Preliminary assessment of rice productivity at different locations within non-system tank irrigated ecosystems in South India

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Introduction: South India is a major rice producing area where most of the rice is grown under irrigated conditions. About 7% of the rice in India is grown in autumn, this season is named as Kuruvai/kar/Sornavari in Tamil Nadu. Short duration rice varieties ranging from 90 to 120 days are sown in this season. Total net irrigated area by tanks (0.53 million ha in 2011-12) accounts for 18% of total net irrigated area under rice and out of this, non-system tanks which are not connected with river or creek systems and depend on catchment of rainfall have about 0.4 million ha of tank-irrigated rice ecosystem. Virudhunagar district near Madurai, Tamil Nadu is a major rice growing area with many non-system tanks. We conducted the eco-physiological survey at two typical non-system tanks with different size in order to assess spatial variability of water distribution and rice production within a tank irrigated ecosystem.

Material and Methods: Eco-physiological survey was conducted at two villages, Sirukulum (9° 39′ N, 78° 12′ E, smaller tank) and Srirampur (9° 39′ N, 78° 10′ E, larger tank) in Virudhunagar District, Tamil Nadu India. Village farmers’ interviews were conducted in order to collect information regarding rice cultivation methods, use of cultivars, fertilizer details, cultural practices, number of irrigations and grain yield for 3 years from 2012-2014. The GPS maps of tank-irrigated rice ecosystems were made in order to know the boundary, total area and location of irrigation channels for distribution of water. The sampling survey of 25 and 27 rice fields, respectively in Sirukulum and Srirampur was conducted in 2014. The fields were grouped into three locations by distance from the tank (i.e., upstream nearby tank, downstream far from tank, in-between middle location) for assessing water distribution, managemental variation, and rice productivity.

Results and Discussion: Maximum tank sizes from GPS map were 16 and 28 ha in Sirukulum and Srirampur, respectively, with approximately 300 to 400 fields and 70 to 80 fields within each rice ecosystem. Both tanks are considered as panchayat union (PU) tanks managed by community which occupies 78% of tanks in Tamil Nadu whereas there are larger tanks (> 40 ha) managed by government’s Public Works Department (PWD). Interviewed average field-based yield in Srirampur was 3.1 t ha⁻¹ (N=98) in the drought year 2012 and 3.9 t ha⁻¹ (N=109) in favorable rain year 2013, and fields receiving 12 to 16 times of irrigation (10 to 14 times from tank supplemented by 1 to 4 times from bore-well in 2012 and almost all from tank in 2013) yielded highest ranges (3.4 to 3.9 t ha⁻¹ in 2012 and 3.8 to 6.4 t ha⁻¹ in 2013). In Sirukulum, many fields could not be harvested in 2012 while most of the fields planted were harvested in 2013, with the average yield 4.3 t ha⁻¹ (N=68), with 5.3 and 1.5 times of irrigation from tank and bore-well, respectively. Sampled grain yield in 2014 was higher in Srirampur (4.4 th a⁻¹, N=27) than in Sirukulum (2.9 th a⁻¹, N=25), and higher at the head location nearby the tanks (4.3 th a⁻¹) than at the downstream tail location (3.3 th a⁻¹). In Srirampur in 2014, the sampled grain yield was higher in the 2 shorter duration varieties (JGL, ANNA4) (4.6 t ha⁻¹) than a longer duration variety (BPT5204) (3.8 t ha⁻¹).