Causes of Irrigation Water Scarcity in Landakhil irrigation Canal, Nangarhar Province/Afghanistan

○Tariqullah Hashemi*, Hiroaki Somura**

Introduction

Afghanistan is an agricultural country where 80% of the population is engaged in agriculture-related activities. Afghanistan is located in the arid and semiarid area where the potential evapotranspiration is higher than the annual rainfall so irrigation is necessary for summer crops. The surface or canal irrigation system is the most extensive irrigation system in Afghanistan, it's mean approximately 75 percent of agricultural land is irrigated by canal irrigation systems. In terms of water resources, Afghanistan has about 55 billion cubic meters (BCM) surface water (Qureshi, 2002). Considerable and greater amount of water, it goes without that Afghanistan does have rich water resources but adversely the Afghans farmers still suffering from water scarcity due to poor conveyance irrigation structure, inequitable water distribution among the farmers and poor on-farm water management practices (Syedy, 2011). Based on the mission and strategy of Ministry of Agriculture, Irrigation and Livestock of Afghanistan (MAIL) there is need to conduct a research as a farm level in that areas where farmers have been facing severe water scarcity especially at the downstream of canals particularly in autumn/summer seasons in order to highlight and find out the possible solution and ways for the reduction of water scarcity in the area and as well as to increase irrigation efficiency, more land under cultivation, and maximize crop production. The core focus of this research is on three main aspects to achieve the objectives and as well as to know which of these aspects are more influenced on water shortage or scarcity in the area, these aspects follows namely; studying traditional water management system, physical structure of the irrigation canal and current on-farm water management practices of the farmers.

Study Area and Methodology

The research area is Landikhil irrigation canal command area with 163.4 ha, which is located in Pachir Agam district, Nangarhar province between 34° 12' 31.78 N and 70° 16' 09.00 E, and the elevation around 1260 meters above from sea level (Figure.1). The annual average precipitation of Nangarhar province is 171-204 mm, and annual potential evapotranspiration is 1350 mm (SHAMS, 2016). And the temperature is fluctuated from 44°C to -1 °C in summer and winter respectively.

For the estimation of irrigation water requirement meteorological data (Sunshine hours, Wind speed, Relative humidity, temperature, and precipitation), soil and crop characteristic were used in CROPWAT 8.0 application (J. Doorenbos, 1992). For the estimation of canal conveyance losses, the inflow-outflow method will be used. And also, the survey was conducted in the field for the current situation analysis the information was obtained about cropping pattern & calendar, infiltration rate, canal water discharge, traditional water distribution, on-farm water management practices of the farmers, and physical condition of the canal from the field. The land cover and soil map data which is prepared by MAIL/FAO was used in ArcGIS software for the spatial distribution of the study area.

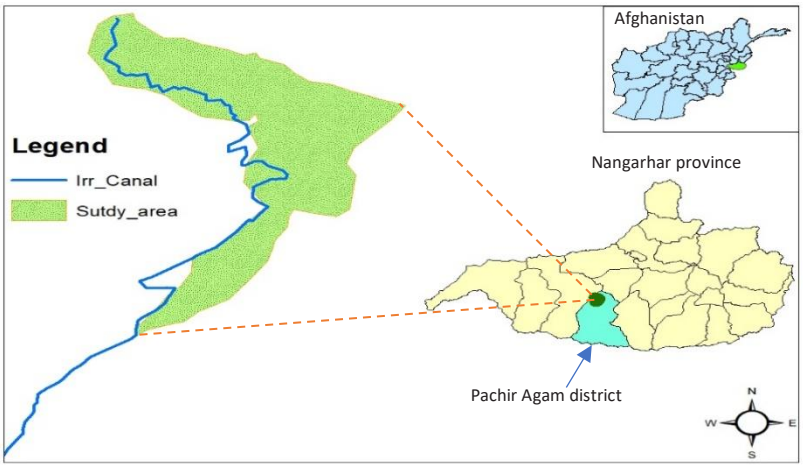

Figure.1 Study area

*島根大学大学院生物資源科学研究科 Shimane University, Graduate School of Life and Environmental Science
**島根大学生物資源科学部 Shimane University, Faculty of Life and Environmental Science
キーワード：畑地灌漑，灌漑施設，用水管理

Result

The calculation of gross irrigation water requirement for summer crops (Maize, Rice, Peanut, Tomato, and Orchards) shows (Fig.1) that at the month of Aug needs more water than the other months and the water supply cannot meet the irrigation water requirement. The Figure.2 indicates that in the study area the high amount of rainfall is in the late winter and early spring where the high evapotranspiration occurs in summer. Therefore, it needs more irrigation than other seasons.

The daily canal discharge data which has been collected from Aug to Dec 2016 (Fig.3) shows some fluctuation due to the few days rainfall on the mountains and poor structure of canal intake, leakage, and illegal water is converted to other canals.

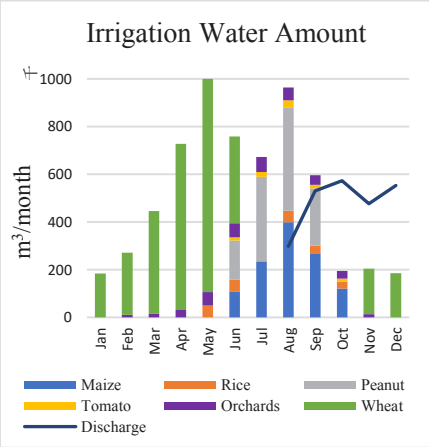

Fig.1 Irrigation water demand and supply

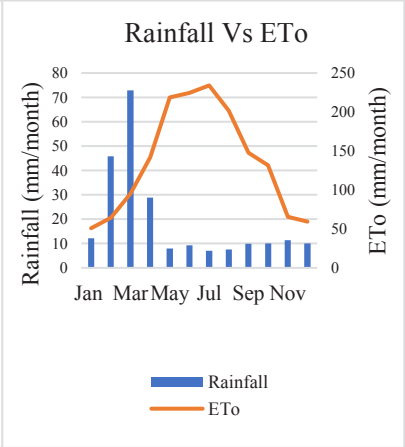

Fig.2 Climate condition of the study area

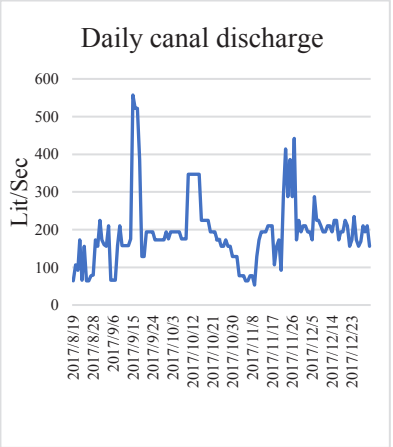

Fig.3 Daily canal water discharge.

Discussion and conclusion

The climate data indicates that in the study area the evapotranspiration is much higher than the effective rainfall in summer. The primary calculation of gross irrigation water requirement and available water supply shows the August is the critical month regarding water shortage which the growth of the crops is at the development stage in this time.

The result of interview and survey indicated that in the Landikhil irrigation canal water scarcity in autumn/summer has different reasons; according to the traditional water distribution system these points are concluded that irrigation water was managed by community-based which is called Mirab System, water was distributed among the farmers by land size, illegal water use, and inequitable water distribution among the farmers, and the irrigation canal was clean up once in three years which is caused the canal cannot to transfer enough water to the downstream area. The survey reveals in the terms of current on-farm water management practices which are done by the farmers, over irrigation, unawareness about crop water requirement and irrigation scheduling, no restriction on crop pattern, and the majority of farmers level their lands once in three years and as well as most of them were used basin irrigation method. Regarding the physical condition of the canal the interview and personal observation revealed that there was not exist improved water control structure, overtopping, leakage, poor intake and outlet structure, and many times the intake wash away by flood mostly in the autumn which caused farmers have been faced water scarcity.

Future scope

- Collecting daily water flow discharge continuously up to next Aug/2018.
- Calculating the watering amount for spring and summer crops and compare with available water supply.
- Measuring of conveyance and field water losses and determining of irrigation scheduling.

References

J. Doorenbos, W. P. (1992). Crop Water Requirement, FAO Irrigation and Drianage Paper 24. *http://www.fao.org/docrep/S2022E/s2022e07.htm*.

Qureshi, A. S. (2002). Water resources management in Afghanistan: The issues and options.

SHAMS, H. K. (2016). Study on effective utilization of irrigation water in Afghanistan.

Syedy, S. H. (2011). Water scarcity management in Nanrang irrigation canal, Kunar/Afghanistan.