

COMPARING ROTATION CROPS FOR SUSTAINABLE COTTON PRODUCTION IN THE MACQUARIE VALLEY OF NEW SOUTH WALES

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Crop monoculture frequently causes a build up of weeds, diseases, insects and soil fertility problems. Furthermore, continuous cotton production in the Macquarie Valley often causes soil compaction, leading to poor crop growth and yields. While cotton growers in the Macquarie Valley have shown an interest in using rotations to minimise degradation of the crop environment, information on the merits of different rotations is sparse. This experiment was set up to provide such data.

MATERIALS AND METHODS

An experiment was established in 1993 to evaluate the effect of seven rotation systems (including fallow) on cotton (*Gossypium hirsutum*) yield, soil quality and economic returns in a sodic, grey clay (Entic chromustert; Ug 5.24) in the Macquarie Valley (147°46'E, 31°47'S). The rotations were low (rainfed and unfertilised) or high (irrigated and 83 kg N/ha) management wheat (*Triticum aestivum*); low management wheat followed by dolichos (*Lablab purpureus*), with and without fertiliser (24 kg P/ha and 73 kg K/ha); field peas (*Pisum sativum*); long fallow; and continuous cotton. All treatments were sown to cotton in 1994-95. Grain produced by the wheat was removed, whereas dry matter from the wheat, field peas and dolichos was incorporated. Total dry matter produced was 5.2, 9.5, 3.5 and 7.2 t/ha by low and high management wheat, field peas and wheat plus dolichos respectively. Soil properties monitored were compaction (cone index measured with a recording penetrometer), organic matter fractions (particulate, mineral associated and total), plastic limit (drop cone penetrometer), pH (0.01M CaCl₂), nitrate-N (extracted by 1M KCl), exchangeable cations (extracted by alcoholic 1M NH₄Cl, pH 8.5) and aggregate stability (as dispersion index).

RESULTS AND DISCUSSION

Extensive drying of the soil profile is known to facilitate cracking and ameliorate compaction in cracking clays. In this context, low management wheat resulted in the driest soil profile in 1993, fallow the wettest, while high management wheat and field peas were intermediate. Cone index values during the 1994-95 season indicated, however, that trafficking rather than profile drying was the major determinant of soil compaction; i.e. lowest and highest compaction were observed under fallow and continuous cotton plots respectively. With respect to other soil properties, fallow resulted in lowest aggregate stability, particulate organic matter, plastic limit, exchangeable Ca and Mg and highest pH, whereas highest nitrate-N occurred where field peas were sown. When all treatments were sown to cotton in 1994-95, continuous cotton produced least lint, with no significant difference between the other rotations. Lint production was 1.79, 2.05, 2.19, 2.09, 2.19, 2.04 and 2.00 t/ha by continuous cotton, fallow, field peas, low and high management wheat, wheat followed by dolichos with and without fertiliser, respectively.

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