BED SYSTEMS

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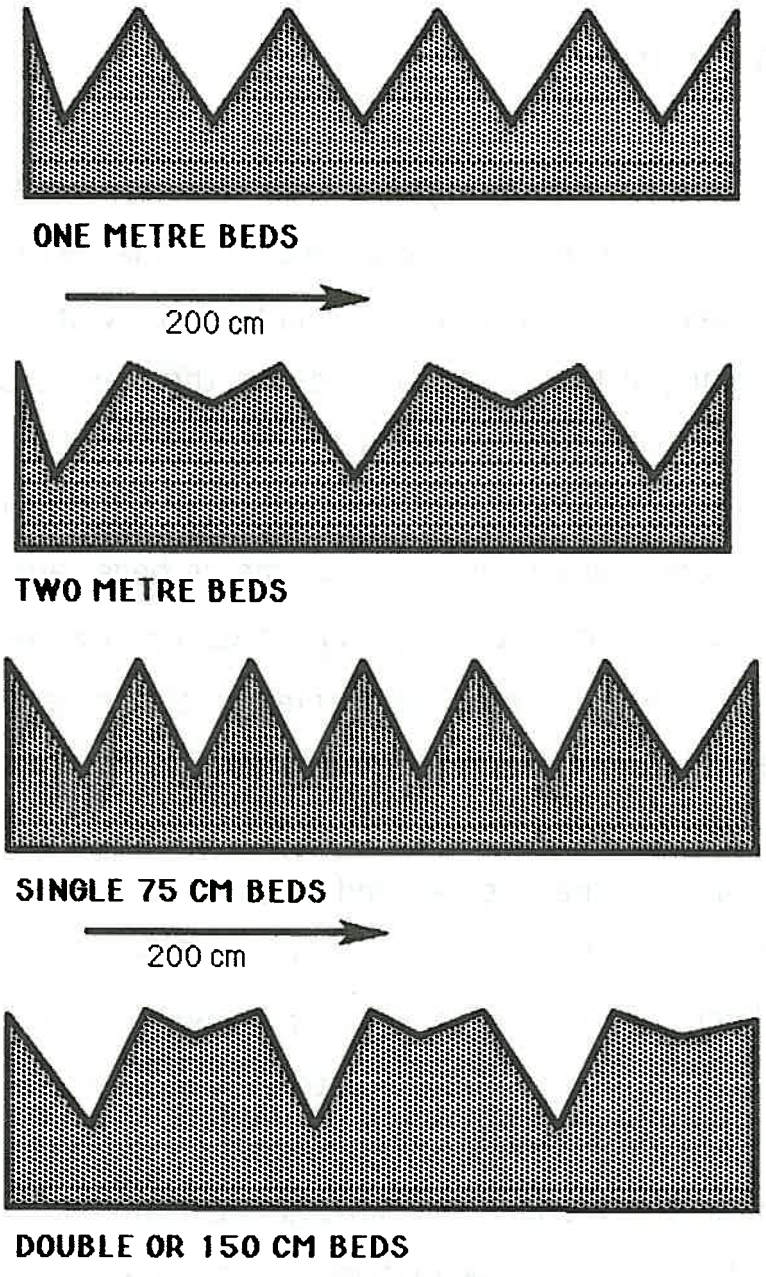
INTRODUCTION

In surface irrigation systems we use beds rather than growing the crop on the flat for several reasons. The two most important reasons are to assist in the control of water and to avoid waterlogging of the cotton; a condition the crop does not enjoy and which can reduce yields drastically. Traditionally, cotton has been grown on one metre beds with furrows either side. In the last ten years "wide beds" or two metre beds, with two rows of cotton planted on a bed having irrigation furrows on 200 cm centres (see Fig. 1), have been tried in the industry. No surveys are available but the area of cotton planted to wide beds could be as high as 20,000 ha. In more recent years 75 cm or 30 inch cotton has become topical and a small area of crop is grown commercially under this configuration. This paper restricts most of its discussion to the comparison between the use of one metre and two metre beds, identifying the advantages and disadvantages of both systems. Results of on farm trial work evaluating these two systems is included. A limited discussion on the role of wide beds with 75 cm row spacings is also included.

Figure 1 Bed configurations as described in the paper.



ADVANTAGES AND DISADVANTAGES OF WIDE BEDS

It is important to realise that the wide bed issue is largely "horses for courses". There are certain situations such as soils with restricted water infiltration characteristics or steeper slope, where wide beds may not be suitable. People wishing to try wide beds should seek further information so that the suitability of their particular field situation can be assessed.

(A) PERCEIVED BENEFITS

People have tried wide beds for a variety of reasons. Perceived benefits of wide beds have included :

* Horsepower savings from decreased draft by not having to pull or work every furrow.
* Water savings by reducing the surfaces exposed to evaporation and soil disturbance.
* Improved use of storm rain by the wide-bed surface.
* Slightly lower refill points for irrigation when using neutron probes for scheduling.
* Improved soil condition by reducing the soil exposed to inundation by furrow irrigation.
* Improved soil condition by minimising the steel to soil contact in the middle of the bed.
* Reduced root pruning by cultivators.
* Suitability to minimum tillage and permanent beds.

PERCEIVED BENEFITS (continued)

* Potential yield benefits from reduced waterlogging.
* Improved watering where side fall is a problem.
* Reduced capital to fully equip a farm with syphons.

(B) ADVANTAGES

Unfortunately there is not a lot of experimental experience dealing with wide beds in Australian cotton and so the above list of perceived benefits remains largely untested scientifically. It would appear from talking to those people farming on wide beds that the greatest benefits have come through advantages to management rather than yield improvements. The advantages that experienced farmers now claim for wide beds include:

* Less horsepower needed to cultivate and list, with tractors often running several gears higher.
* Ease of nitrogen application with solid or gas fertilizer being applied in the centre of the wide bed.
* Less striping where nitrogen is applied to the middle of the wide bed.
* Better crop response following a crop irrigation with less yellowing and crop set back.
* Greater advantage taken of rain from short sharp storms and showers.

ADVANTAGES (continued)

* The ability to give a crop a quick flush without unduly cooling the beds or overwatering small cotton.
* Easier minimum tillage management and well suited to permanent bed farming systems.
* Improved weed control from cultivation across the top of the wide bed with shallower working to cut out all weeds.
* Improved evenness of irrigation and generally faster irrigations. (Note this evenness is not always the case particularly after deep working)
* Side fall problems and row breakages which cause problems with irrigation are virtually eliminated.
* Soil structure in the central section of the wide bed becomes more friable and general root growth is encouraged.
* In certain soils, particularly where waterlogging is a problem, yield increases of 7 to 10% have been measured.

Tables 1 to 6 show the results of the available wide bed yield comparison trials. These trials indicate wide beds have given a yield increase in half of the known trial assessments.

(C) DISADVANTAGES

Like many farming systems the advantages need to be

assessed against the problems that are encountered. It is then up to growers or their crop managers to decide whether the benefits out-weigh the disadvantages. The potential problems which have been experienced in the field with wide bed farming systems include :

* Subbing or infiltration problems on lighter soils, especially red-brown earths and on certain grey-brown clays.
* More care required on pre-irrigation and watering-up to ensure the seed zone is adequately watered.
* More reliance on watering-up rather than moisture planting although careful bedshape and appropriate timing of pre-irrigation can offset this situation.
* Very low fruiting limbs will sometimes rest on the ground and run the risk of boll rot or being missed by the plant lifters of the picker.
* Special care needed with cultivation to avoid the creation of a ridge on the inside of the bed which will cause problems with plant lifters at harvest.
* Uneven watering can result where wide beds are used on freshly chiselled soil, accentuating the difference between wheeled and non-wheeled furrows.
* Northern row sometimes emerges ahead of southern row. Some people consider this a problem although there is no evidence to support that view.

APPLICATION TO NARROW ROW (75 CM) COTTON

While this discussion is based on one metre spacings, some mention of narrow row cotton farming is relevant to wide bed technology. It is thought that wide beds are useful where waterlogging is a problem. In early trial work using 75 cm cotton at Auscott Narrabri it was visually obvious that single 75 cm rows suffered (went more yellow) more than one metre rows or 75 cm rows grown on 150 cm wide beds. Unfortunately picker wheel configurations and subbing considerations make it difficult to avoid single 75 cm rows. Although not tested, it is quite likely that 75 cm cotton grown on 150 cm wide beds could be very beneficial. To achieve this on a commercial scale will require changes to wheel configurations of pickers and tractors. Narrower tyres with 300 cm centres are options which may be appropriate to the success of this system.

CONCLUSION

Wide beds are not suited to all fields. Careful selection of the soils on which to utilize wide bed technology is important. Where subbing and water infiltration are a problem wide beds may be difficult to manage. On soils prone to waterlogging wide beds can be quite beneficial and yield increases of up to 10% have been achieved. Wide beds are very suited to permanent bed systems as they assist in controlled traffic and biological stabilisation and improvement of soil structure.

75 cm or 30 inch cotton is an alternative system of bed farming.

On heavier soils the ability to grow successful narrow cotton may well depend on the ability to succesfully farm 150 cm or 60 inch wide beds. To achieve this, narrower wheeled tractor tyres and realigned picker wheel centres will be required.

"Horses for courses" is a key to the suitability of wide beds. Where they are appropriate both yield advantages and cost savings can be achieved.

ACKNOWLEDGEMENTS

The inputs and ideas from Lindsay Smith, Peter Morrison, Michael Finucane, Sue Forsell, Harvey Gaynor, Terry Haynes, Jeff Bell, Bill Duncan and Curly Murphy are greatly appreciated.

TRIAL RESULTS

Table 1 1989 Auscott Narrabri : Heavy grey clay with 1 in 1500 slope. 4 replicates.

TREATMENT MEAN YIELD	B / HA	B/AC
WIDE BEDS	7.8	3.2
METRE BEDS	7.3	3.0
Yield increase = 6 %.	Statistically significant.	

Table 2 1990 Auscott Narrabri : Heavy grey clay with 1 in 1500 slope. 4 replicates.

TREATMENT	MEAN YIELD
WIDE BEDS	109 %
30 INCH	110 %
ONE METRE	100 %

30 inch and wide beds not statistically different.
30 inch and wide beds statistically significant to one metre beds. 9% yield increase

Table 3 1990 Auscott Midkin : Medium grey clay with some fine gravel content. Block trial not replicated.

TREATMENT	MEAN YIELD	
	B / HA	B / AC
WIDE BEDS	6.35	2.57
ONE METRE	6.55	2.65

Results not statistically analysable.

Table 4 1991 Auscott Midkin : Medium grey clay with some fine gravel content.. Five replicates.

TREATMENT MEAN YIELD

	B / HA	B / AC
WIDE BEDS	6.75	2.73
ONE METRE	6.84	2.77

Results not statistically different.

Table 5 1992 Auscott Midkin : Medium grey clay with some fine gravel content. Five replicates.

TREATMENT MEAN YIELD

	B / HA	B / AC
WIDE BEDS	7.19	2.91
ONE METRE	6.97	2.82

Results not statistically significant.

Table 6 1991 Auscott Warren : Medium grey clay with five replicates.

TREATMENT	YIELD B / HA	B / AC
WIDE BEDS	6.54	2.65
ONE METRE	6.81	2.76

Results not statistically significant.