平成２０年度　環境科学院　修士論文内容の要旨

Water balance for agricultural production responding to climatic variability in Bangladesh

（気候変動に応答するバングラデッシュ農作物の水供給バランス）

北海道大学　大学院環境科学院

環境起学専攻　統合コース

Karim, Mohammed Rezaul（かりむ、もはめど　れざうる）

Climate change! This phrase has become a ghastly foe of the world. The present study area, Bangladesh is a semi-tropical riverine country with monsoon climate. The IPCC identified Bangladesh as the most vulnerable to climate change. Each year, the country is loosing about 1 percent of its cultivable lands to non-agricultural uses, while its population is increasing by about 2 million. Agricultural yield is highly dependent on climatic condition especially on the availability of water in the proper growing season. In present study water deficiency (or drought) is considered as one of the major climatic restraints for winter crop production. To better understand the crop responses to moisture variation, a quantitative analysis is done for water balance components in different seasons. The major inflow of water is from precipitation and outflow is evapotranspiration. As input data, air temperature and precipitation data were collected from Bangladesh meteorological department & Bangladesh Agricultural research council (during 1987 to 2006). The water balance was estimated for twelve different districts in representing the north, central, southern & coastal zones. Data were validated with reanalysis data gathered by National Center for Environmental Protection & Global Precipitation Climatology Project.

Weather is a dominant factor influencing the agricultural operations through its effects on soil and plant growth. Hence any changes in regional climate could have significant effects on crop production. Potential evapotranspiration (PET), actual evapotranspiration (AET), soil moisture storage (ST), water deficiency (WD) and water surplus (WS) were analyzed annually and seasonally using the Thornthwaite monthly water balance program. As a result, Khulna coastal belt had the highest annual PET at maximum in July. Soil moisture was found almost at field capacity from July to September. Southern station Chittagong experienced the highest average monthly moisture. Teknaf had the lowest annual AET, while Dinajpur stands in second lowest position. Maximum WD is found in Bogra and second highest in Dinajpur. Least amount of water surplus is noticed at Khulna. The assessment of water deficiency in northern Bangladesh provides a value of water shortage about 178 mm per annum and reflects its worst situation among all regions. Winter was found as the most crucial regarding water deficit.

An agro-climatic study was also conducted for four important rice-growing regions of Bangladesh by using the climatic data (temperature and rainfall) and rice data (summer, monsoon & winter rice yield and cultivated area), collected from Bangladesh Bureau of Statistics to find out the climatic variability and its impact on rice production with regression analysis. Major features are rising trends in annual average temperature and decreasing trends in annual rainfalls. Responding to year-to-year variability, high temperature in all cropping seasons & heavy rainfall in monsoon & summer seasons had negative effects on rice, while winter rice had been benefited through higher rainfall.

Findings of this study would help the planners, farmers, NGO workers, economists and researchers. In Bangladesh we need to boost up the rice production for the high population growth and special measures. Beside conservation of surplus water for winter season crop production, less water loving crops like wheat, radish, carrots, citrus, cucumber etc can be planted for mitigating the climate change problem. Climatic variability information and crop climate relation need to be disseminated for better crop production in future.