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RESEARCH REPORTS

SUSTAINABLE AQUACULTURE FOR A SECURE FUTURE

Title: A pilot study on the spatial and temporal soil moisture distribution in integrated crop-fish-wetland and crop-wetland agroecosystems in Zomba-East, Malawi

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Abstract: Integration of aquaculture into existing agricultural systems has been reported to improve productivity and ecological sustainability through better water management, improved soil fertility arising from waste recycling and synergies occurring between the aquaculture and agricultural components, and extension of the crop growing season. While information is available on the role of integrated systems in improving soil fertility and waste recycling, quantitative data on the influence of fishponds on the length of the crop growing season, and the temporal and spatial distribution of soil moisture around fishponds is not available. I therefore quantified the influence of fishponds on soil moisture regimes on six farm systems in Zomba district by comparing the spatial and temporal distribution of soil moisture between farm subsystems with fishponds (integrated crop-fish-wetland) with that from adjacent sites without fishponds (crop-wetland). Four sampling transects, each with five sampling sites placed at 2, 4, 6, 8 and 10m from the pond dike were established at four cardinal points of the pond. Soil samples were obtained biweekly from each sampling site for gravimetric soil moisture determination. Sampling was terminated when soil moisture content fell below the permanent crop wilting point, which for this study was 13%. A similar procedure was adopted for the crop-wetland subsystem; however, a predetermined axis in the subsystem was used as a reference point for the placement of transects. Soil moisture content was measured gravimetrically. A paired t-test was used to determine differences in soil moisture content between the integrated crop-fish-wetland and crop-wetland subsystem. The length of the crop-growing season was defined as the period during which soil moisture content was above the permanent wilting point and below field capacity (23% moisture content). One-way ANOVA was used to determine significant differences ($P< 0.05$) in the spatial distribution of soil moisture between the four cardinal points of each subsystem. Significant differences ($P< 0.05$) in soil moisture content between the two subsystems were detected at five of the six farms sampled. At two of the sites where

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significant differences were detected, the crop-wetland subsystem had significantly higher soil moisture content than the integrated crop-fish-wetland subsystem. Placement of a fishpond in a seasonal wetland did not influence the length of the crop-growing season. These initial results appear to suggest that although integration of fishponds in crop-wetland systems may significantly affect soil moisture regimes, these differences are not important in so far as the extension of the crop-growing season is concerned. Since the study used a small sample size and soil samples from the top 15cm of the soil, and the fishpond may influence soil moisture below this zone, further studies that incorporate more farms and sample at depths greater than 15cm are needed before definitive conclusions on the influence of fishponds on soil moisture regimes in seasonal wetlands are drawn.

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