BUDGET SUMMARY

Source of Funds	Seasons	Amount ($)
A.C.G.R.A.	1981-82	2500
	1982-83	17525
C.R.C.	1983-84	13950
	1984-85	16385
	1985-86	9250
	1986-87	10405
TOTAL		70015

SUMMARY OF RESULTS AND BENEFITS TO INDUSTRY

Waterlogging damage to furrow-irrigated cotton is surprisingly high. Over 100,000 ha of cotton are irrigated each year in NSW, predominantly on fine-textured cracking clays. Each furrow irrigation waterlogs these soils for 2-3 days on average (reference[3,4,9]), and crops are irrigated up to six times per season (average approximately four). In the absence of rain, this gives 1 days of waterlogging per season on average, with yield loss per day averaging 30 kg lint/ha([9]). Thus 300 kg lint/ha yield loss is average, which at S1.50-S2.00/kg is S450 to $600/ha per year. ***Over 100,000 ha, the total loss to the industry (in NSW) is $45m to $60m per year.*** More loss occurs in wet seasons, when the number of days of waterlogging can exceed 20. However, this does not double the loss since the yield response follows a decay function([1]).

Approximately 10% of the yield loss (S4.5m to $6m p.a.) can be readily recovered by completing irrigations quickly and maintaining deep, clean furrows to remove excess water([2,3,9]). Current work is evaluating the additional benefit of increasing field slope. Tactical applications of foliar nitrogen fertilizer can also recover a considerable proportion of lost yield under certain conditions, which have now been defined([4,7,9]). Present experiments in a new CRC-funded project ('Improving Soil Aeration for Cotton') are addressing the remaining loss.

ACHIEVEMENT OF AIMS

This has been a major, long-running project, and all of the stated aims have been achieved. In addition, several ancillary projects which were necessary for the success of the major project have been completed. These include: quantifying the physical properties of these soils under irrigation ([2]); calibrating the neutron method of estimating soil water content ([6]) and the gamma and neutron methods of estimating soil bulk density ([8]); determining the critical limits of oxygen exchange in these soils ([10]); demonstrating that oxygen diffusion is a sensitive index of changes in the structure of these soils ([11]); ameliorating damaged soil structure by using wheat and safflower crops to deeply dry and crack the soil ([5]); and evaluating the relative tolerance of summer grain legumes to waterlogging and assessing their potential for irrigated cropping ([12]).

DIFFICULTIES

The biggest difficulty was rain when it closely followed the imposition of waterlogging treatments. Nevertheless, no field experiment was writted off by this factor and the results from all experiments have or are being published. Field experiments offer the only realistic option for a project of this type because the behaviour of both cotton and cracking clays is almost impossible to reproduce under controlled laboratory or glasshouse conditions. The large, indeterminate, bushy cotton plant has a prodigious ability to compensate for variation in plant spacing; thus plant variability, pot spacing and buffering of outermost plants present logistic problems in glasshouse experiments. Cotton root growth and leaf canopies in field experiments are likely to be more uniform and more relevant to commercial applications. The non-random variability associated with cracks of these soils makes representative soil sampling difficult, particularly at depth, but problems associated with reproducing this variability in the glasshouse or laboratory are almost insuperable.