Case Study on Agricultural Rainwater Utilization Sites in Korea

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Background and needs

Rainwater and agriculture are becoming ones of remarkable fields for climate change adaption in Pacific-Asia region. Rainwater management; harvesting, storage, retention, filtration, supply and utilization is a multiple technology for various water problems; shortage, contamination and disaster. Private water consumers as urban residents or farmers can take their own water resource of rainwater independent from centralized large water system. A number of inter-regional societies support this simple and low cost rainwater system development as a kind of sustainable agricultural water resource. Korean rainfall pattern is changing into that of monsoon, which has heavy rainfall during summer from June into August and drought for spring and winter season. In the last year of 2012, the Korean total rainfall depth from March to May was only 8~10% of the average value of the last 30 years. This drought caused the production decrease of 10~20% from dry-field farming. Rural Development Administration, Korea is surveying the water management and geological conditions of dry-field farm to develop the technology of rainwater harvesting and utilization. This study analyses problems of the existing rainwater system in Jeju island and the province of Jeollanamdo, consequently to propose engineering parameters of rainwater system design and installation

Rainwater system in Jeju island

The self-governing province of Jeju island manages the most many rainwater facilities for agriculture and tourism in Korea. Jeju government has released the first regulations on the installation and institutionalization of rainwater facility in 2004. The regulations reinforce rainwater utilization in large tourism sites and support the installation of rainwater facilities in greenhouses as voluntary.

In the year of 2011, Jeju has agricultural rainwater retention total capacity of 27,713 ton in 200 sites. This is about 154 times of the 180 ton in 4 sites in the year of 2006. Jeju government plans to consistently develop rainwater system.

Fig 1. Rainwater canal in green house roof, Jeju

Fig 2. Rainwater tank, Jeju

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The cases of rainwater facilities in Jeollanamdo

Jeollanamdo, especially its coastal area promotes real scale pilot systems of rainwater reservoirs and tanks. Dumbeong, Korean traditional small agricultural pond is developed into a rainwater reservoir. Dumbeong retains precipitation water for late autumn and winter seaon, The stored water supplies into paddy field or dry-farm field during the dry season from April to June. This reservoir generally exists in small and useless side area nearby farm field. The Dumbeong in Wando of Fig. 3 is filled up with rainwater from greenhouse roof. This pond of 700 ton supplies water for cherry tomato farming in the green house of 25 a. Other type of Dumbeong in Muan of Fig 4 in 700 ton storage capacity retains rainwater from mountainous slope and supplies water for surrounding paddy field. Constructed rainwater pond type is also found in Gochang region (Fig. 5).

Fig 3. Dumbong, Wando

Fig 4. Dumbong, Muan

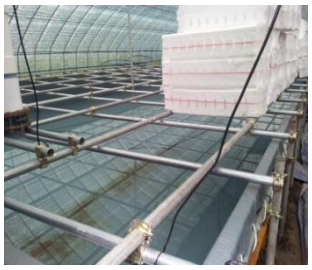

Fig 4. Rainwater tank, Gochang

Conclusion

Rainwater utilization in agriculture is spreading to adapt change of water circumstance. Even though the cases of this study shows successful experience of rain water system, only limited field and not engineered design. Scientific research and analysis on rainfall, system design and structure would be necessary for more effective and economical rainwater utilization. Rainfall time distribution analysis is a critical factor in the decision of rainwater retention volume. Design rainfall hyetograph constructed on accumulative monthly rainfall data would be appropriate to agricultural water consumption. Additionally, suspended solid (SS) flows into rainwater reservoir causes problems in water quality and retention capacity. Screen facilities or sedimentation basin pre from a retention tank is necessary to develop for agricultural rainwater system.

References

Choi. Gwangyong, 2012, Legacy of Rainwater Use in Jeju island, Korea, The 3rd International Conference on Rainwater Harvesting & Management, International Water Association.

Kim. Youngjin, 2008, A Design Method of Rainwater Tank Retention Volume for the Control of Runoff from Building rooftop, doctoral thesis, Seoul National University.

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