

Technological Options for Sustaining Crop Production under Changing Climate in Bangladesh

Md Abdul KARIM^{1,2}, Hirokazu HIGUCHI² and Eiji NAWATA²

¹Bangabandhu Sheikh Mujibur Rahman Agricultural University, Bangladesh

²Graduate School of Agriculture, Kyoto University

Introduction

The unique geophysical location of Bangladesh made it one of the most vulnerable countries of the world to climate change effect. The example of year to year inter or intra-seasonal temperature and rainfall variations illustrate the noticeable climatic variability of the country. For example during 2012, 2013 and 2014 the average maximum temperature varied remarkably as 30°C, 33°C and 29°C, respectively. The maximum temperatures in April at that time were 30.87°C, 35.07°C and 37.30°C, respectively. The total annual rainfall during 2010 – 2014 ranged from 1771 mm in 2013 to 2263 in 2012. The rainfall in April of 2012 – 2015 were 209 mm, 72 mm, 10.74 mm, and 212 mm, respectively. The major challenges for crop production in the context of climatic variability in Bangladesh are 1. Temp rise- even 1°C rise in global mean temperature may inundate 18% land, 2. Salinity- continue increasing and by now exceeded one million ha, 3. Drought - almost 3.7 m ha are affected, 4. Flooding/ waterlogging – about 2.6 m ha of agricultural land is affected by flood and about 0.4 m ha crop land is waterlogged, 5. Charland agriculture - about one million ha of land is developed newly on the riverbed and bank of the rivers of all over the country due to siltation and 6. Organic matter depletion - seemingly depleted faster probably due to increase in maximum temperature event (Karim, *et al.* 2014; Mondal, 2012).

Some Technological Achievements

Some progresses have been made on the development of technologies fit for a specific problem.

- Elevated CO₂**- Despite varietal differences, growth and yield of both mungbean and rice responded positively to elevated CO₂ (up to 560±10 ppm). Flowers drop in mungbean and number of unfilled grains in rice increased due to concomitant rise in temperature.
- Salinity tolerance** - mungbean genotypes MBI and BM8, soybean genotypes AGS313 and BD2331, wheat genotype BAW 1147, rice varieties BRR dhan47 and BRRI dhan61 for boro season, and BRRI dhan40, BRRI dhan41, BRRI dhan53, BRRI dhan54 and Bina dhan8 for aman season, mustard genotypes BD-9093 and BARI Sarisha-11 are found salt tolerant. Ca, K and ABA application enhanced salt tolerance of soybean.
- Submergence tolerance** - Rice varieties BRRI dhan51 and BRRI dhan52, mungbean genotypes GK-48, IPSA 13, VC-6173A, BU mug2, BARI mug5 and IPSA-12 have been identified. Application of K increased submergence tolerance of mungbean.
- Drought tolerance** - wheat genotypes namely BARI Gom 26, Sourav, BAW 1169 and BAW 1158, French bean BB24 and BB43, mungbean BARI mug2 and BU mug2 and soybean BARI soybean5, BARI soybean6, Shohag and BD-2331 are tolerant. 100 ppm benzylaminopurine increased seed yield by 18.2% and 25.6% in BARI mug 2 and ML 613 respectively.
- Other technologies** -IPSA 12 is a low N and P required mungbean. Cultivation of lentil/wheat – mungbean – short duration aman rice in charlands and growing four crops (eg. mustard/potato – mungbean – aus rice (short duration, cv. Parija) – short duration aman rice are getting popular in the high and medium high land.

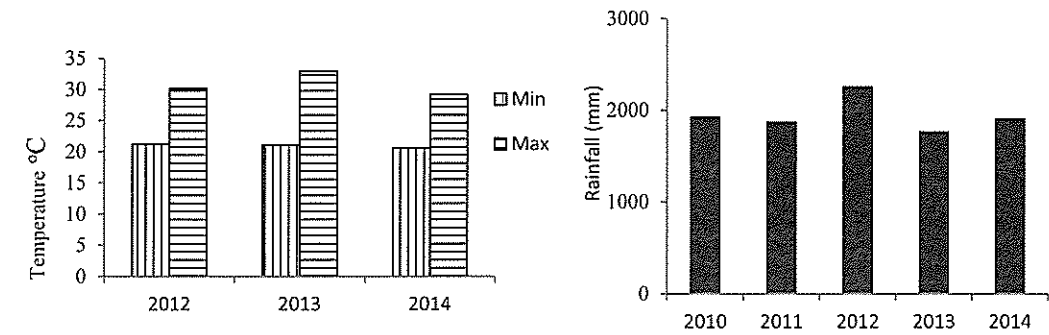


Fig. 1. Average temperature and rainfall in Kurigram

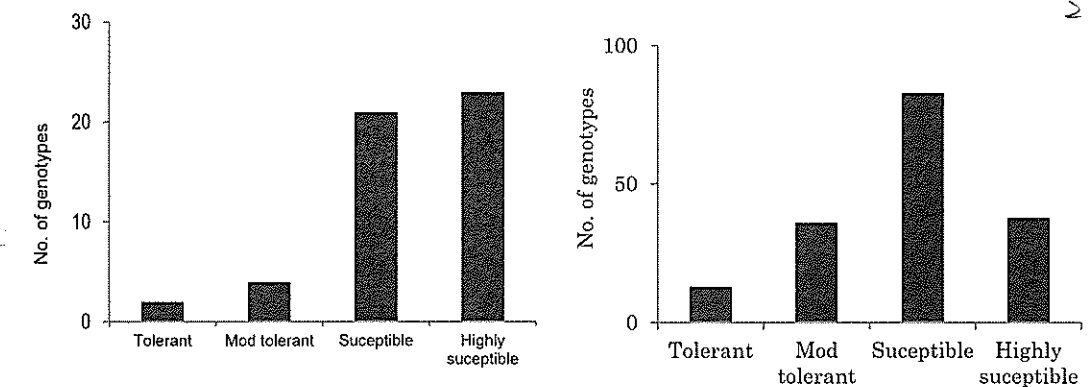


Fig. 2. Salt tolerance of mungbean (left) and soybean (right) genotypes

Table 1. Effect of 4-day soil flooding on seed yield of mungbean genotypes.

Genotypes	Seed yield (g plant ⁻¹)		
	Control	4-day soil flooding	% relative to control
IPSA-13	4.81 ± 0.11	2.40 ± 0.29	50.0
VC-6173A	4.04 ± 0.72	2.99 ± 0.40	75.0
BU mug 2	3.79 ± 0.57	2.46 ± 0.34	65.0
BARI mung 5	3.95 ± 0.34	1.96 ± 0.40	50.0
IPSA-12	3.79 ± 0.48	2.16 ± 0.52	57.0

Table 2. Ranking of 35 wheat genotypes on the basis of their drought tolerance

Rank order	Yield reduction (%)	Genotypes
Tolerant	<30.00	BARI Gom 26, Sourav, BAW 1169 and BAW 1158
Moderately tolerant	30.01-40.00	BAW 1151, BAW 1157, BAW 1159, BAW 1161, BAW 1165 and BAW 1170
Moderately susceptible	40.01-50.00	Prodip, Shatabdi, Gourav, Sufi, Kanchan, Barkat, Balaka, Aghrani, Akbar, Protiva, Ananda, Bijoy, BAW 1160, BAW 1162, BAW1163, BAW1164, BAW1168 and BAW 1172
Susceptible	Above 50.01	Seri, Pavon, BARI Gom 25, BAW 1166, BAW 1167, BAW 1171 and BAW 1173