane yield, the highest 156.60 t ha^{-1} was observed in (1 budded 60 setts in each pit treatment) where the lowest was in (3 budded setts end to end in trench) treatment. There was no significant difference among the

treatment in pol % cane. The overall result suggested that the ring pit method 1 budded 60 setts in each pit might be used for sugarcane cultivation.

Key words: Planting materials, sugarcane, pit and trench

24. A STUDY ON ONION SEED PRODUCTION IN PAIRED ROW SUGARCANE

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The experiment was conducted at the Bangladesh Sugarcane Research Institute (BSRI) farm, Ishurdi, Pabna under irrigated condition during 2007-2008 cropping season to study onion seed production as first and dhaincha as second intercrop in paired row transplanted sugarcane. There were six different treatments viz. Paired row cane (PRC) only, PRC + potato-dhaincha, PRC + 3 lines onion seed-dhaincha, PRC + 4 lines onion seed-dhaincha, PRC + 5 lines onion seed-dhaincha and PRC + 6 lines onion seed-dhaincha. No significant effect of intercropping on tiller, millable cane, cane yield and pol % cane was found in the experiment. It was observed that total adjusted cane yield of sugarcane and intercropping practices were higher compared to sole sugarcane cultivation. Maximum benefit-cost ratio of 4.37 was found from PRC + 6 lines onion seed-dhaincha combination. Growing dhaincha as second intercrop with PRC earned an additional income and helped to improve soil health by fixing atmospheric nitrogen and adding organic matter in the soil. Therefore, onion seed intercropping as first and dhaincha as the second intercrop grown in paired row transplanted sugarcane seems to be profitable intercropping combination for sugarcane farming and may be recommended for large scale adoption in farmer's field for quality onion seed production.

Key words: Intercropping, transplanted sugarcane, onion seed, dhainch

25. DEVELOPMENTAL PERSPECTIVE OF ORGANIC AGRICULTURE AND IPM: A REVIEW OF BANGLADESH

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Organic agriculture and Integrated Pest Management (IPM) are widely perceived as being more environmentally friendly than conventional agriculture and plant protection practices. Insect Management using organic methods are a lot like IPM, with an emphasis on cultural practices and without the option of using synthetic insecticides. Newer botanicals such as azadiractin (neem extract), biologicals such as Bt (a bacterial toxin) and other materials including insecticidal soap, kaolin (clay) and a variety of plant-based repellents such as garlic and hot pepper sprays are available. In Bangladesh, organic agriculture research is at the very primitive stage. Infrastructure and marketing behaviour of these inputs are not so well organized. On the

other hand, research on IPM is widely practicing and also some new avenues especially biological control has developed against vegetable pests. Recently, people are getting aware about the advantages of organic food and few shopping malls especially in capital city Dhaka are introducing vegetables produced through using organic insecticides. Urban customers are gradually inclining to buy organic products with paying comparatively higher prices than the same produced by using synthetic fertilizers. Most organic farms use fewer pesticides than conventional farms. The five main pesticides used in organic farming are Bt, pyrethrum, rotenone, copper and sulphur. Fewer than 10% of organic vegetable farmers acknowledge using these pesticides regularly; 5.3% of vegetable growers admit rotenone while 1.7% admits pyrethrum. Reduction and elimination of the use of chemical pesticides is technically unavoidable for practical reasons. Organic pesticides often act as a complement of other pest control methods. Less toxic but still effective organic insecticides include neem, spinosad, soaps, garlic, citrus oil, capsaicin (repellent), *Bacillus popilliae*, myco-insecticides such as *Beauveria bassiana*, and boric acid. Biological pest control uses natural predators or Parasitoid wasp/parasitoids such as praying mantis, *Trichogramma sp*, *Trathala flavo-orbitalis*, *Bracon habetor*, minute pirate bugs, big-eyed bugs, and to a lesser extent ladybugs (which tend to fly away), all of which eat a wide range of pests.

26. FERTILIZER MANAGEMENT OPTIONS FOR GROUNDNUT INTERCROPPING WITH ONION

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The experiment was conducted at Multi Location Test (MLT) site Hossainpur, Kishoregonj (AEZ-9) during rabi season of two consecutive years of 2008 and 2009 to determine the optimum and economic dose of fertilizer for groundnut + onion intercropping system. The soil was sandy loam with pH 6.7, organic carbon 0.94%, total N 0.091%, available P 6.24 $\mu\text{g g}^{-1}$, and exchangeable K 0.15 meq/100-g soil, respectively. During the growing period, monthly maximum temperature ranged from 20.95°C to 30.35°C and 21.34°C to 32.28°C in 2008 and 2009, respectively. Monthly maximum temperature ranged from 14.95°C to 25.83°C and 15.34°C to 25.28°C in 2008 and 2009, respectively. Three fertilizer options of groundnut intercropping with onion were arranged in randomized completely block design replicated six times. There were three treatments viz, T1= 30-45-85-30-4-1 kg ha^{-1} of NPKSZnB (Sole groundnut dose), T2= 120-40-75-20-5-1 kg ha^{-1} of NPKSZnB (Sole onion dose) and T3 = 90-44-83-30-4 kg ha^{-1} of NPKSZn (Fertilizer Recommendation Guide-2005). Results showed that different fertilizer options significantly influenced kernels pod^{-1} of groundnut in both years. The average nut yield (1.92 t ha^{-1}), onion yield (3.25 t ha^{-1}) and groundnut equivalent yield (3.22 t ha^{-1}) were obtained from treatment T2 followed by treatment T3. The average gross return (1,16,875 Tk ha^{-1}) as well as benefit cost ratio (2.19) was found in T2. Sole onion dose (120-40-75-20-5-1 kg ha^{-1} of NPKSZnB) was the most suitable and economic dose of nutrients for acceptable yield of groundnut with additional higher yield of onion.

27. A DIAGNOSTIC SURVEY ON CROPS AND CROPPING IN HAOR AREAS OF BANGLADESH

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The study was conducted in three haor upazillas namely Dirai, Khaliazuri and Itna under Sunamgonj, Netrokona and Kisorgonj districts of Bangladesh respectively to assess socio economic status, land utilization pattern, delineate the productivity and profitability of growing major crops, find out the existing cropping patterns and assess the prospect of possible cropping patterns. Both primary and secondary data were used in the study. Thirty seven percent of respondent involved in sole agriculture. And rest of them engaged in boating, fishing, ducks rearing besides agriculture. And about 40% of sample farmers were involved in NGO for getting loan. There are about 0.58 million hectares of cultivated lands in selected three haor districts, of which 73% falls under haor areas. Though boro rice is the major crop of haor areas but some field crops such as maize, wheat, groundnut, sweet potato, cucumber and some winter vegetables like, cauliflower, corolla etc are also grown in Rabi season. About 80% respondents of those three haor districts follow Boro rice -Fallow-Fallow cropping pattern. And rest of them follows some other cropping pattern such as groundnut/ sweet potato-Fallow-Fallow, Maize -Fallow- fallow and winter vegetables- Fallow- Fallow. The cost of Hybrid rice production in farmers field was found 66,536/- per hector whereas 59,067/- for MV. The yield of hybrid boro was double (10 t ha^{-1}) than that of MV boro (5 t ha^{-1}). BCR of hybrid rice was 2.75 whereas 1.62 for MV rice. According to the farmers' assessment, natural hazard specially flash flood, higher price of inputs, and transportation problem were the major hindrance to crop production. Considering the scope of annual income and infrastructural situation, poor standard of living of the farmers was found in haor areas. Short durational Rabi crops (mustard) – Boro rice- Fellow- Fellow and intercropping with maize-Fallow-Fallow may become potential pattern beside Boro rice- Fallow - Fallow-Fallow pattern. Selection of short durational and water lodging tolerant varieties along with improved management practices should be potentials for further researchable issues.

Key words: Survey, Crops and Cropping, Haor, Bangladesh

28. CROP ADAPTATION AND ON-FARM EVALUATION OF DIFFERENT CROPS IN SALINE SOILS OF NOAKHALI

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During the rabi season of 2009-2010 and 2010-2011, two experiments were conducted at FSRD site, OFRD, BARI, Noakhali. Both adaptive and On-Farm trials have been performed in the farmers field. Twelve rabi crops (sunflower, sugarbeet, barley, linseed, chilli, sweet potato, cowpea, wheat, grasspea, soybean, groundnut, Mungbean) were tested in Randomized Complete Block Design with 7 replications and unit plot was $2.5 \times 3 \text{ m}^2$. Also, On-Farm trials

of the screened salt tolerant crops (soybean, cowpea, grasspea and sweet potato) were conducted in 4 upazillas of Noakhali and Laxmipur districts for further confirmation of the findings, determination of critical/ threshold level of salinity and drawing a conclusion on the economic cultivation of the existing crops in the coastal saline soils of Noakhali region. The spacing and fertilizer rate was maintained as per BARI recommendation. One supplementary irrigation was applied in the mid February. Results from both the adaptive and the On-Farm trials indicated that the ranges of salinity level for commercial cultivation in Noakhali region were 1.2-8 dS/m for relay grasspea (kleshari), 3.88-10.92 dS/m for cowpea, 2.09-9.42 dS/m for soybean, 3.8-9.67 dS/m for sweet potato, 3.12-12.20 dS/m for linseed, 3.45-6.9 dS/m for groundnut, 3.2-12.91 dS/m for chilli, 5.72-13.63 dS/m for sugarbeet, 2.22-7.23 dS/m for wheat, 3.30-13.12 dS/m for barley, 4.67-17.56 dS/m for sunflower and 2.05-5.9 dS/m for mungbean from emergence to maturity. Moreover, the order of salinity tolerance of the tested crops were as Sunflower>Sugarbeet>Barley>Linseed>Chilli>Sweetpotato>Cowpea> Wheat> Grasspea> Soybean>Groundnut>Mungbean. The initial soil salinity level >4 dS/m is very harmful for emergence of any crop.

29. AGRONOMIC EVALUATION OF PROMISING CLONES OF SUGARCANE DEVELOPED AT BSRI

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An experiment was conducted at BSRI farm including four promising sugarcane clones viz; I 99-01, I 111-01, I 145-02 and I 191-02 which compared with two standard varieties Isd 16 and Isd 36. Three budded setts were planted maintaining 100 cm row spacing. Setts were planted end to end in the row in two times viz. 15 October, 2008 as early planting and 15 January, 2009 as late planting to study their agronomic performances. The experiment was set up in Randomized Complete Block (RCB) Design with three replications. In early plantation, the highest cane yield (81.38 t ha⁻¹) was obtained from the clone I 99-01 followed by I 111-01 and the standard variety Isd 36 while the lowest (62.50 t ha⁻¹) was recorded from the clone I 191-02. Under late plantation, the highest cane yield (64.50 t ha⁻¹) was produced in the clone I 99-01 followed by clone I 111-01 and the lowest (58.33 t ha⁻¹) was obtained from the standard variety Isd 16. Pol % cane in early planting, the maximum value of 15.32 % was recorded from the clone I 99-01 followed by I 111-01 and the lowest (14.60 %) was recorded from the standard variety Isd 36; In late planting, the highest pol % cane (15.51 %) was found from the clone I 99-01 followed by the clone I 145-02 and the lowest (13.64 %) was recorded from the clone I 191-02. The overall results revealed that among the tested clones I 99-01, I 111-01 and I 145-02 showed the potentiality in all yield contributing parameters and juice quality both early and late planting. So, these clones may be recommended to release as varieties for commercial cultivation.

Key words: Sugarcane, promising clone, early and late, yield

30. EFFECTS OF ROW SPACING ON YIELD OF SUGARCANE UNDER MODHUPUR TRACT SOILS

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Sugarcane is one of the income generating cash crop which grown in the mill and non mill zone area of Bangladesh. Sugarcane is mainly used for gur production, chewing and juice purpose in the non mill zone area. So sugarcane production increased per hectare area is very much essential for our country. An experiment was conducted at farmer's field of kapasias, Gazipur under the regional station of Bangladesh Sugarcane Research Institute during 2008-2009 cropping season in order to find out the appropriate row spacing for sugarcane cultivation to get higher yield. The experiment was comprised of five treatments which as row to row spacing 100 cm, 90 cm, 80cm, 70 cm and farmers practice (60 cm) following RCB design and replicated three times. Sugarcane variety Isd 37 was used as planting materials. Data on growth and yield contributing characters were taken and analyzed. Significant effects on yield contributing characters like tillering, number of millable stalk, yield of cane and brix percentage. Row spacing 100 cm produced the highest ($54.37 \times 10^3 \text{ ha}^{-1}$) number of millable cane which was statistically similar with 90 cm row spacing. The highest cane yield (81.54 TCH) was observed in 100 cm row spacing where the lowest one was farmers practice (56.97 TCH). In case of Brix % there was no significant differences among the treatments however the highest brix % was obtained from (18 %) row to row spacing 100 cm. Overall 100 cm row to row spacing performed better was suitable for sugarcane cultivation.

Key words: Sugarcane, row spacing, modhupur tract soils, yield

31. PERFORMANCE OF BARI RELEASED MUSTARD, LENTIL AND WHEAT VARIETIES AT CHARLAND UNDER RAINFED CONDITION

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The selected charland was Koikunda under Ishurdi upazilla of Pabna district. Five mustard varieties viz. BARI sarisha 9, BARI sarisha 11, BARI sarisha 14, BARI sarisha 15 and BARI sarisha 16 were tested in experiment 1 and five lentil varieties namely BARI mosur 3, BARI mosur 4, BARI mosur 5, BARI mosur 6 and one local were tested in experiment 2 for two consecutive years of 2009-10 and 2010-11. Four wheat varieties like Shatabdi, Prodig, Bijoy and Sufi were grown in experiment 3 in 2010-11. All experiments were laid out in RCB design with four replications under rainfed condition. Unit plot size was 20 m × 16 m. Seeds were broadcasted on 9 November 2009 and 26 November 2010. All mustard varieties produced substantial yield (1314-1578 kg ha⁻¹) except BARI sarisha 9 in both the years. BARI mosur 3 (1033-1065 kg ha⁻¹) and BARI mosur 6 (1305-1358 kg ha⁻¹) showed better yield performance as compared to others in 2009-10 and 2010-11. All wheat varieties gave good yield (2889-3052 kg ha⁻¹) in 2010-11. All three crops cultivation was profitable while lentil (BCR of 3.79-4.81)

cultivation was more preferable as compared to mustard (BCR of 2.39-2.55) and wheat (BCR of 2.04-2.16) in economic point of view.

32. ESTIMATION OF NUTRIENT LEVEL OF BARI SARISHA 11 AT CHARLAND

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The selected charland was Koikunda under Ishurdi upazilla of Pabna district. The experiment was laid out in a RCB design with three replications to estimate the optimum nutrient level for BARI sarisha 11 at charland under rainfed condition. The treatments were viz. N1=115-33-43-27-2-2 kg ha⁻¹ of N-P-K-S-Zn-B (ORC recommendation), N2=84-18-33-10-1-1 kg ha⁻¹ of N-P-K-S-Zn-B (AEZ-11 based recommendation), N3=66-25-20-6-1-0.7 kg ha⁻¹ of N-P-K-S-Zn-B (Soil test based for MYG), N4=20-5-10-0-0-0 kg ha⁻¹ of N-P-K-S-Zn-B (Farmers' practice) and N5=control. Unit plot size was 8.0 m × 4.8 m. BARI sarisha 11 was sown on 9 November 2009 and 25 November 2010 and harvested on 19 February 2010 and 24 February 2011 respectively. Nutrients were applied as basal as per specification of the treatments. The highest seed yield of mustard was obtained from ORC (1280-1582 kg ha⁻¹) and AEZ based (1183-1431 kg ha⁻¹) recommendation. But AEZ-11 based recommendation was more preferable in respect of economic point of view with BCR of 2.79. The effect of nutrient can be explained 93 % by the function of $Y=441.19 + 7.2054x - 0.0122x^2$ ($R^2=0.93$). The estimated nutrient level for maximum yield of mustard is 152-43-57-35-2.6-2.6 N-P-K-S-Zn-B kg ha⁻¹ by using the developed function and then the predicted yield is 1505 kg ha⁻¹.

33. PERFORMANCE OF BRRI dhan 29 AS INFLUENCED BY NITROGEN APPLICATION AND SEEDLING FROM DIFFERENT METHODS

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A field experiment was carried out at Agronomy Field of Sher-e-Bangla Agricultural University, Dhaka during 2007 - 08 to study performance of BRRI dhan29 in boro season as influenced by N application and seedling from different bed methods. The experiment was laid out in split-plot design with 3 replications. Nitrogen application (N0 =No nitrogen, N1= 2 splits at ½ active tillering stage + ½ at panicle initiation stage, N2=3 splits at ⅓ at 15 DAT + ⅓ active tillering stage + ⅓ at panicle initiation stage, N3=3 splits at ⅓ at 15 DAT + ⅓ active tillering stage + ⅓ at panicle initiation stage+ additional 10 kg ha⁻¹ at flowering stage and N4=Urea Super Granules) were allocated in the main plots and seedling from different methods (S1= normal seedling as produced using farmer's practices, S2=seedling produced following BRRI recommendation and S3= robust seedling from modified mat nursery) were assigned in sub plots. Superior grain yield (7.27 t ha⁻¹) was obtained from the Urea Super Granules (N4). Again, the highest grain yield (6.27 t ha⁻¹) was obtained from robust seedling by modified mat nursery. In interaction, Urea Super Granules with robust seedling from modified mat nursery produced the highest grain yield (7.84 t ha⁻¹).

34. BLOCK DEMONSTRATION OF ENVIRONMENT FRIENDLY TECHNOLOGY FOR HIGHER PRODUCTION OF BORO RICE- A CASE STUDY OF ASPADA IN MYMENSINGH

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ASPADA an NGO recently introduced a new approach to transfer crop production technology in its working areas. In 2009-2010 boro season ASPADA followed block demonstration approach. One Shallow Tube Well (STW) Irrigation block was considered as a Unit Demo Block comprising of 3-5 acres of land. The activities were carried under strict supervision and advice of the ASPADA agronomists and field workers. ASPADA supplied all inputs e.g. seed, USG and testing kits such as leaf color chart, porous pipe etc. The targeted demo involved three technology packages: (1) Application of Urea Super Granules (USG) for increased nitrogen use efficiency (NUE); (2) Use of LCC in boro rice for balanced nutrient supply (STB Nutrients) and (3) Use of porous pipes of irrigation for increased water use efficiency (WUE). One improved technology based block demo was established in each of Bhaluka, Trisal and Gouripur Upazillas. The demonstration effect/results were compared with those of the adjacent blocks cultivated under farmers' own management practices under similar conditions. Data were analyzed to investigate the difference between the improved technology and the traditional methods on yield, costs, advantages and amount of fertilizers and water used. In general, the improved technology showed better results as compared to the traditional method in all respects.

35. PERFORMANCE OF DIFFERENT LENTIL GENOTYPES AS RELAY CROP IN TRANSPLANTED AMAN RICE UNDER RAINFED CONDITION

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The study was conducted at the Pulses Research Centre (PRC), BARI, Ishurdi, Pabna during rabi season of two consecutive years, 2006-07 and 2007-08 to develop an improved varieties for lentil relay cropping to recommended to farmer's of Bangladesh. Normally, farmers of Bangladesh have to sow lentil with extensive land preparation. But after transplant aman rice harvesting, it is difficult to get the time for land preparation for lentil cultivation due to late harvesting and/or soil moisture condition which in turns to late planting. These lead to a low seedling density in the field, the crop gets less period for vegetative growth, and thus the crop faces high yield penalty. In this context, lentil relay cropping in the rice field has great promise which is also generally ensures the best use of residual moisture of rice fields. For better establishment and higher yield of lentil under relay cropping, suitable variety yet to be developed. Considering the above demand, 4 promising lentil genotypes (X95S-167(4), X95S-167(5), ILL-5134 and X95S-136), 3 local cultivars (Kushtia, Rajshahi and Rajbari local) and 3

released varieties (BINA Masur-3, BARI Masur-3 and BARI Masur-4) were tested into RCB design with three replications. Lentil seeds @ 50 kg ha⁻¹ were broadcasted as treatment-wise in a transplanted aman rice (Var.BRRIdhan 32) field after excess water was drained out 15 days before rice harvest on 29 October, 2006 and 1 November, 2007, respectively. Fertilizers @ of 20-40-20 kg ha⁻¹ of N- P₂O₅-K₂O as urea, triple-supper phosphate and murate of potash were used. TSP and MP were applied 2 days before lentil seed broadcasting and urea was top dressed at 20 days after emergence. Rice was harvested with retaining 20 cm rice straw height from the ground level at 15 days after seed sown. Among the 10 lentil genotypes studied under this program, X95S-136, X95S-167(4) and BARI Masur-4 performed better in yield (1708-1750 kg ha⁻¹), yield contributing characters and growth related characters, such as total dry matter, leaf area index, crop growth rate, root length, root dry weight, water loss rate due to evapo-transpiration, nodule number, nodule dry weight, chlorophyll content and disease resistance over local cultivars as well as rest of the genotypes. Hence, by inclusion of lentil in the transplanted aman rice field as relay crop in the medium low lands could be brought under lentil cultivation to enhance lentil production and farmer's income, and also to ensure soil health improvement for sustainable production system.

36. SALINITY MANAGEMENT AND CROP PRODUCTION IN THE COASTAL SALINE AREA OF BANGLADESH

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Soil salinity is one of the most important natural factors leading to severe crop losses every year especially in the coastal region of Bangladesh. To overcome these problems, crop physiology section of Agronomy Division, BARI, Gazipur conduct a series of experiments to select salt tolerant genotypes and to develop salinity avoidance and/or management technologies of different BARI mandate crops for traditional rice-fallow areas of the coastal region of Bangladesh. The experiments were conducted through Hoagland solution culture in laboratory, pot culture in vinyl house, seed bed culture in stress condition and finally under natural saline condition in the coastal saline area of Nokhali, Patouakhli, Sathkhira and Dacope, Khulna.

Three salt tolerant barley genotypes (BHL-15, BHL-18, BHL-19), 2 salt tolerant mungbean genotypes (BM-01, BM-08), 4 salt tolerant mustard genotypes (DB-9069, BD- 9093, BD-9070, BD-9064) and 5 salt tolerant cowpea genotypes (BD-1604, BD-8337, BD-8338, BD-8345, BD-8346) were identified from different trials. Five genotypes of chickpea (BD-6061, BD-6066, BD-6071, BD-6060, BD-6067, BD 6078) and 4 genotypes of sweet gourd (BD-204, BD-306, BD-2143 and BD-9494) were selected for further verification under pot culture and/or field trial in the coastal area. Soybean variety Shohag, BARI soybean-5 and sesame variety BARITil-4 showed better adaptability in the coastal saline area. Relay cropping of BARISarisha-11 with T.aman rice, sowing of Mungbean up to 3rd week of December at Patouakhali and 2nd week of January at Satkhira; Soybean up to 3rd week of December at Patouakhali and Noakhali and 1st week of January at Satkhira; Cowpea up to 2nd week of January and Sesame up to 3rd week of January in the coastal saline area were found suitable as salinity avoidance technology to increase production and cropping intensity in the coastal area

of south-west Bangladesh in T.aman-fallow-fallow cropping pattern. Pacific-11 followed by BARI hybrid maize-5 found suitable for cultivation in the coastal cyclone prone area after harvest of T.aman rice. Supplemental irrigation for tomato, cabbage and sweet gourd, rice straw followed by rice bran mulch with supplemental irrigation for pit based crops and hybrid maize + sweet potato intercropping were found suitable as salinity management technology for the saline areas.

37. POTENTIAL OF INCREASING CROPPING INTENSITY AND PRODUCTIVITY IN THE HILLY AREAS

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Hill eco-system is one of the most fragile eco-systems of the world. Hills are conventionally described as being fragile and vulnerable ecosystems, which are largely undeveloped mainly due to remoteness and inaccessibility. The Chittagong Hill Tracts has high potential for agricultural development. About 90% of the tribal population depends on agriculture for livelihood. Despite hilly terrain high rainfall and prolonged wet season, it remains well drained and offers an attractive scope for year-round agricultural production.

Rice based cropping pattern is predominant in the hill valley and 54% farmers follow T.aman-Fallow-Fallow pattern. Research activities done in hill valley revealed that after harvest of T.aman rice mustard (BARISarisha-11), maize (BARI Hybrid maize-5), chickpea (BARI Chola-5), lentil (BARI Masur-4), wheat (Shatabdi, Sourav and Bijoy), maize based intercrops (BARI Hybrid maize-5 + Bushbean and BARI Hybrid maize-5 + BABI Fallon-1) found suitable for increased productivity and cropping intensity. BARI Mung-5 performed better after harvest of mustard against T. aman-fallow-fallow pattern. However, hill agriculture holds promise to meet the future requirements of the population it supports, and in addition to the market. There are several success stories both at research station and farm level. Adoption of the same will go long way to ensure food, environment, economic and livelihood security in the hill region.

38. PARTICIPATORY VARIETY SELECTION FOR T. AUS RICE IN COASTAL SALINE AREA OF NOAKHALI

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The experiment was conducted in the saline area of FSRD site Hazirhat Noakhali during the aus season of 2010 to identify the suitable salt tolerant and short duration aus rice variety for the saline coastal area of Noakhali. Twelve advance lines with BRRI dhan-27, 48 and Hashikalmi were tested with three replications. Among the varieties/lines IR-61919-3B-15-3 gave the highest yield (3.66 t ha⁻¹) followed by OM-576 (3.59 t ha⁻¹) and IR-78802-4R-1 (3.06 t ha⁻¹). The minimum crop duration was observed in Hashikalmi (103 days) followed by BRRI

dhan-27(108 days) and IR-78802-4R-1 (110 days). Salinity level in the crop field was 2.5 to 14 dS/m from emergence to maturity. Hashikalmi and OMCS-2000 did not show any mortality under different level of salinity over the growth period. Less mortality were found in OM-576(5%) and IR-78802-4R-1(13%) which gave relatively higher yield than Hashikalmi and OMCS-2000. Considering salinity level yield and field duration in participatory variety selection procedure farmers, researchers and extension personnel in this region ranked first IR-78802-4R-1 followed by OM-576, IR-61919-3B-15-3 and IR-69997-AC-2 compared with local variety Hayidda and HYV BRRI dhan-27 & 48. These lines are moderately high yielding, short duration and salt tolerant which will be fitted in the dibbling aus- T. aman cropping pattern as per demand of the farmers.

39. RESPONSE OF MUNGBEAN VARIETIES TO SOIL MOISTURE AT DIFFERENT GROWTH STAGES IN KHARIF-I SEASON

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A field experiment was conducted at PRC, Ishurdi, Pabna during Kharif-I seasons of 2006 and 2007 to find out the response to water stress at specific growth stages of mungbean. There were eight irrigation treatments which applied at different growth stages of mungbean i.e. Control (I0), Vegetative stage (V) (I1), Flowering (F) (I2), Pod Development Stage (P) (I3), V+F (I4), V+P (I5), F+P (I6) and V+F+P (I7) were placed in the main plot and two mungbean varieties i.e. BARI Mung 2 (V1) and BARI Mung 5 (V2) were placed in the sub-plot. It was laid out in split-plot design with three replications. In 2006, I5 produced the highest grain yield (1438 kg ha⁻¹) which was statistically identical to I1, I4 and I7 and in 2007, I7 produced the highest grain yield (1440 kg ha⁻¹) which was statistically identical to I1, I4, I5. But the lowest yield (1095 kg ha⁻¹ and 1100 kg ha⁻¹) was obtained in control plots in 2006 and 2007, respectively. Between two varieties BARI Mung 2 showed better performance (1336 kg ha⁻¹ and 1412 kg ha⁻¹) than BARI Mung 5. In case of interaction of irrigation and variety, BARI Mung 2 (V1) produced the highest yield (1573 kg ha⁻¹) under I5 which was statistically identical to I1V1, I4V1 and I7V1 in 2006 and in 2007, BARI Mung 2 produced the highest yield (1580 kg ha⁻¹) under I7 which was statistically identical to I5V1, I1V1 and I4V1. Through the combined analysis, pooled results showed that I5V1 produced the highest grain yield (1573 kg ha⁻¹) which was statistically identical to I7V1 and I1V1. From the economic analysis, it was observed that the highest net return (Tk 40,920/ha, Tk 38,920/ha and Tk 38,480/ha) and the highest BCR (2.86, 2.85 and 2.67) were obtained from the treatments I5V1, I1V1 and I7V1, respectively.

40. SCREENING OF FRENCH BEAN GENOTYPES FOR DROUGHT TOLERANCE IN BANGLADESH

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In this study 46 French bean (*Phaseolus vulgaris*) genotypes were screened against drought stress imposed by withholding water until appearance of wilting. The objective of this study was to identify drought tolerance genotype(s) under drought stress and non stress conditions in Bangladesh. The efficiency indexes that we used are the geometric mean (GM), the drought susceptibility index (DSI) and the relative performance (RP). With GM values $>8.0 \text{ g plant}^{-1}$ genotypes BB24, BB43 and BB45 had the highest values, whereas BB04, BB08 and BB01 had the lowest. BB24, BB43 and BB36 showed the highest values of relative yield (RY) and the lowest DSI, while BB04 and BARI bushbean-2 exhibited the lowest RY and the highest DSI. The GM seed yield showed the strongest correlation with seed yield in drought stress ($r = 0.95^{**}$) followed by RY ($r = 0.90^{**}$) and DSI ($r = -0.90^{**}$). Among the 12 different plant characters, five were correlated with yield under drought stress. However, only total above ground biomass (TDM) contributed significantly to the step-wise regression model to predict yield. The GM seed yield followed by RY and DSI; and TDM are important criteria for selecting drought tolerance of French bean.

Keywords: drought stress; *Phaseolus vulgaris*; yield based screening

41. EFFECT OF DATE OF HARVEST ON YIELD AND NUTRIENTS COMPOSITION OF TUBER IN TWO CASSAVA (*Manihot esculenta* Crantz.) ACCESSIONS

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Cassava tubers (root) are used as staple food, feed, and raw materials in pharmaceuticals, garment, and paper and food industries. It would be an ideal crop under changed climate since the crop possesses high drought tolerance and can produce good yield (av. $15\text{-}60 \text{ t ha}^{-1}$, fresh tuber yield) in poor and drought prone soils of fallow upland and hill slopes. Tubers of two accessions (CCC A1, CK A2) were grown at Bangladesh Agricultural University, Mymensingh and were harvested at 4, 6, 8, and 10 months after planting (MAP) for evaluation of tuber yield; dry matter (DM), starch, protein and fiber contents. Results revealed that fresh tuber yield increased with increasing MAP reaching maximum (mean of 50 t ha^{-1}) at 10 MAP irrespective of accessions. DM and starch contents followed a trend similar to that of yield. The DM yield varied from 41-45% that of starch 29-30% at 10 MAP. Protein content was greater at earlier but fiber content was greater at later stages of harvests. Significant genetic variation exists for tuber yield and nutrient contents. Results conclude that optimum harvest time is around 10 MAP with good yield and nutrient contents in the two cassava accessions.

42. STRIP TILLAGE SEEDING FOR UTILIZATION OF RESIDUAL SOIL MOISTURE IN DRY LAND FARMING

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Strip till seeding system in which tilling the planting strip, seeding, fertilizing beside the seeding line and seed covering simultaneously utilize the residual soil moisture for crop establishment specially in dry areas. Power tiller operated seeder modified as strip till seeding mechanism by introducing the soil cutting blades in front of the seeding line, inclined plate seed metering devices with fertilizing attachment and press wheel behind the seeding line for minimal compaction of seeds. Strip tillage experiment was conducted in Rajshahi area 2008-10 for wheat, lentil, chickpea, mungbean and maize cultivation. The seeder creates 4-6 cm wide planting strip and produce good seed soil contact which facilitates better plant stand. Depth of seed placement can be controlled easily. Seed placement vary 5-7 cm below the soil surface depending the moisture availability in the soil. The grain yield is comparatively higher than conventional methods. The rotating strip blades can operate through moderate crop residues field without plugging. Effective field capacity of the seeder increased 25% and fuel consumption reduced 20% compared to normal seeding system of the seeder.

43. YIELD AND YIELD COMPONENTS OF RICE GENOTYPES AS AFFECTED BY PLANTING TIME IN DROUGHT PRONE RAINFED ENVIRONMENT

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A field experiment was conducted at Bangladesh Rice Research Institute, Regional Station, Rajshahi during June to December 2009 to find out the optimum planting time of the rice genotypes under rainfed condition in Aman season. The experiment was in strip plot design with 3 replications. Seven planting dates (05 July, 15 July, 25 July, 05 August, 15 August, 25 August and 05 September) were in main plot and 3 rice genotypes (BRRI dhan49, BR7155-20-1-3 and IR74371-54-1-1) were in sub plot. Yield and yield components were significantly affected by planting dates. Irrespective of variety, the highest mean grain yield (5.20 t ha⁻¹) was obtained on 25 July planting that was at par with 15 July planting (5.12 t ha⁻¹) and it was drastically reduced in latter planting started on 15 August and on ward. Yield reduced in delayed planting because of drought stress at reproductive phase caused higher sterility. Panicles per unit area, 1000-grain weight, sterility, plant height and growth duration followed the similar trend. Yield reduced in 5 September planting by 49 % compared to 25 July planting. The results revealed that planting in 15 to 25 July was optimum for BRRI dhan49 and BR7155-20-1-3 while 25 July to 05 August was for IR74371-54-1-1 to get better performance.

44. PERFORMANCE AND ADOPTION OF BRRI DHAN45 IN HAOR AREAS OF BANGLADESH

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A scaling up program of BRRRI dhan45 was conducted among 37 farmers during Boro 2008-09 to evaluate the performance and adoption related aspects of the variety in Haor areas of Habiganj and Kishorganj district. The observed mean grain yield and growth duration of BRRRI dhan45 was 6.05 t ha⁻¹ and 141 days respectively. Highest grain yield (6.43 t ha⁻¹) was observed in Haripur, Baniachong of Habiganj district while lowest (4.80 t ha⁻¹) was found in Adarshagram of same upazila and district. On the other hand, lowest growth duration (137days) was recorded in Kewerjore, Miatamain upazila of Kishorganj and highest (147 days) was found in Adarshagram, Baniachong of Habiganj district. Most participated and neighboring farmers preferred this variety due to having the attributes of higher yield than existing short duration varieties, less growth duration, less insect disease, more tiller, long panicle, bold grain, less unfilled grain, tall plant, strong plant and non lodging. Thus, BRRRI dhan45 can escape flash flood damage due to its shorter growth duration. On the other hand, food insecurity of Haor areas may reduce considerably by adopting this variety through early harvest and comparatively higher grain yield. All participated farmers' adopted the variety.

45. CROP PRODUCTIVITY OF TOMATO AS AFFECTED BY UREA SUPER GRANULE IN ESTERN SURMA-KUSHIYARA FLOODPLAIN OF SYLHET

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An experiment was conducted at the Multi location testing (MLT) site, Sunamgonj under Estern surma-kushiyara floodplain (AEZ-20) during the year 2007-09 to evaluate the effect of Urea Super Granule (USG) application on the growth and yield of tomato. There were five treatments viz. T₁= recommended N dose as prilled urea (PU), T₂=recommended N dose as USG, T₃= 10% less than recommended dose of N as USG, T₄= 20% less than recommended dose of N as USG, and T₅= farmers practice (average of 20 farmers N dose used as PU) used in this experiment. Results revealed that yield and yield attribute of tomato significantly responded to application of USG. The highest yields (81.89 and 80.55tha⁻¹ for the year 2007-08 and 2008-09, respectively) were obtained from the recommended N dose as USG followed by USG 10% less than recommended dose of N (80.06 and 79.43tha⁻¹ for the year 2007-08 and 2008-09, respectively). The treatments T₃ and T₄ was also observed to be more effective over PU and 10-20% nitrogenous fertilizer could be saved by using USG instead of traditional PU. Economic analysis revealed that the treatment T₂ was found profitable in terms of higher gross returns as well as BCR.

Key words: USG, Prilled urea, Tomato, Economic analysis

46. MODELING THE CLIMATE CHANGE IMPACTS ON RICE PRODUCTION OF THE COASTAL ZONE OF BANGLADESH

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Climate has been changing due to natural forcing. Climate factors such as temperature, rainfall, atmospheric carbon dioxide, solar radiation, etc. are closely link with agricultural production. Rice production would be major concern in recent years due to changing climatic conditions. Simulation study has been conducted to assess the climate change impacts on rice production in the coastal zone of Bangladesh and the effects of climate changes on the yield of rice have been assessed using crop growth model InfoCrop.

The simulation was carried out to predict the yields of rice under different climatic trends of temperature and carbon dioxide concentration. The effect of temperature on the yield of rice that is negative while of CO₂ is positive but temperature plays dominant role. Prediction was also made to predict the climate change impacts of rice yields based on historical and IPCC climate change scenarios. Historical climate change scenario has little or no negative impacts on rice yield but there is small reduction in the yields of rice for IPCC climate change scenario. Rice yield decreases from 4704.4 kg ha⁻¹ to 4657 kg ha⁻¹ and from 4588.8 kg ha⁻¹ to 3993.2 kg ha⁻¹ for historical and IPCC climatic change scenarios, respectively in the coastal zone.

47. POTENTIAL FOR PRODUCTIVITY IMPROVEMENT THROUGH SUPPLEMENTARY IRRIGATED HYV AUS RICE IN THE DELTAIC TIDAL PLAIN

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The southwest region of Bangladesh that represents about 27 per cent of the total area of the country is crisscrossed by large tidal rivers. A large number of Tidal Basins (Beels), which are flat, low-lying alluvial lands interspersed with tidal streams and water-filled depressions are found in this region. The southwest area of Bangladesh is still very much dependent on agricultural crops, particularly rice, as the main source of income and livelihood for its rural population. Inundation during the rainy season is the general characteristics of the tidal basin. The depth and period of inundation varies with land types. Longtime inundation has constrained the cultivation of high yielding varieties in all land types except the high land. The medium high land (MHL) is the most productive land in the tidal basin and cover more than 30% area. These lands remain dry during Nov.-Jun. and used for Boro and Rabi crops. The lands remain inundated during Jul.- Oct. with a depth from 30 to 90 cm. Therefore, it is not

possible to cultivate HYV T. Aman in the MHL. The only scope for productivity improvement in the monsoon season is the introduction of HYV Aus varieties that can tolerate water logging upto 90 cm after the vegetative stage. But till now no BRRI varieties has been reported as tolerant to long time inundation. The study was conducted in the basin areas of Narail Sadar upazila during Aus 2008 and 2009. The objective of this research work was to evaluate the potential of HYV Aus varieties for productivity improvement in the MHL of tidal basin area. Three BRRI developed HYV Aus varieties (BR14, BR20 and BRRI dhan27) were cultivated in the farmers' field along with the popular local variety 'Ratul'. Farmers are given freedom to select the time of planting. Study results showed that all the HYVs have the potential to survive under the tidal basin environment. Timely cultivation of BR14 and BRRI dhan27 could give 1 t ha⁻¹ higher yield compared to the local variety Ratul (2 t ha⁻¹). The rainfall and crop water requirement analysis showed that supplementary irrigation is needed for timely establishment of HYV T. Aus. Cost and benefit analysis showed that the gross margin of HYV T. Aus (Tk. 21112 per ha) is 1.50 and 1.57 times higher than the local B. Aus (Tk. 14160) and local T. Aus (Tk. 13641). The acceptability of the HYV T. Aus varieties was also evaluated by the stakeholders through focus group discussions. It showed that the farmers' have selected HYV T. Aus cultivation as the top most choice compared to the cultivation of local Aus and Aman varieties. Therefore, steps should be taken for extensive adoption of HYV T. Aus in the MHL of tidal basin area.

48. AGRONOMIC OPTIONS FOR IMPROVING CROP PRODUCTIVITY UNDER SALINITY STRESSED CONDITION IN BANGLADESH

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Salinity is the most deleterious abiotic stress causing significant crop losses in Bangladesh. Salinity is a year-round problem in the coastal Bangladesh but its intensity reaches peak during the dry season (January- May) and as such *Boro* rice crop suffers the most. Reclamation of saline soil in the coastal area is not a viable option because of frequent inundation by tidal saline water. Therefore, the remaining options for continuing crop productivity under salinity stressed conditions are: i) selecting existing salinity tolerant crop species/varieties, ii) improving salinity tolerance in crop species/variety by incorporating the tolerant genes and ii) ameliorating stress effects through crop management practices. A considerable research progress has been made in developing salinity tolerant crop species/variety through gene transfer approach in the laboratory. Again, a significant number of effective crop management approaches has been reported in country and abroad in ameliorating salinity stress in crop plants viz., seed priming, mulching, liming, application of silicon and gypsum, planting crops in raised bed, etc. This paper focuses on various options that could be adopted for improving crop productivity in the coastal area of Bangladesh with emphasis on *Boro* rice.

49. CALIBRATION AND VALIDATION OF AQUACROP MODEL UNDER FULL IRRIGATION AND WATER STRESS CONDITION IN BANGLADESH

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Predicting yield is increasingly important to optimize irrigation under limited available water for enhanced sustainability and profitable production. Food and Agriculture Organization (FAO) of the United Nations has recently addressed this need by providing a yield response to water simulation model (AquaCrop). This model is already parameterized for different crops including potato. In this study, AquaCrop was locally calibrated and tested for potato crop (variety: Diamant) with several treatment variables of irrigation: full irrigation as the control, water stress at stolonization stage, at tuberization stage and at bulking stage. The field experiment was conducted in the research field of Bangladesh Agricultural Research Institute (BARI), Jodebpur, Bangladesh during winter season of 2009-2010. Model parameters that were calibrated using the field experiment data. The conservative parameters were held constant, and the calibrated model was evaluated by test simulations. The simulation results showed a reasonably accurate prediction of the final aboveground biomass within 10% of the measured value. The predicted tuber yield values were within 15% of measurements, except in the treatment of water stress at stolonization stage, with errors up to 17.01%. The simulated pattern of canopy progression and biomass accumulation over time were close to measured values, with Willmott's index of agreement for all the cases being ≥ 0.992 for canopy cover, and ≥ 0.986 for biomass. The simulation results showed a reasonably accurate prediction of evapotranspiration in all cases (error less than 12 %), except in full irrigation (15% error). Accelerated senescence of canopy due to water stress was difficult to simulate accurately. The model closely predicted the trend in soil water content, but overestimated soil moisture for the three water stress treatments. According to the study, the calibrated model seems to have performed well for potato crop under water stress condition in Bangladesh.

Key words: AquaCrop, field experiment, water stress condition, yield contributing parameters, potato

50. RICE-BASED FARMING SYSTEMS TECHNOLOGY ADOPTION FOR CLIMATE CHANGE ADAPTATION

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The major constraints of agricultural production in the south western coastal areas are soil and water salinity of varying degrees, lack of fresh water for irrigation, slow soil drying pattern

which are being augmented further due to climate change, requires suitable farming system and component technologies. Some farming/cropping systems and component technologies were validated or demonstrated in the Aila and or Sidr affected areas in Dacope Upazila under Khulna district. The package of rice fish culture with vegetables on the gher levee is suitable where soil salinity reaches a peak to >30 dS/m in March-April. Adoption of modern varieties of rice in Boro or Aus season after T. Aman rice gave 2.5 t ha^{-1} yield advantages with the soil salinity 14 dS m^{-1} at seeding. In areas with medium soil salinity level (6-8 dS/m), watermelon, mask melon and okra had sown possibility to grow even after late harvest of traditional local varieties of T. Aman rice which might be further increased of productivity by adopting of high yielding rice varieties. Farmers preferred BRRI dhan47 and BRRI dhan53, and BRRI dhan44 and BRRI dhan41 for Boro and Aman seasons, respectively, and autonomous adoption of these varieties were taken place.

51. INTEGRATED FERTILIZER MANAGEMENT FOR WHEAT- JUTE-T. AMAN CROPPING PATTERN

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A field experiment was conducted in medium highland of FSRD site Palima, Tangail (AEZ-8) during 2002-2005 to find out the optimum and economic fertilizer dose for the cropping pattern viz. Wheat–Jute–T. aman rice. Six nutrient management packages including farmers' practice and one fertilizer control were tested such as; T_1 = Estimated mineral fertilizer dose for moderate yield goal (ED_1), T_2 = Estimated mineral fertilizer dose for high yield goal (ED_2), T_3 = Integrated nutrient management (IPNS), T_4 = Recommended fertilizer based on FRG'97(RF), T_5 = Farmers' Practice (FP) and T_6 = Absolute control. Three years pooled average results showed that higher yield from Wheat, Jute and T. aman as well as gross margin was recorded from IPNS (T_3) and T_2 for HYG treatment. But marginal benefit cost ratio (MBCR) over control was higher in AEZ based fertilizer recommendation (FRG'97). In IPNS treatment due to cost of organic manure MBCR was less compare with T_4 and T_5 treatment. Recommended fertilizer based on FRG'97 (T_4) was most economic dose for Wheat–Jute–T. aman rice cropping pattern in AEZ-8.

Key words: Cropping pattern, IPNS, fertilizer management

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