DICK HOUGHTON (IFFLEY COTTON PTY LTD - ROWENA)

MINIMUM TILLAGE - A GROWER'S EXPERIENCE

INTRODUCTION

The subject of minimum tillage is one that has been discussed on "Iffley" for many years. However, it is only during the last four land preparation seasons that any real effort has been made and experience gained in establishing a Minimum Tillage System. I am sure there are many here today who have been involved in mimimum tillage systems over a much longer period of time. Methods such as "Middle Busting" were being developed many years ago.

Firstly, it is important to define "Minimum Tillage" as it applies to our operation. Our objective in achieving such a system is more correctly described as a"Permanent Bed" system i.e. we have totally directed our efforts to maintaining the same bed.

In discussing this subject and the methods we have tried it is also important to point out that our experience is confined to the heavier soil types of the Lower Gwydir System. Other factors that must be kept in mind in discussing the application of Permanent Bed methods on "Iffley" are:-

1. The climatic variability of the area - particularly during the land preparation period.
2. That during the period of our experience with Permanent Bed Systems we have been growing cotton totally back to back i.e. no rotation.

3. That we have been using a very high volume irrigation system which requires ideally a very high, consolidated bed.
4. Our operation from its commencement has been based on the use of twelve row equipment and that any system developed had to be compatible with the use of this equipment for the row crop operations.

HISTORY OF PERMANENT BED SYSTEMS ON "IFFLEY"

Following the drought year of 1982/83 it was decided to use the same beds on the farm for the following year's crop. This was a relatively easy task as three quarters of the crop planted for the 1982/83 season did not receive a crop irrigation and was in fact "skip rowed". The remaining quarter of the crop received three crop irrigations. Generally there was very little plant material to contend with and Permanent Beds for the 1983/84 crop were achieved using existing conventional equipment.

For the following crop i.e. 1984/85 it was again decided to use permanent beds. However, circumstances had changed considerably in that there was considerably more plant material to contend with as well as a reasonably wet winter period, and our objective using again our conventional existing equipment failed because of:-

1. The inability of the equipment to handle the plant material left on the surface after slashing.

2. Soil conditions would not let us cut the old plant stalks out of the bed.

It was more the fact that the volume of surface trash combined with wet ground conditions that prevented us from achieving our objectives for that year and we consequently ended up with a very late conventional land preparation for the 1984/85 crop.

Changes to our methods were necessary and it was for the 1985/86 crop that we introduced equipment which allowed us to pull the old cotton plants from the beds and shred the plant material into much smaller lengths than that achieved with the normal slashing operation. It was this equipment that has really provided a turning point in achieveing a successful Permanent Bed operation and allowed us to bed up 90% of the farm for the 1985/86 year.

For the current season we have Permanent Bedded some 50% of the acreage for cotton. The reduction is due to some problems introduced into some of our fields during the course of the last crop and these will be mentioned later.

OBJECTIVES OF PERMANENT BED SYSTEMS

The history of cotton production on "Iffley" being one of continuous cotton since we commenced with the crop of 1980/81 has meant that our total land preparation period fore each crop has been confined to the winter months.

When we have prepared the farm conventionally i.e. plow down etc. and re-list, we have found that:-

1. In a wet winter the time available was even further compressed and the risks of introducing problems such as compaction increased tremendously.
2. In a dry winter the cloddy conditions resulting from conventional methods were nearly impossible to handle.
3. In either of the above situations our requirement for a high, consolidated bed was rarely ever achieved.

We therefore saw our purpose in developing a permanent bed system as achieving the following objectives:-

1. To provide as ideal a bed as possible to achieve:-
   (a) Uniformity of the beds for planter operations.
   (b) Conditions for seed germination and plant establishment.

(c) Bed shape and tilth to allow proper incorporation of herbicides.

(d) A bed to control the water flows for operation of planters and cultivators.

(e) Uniformity of the beds for operation of planters and cultivators.

2. More time for land preparation because of the reduced number of passes required.

3. Earlier beds which allow time and the season to help in achieving the right planting conditions.

Another objective which, when combined with a permanent bedding system, gives even more time for Land Preparation is to achieve a single pick harvest. This we have achieved over the last two seasons and on each occasion land preparation has commenced on picked country within a few days of the start of picking, and in fact, beds have been reformed and Anhydrous Ammonia applied while pickers have still been in the same field.

METHODS AND EQUIPMENT

For this discussion the subject of Permanent Bedding is primarily concerned with what can be called the First Phase of Land Preparation i.e. the operations involved in achieving reformed beds following the picking operation.

Depending on seasonal factors,
Permanment Bedding may have some influence on the number of passes required and the equipment used for the following operations:-

1. Plant Removal and Shredding.

After our initial experience using slashers and conventional equipment we decided on the purchase of the Israeli U.S.M. for plant pulling and shredding for the first operation after picking.

We had determined that we needed a system to remove the old cotton plants from the bed to eliminate any problem of the old plants affecting the operation of planters and placement of the seed. It seemed after a few attempts that any soil engaging implement used to cut plant stalks from the beds would not achieve this aim in the variable soil moisture conditions that can exist from season to season or in fact in any one season.

We also thought that chopping of all the plant material including part of the root into shorter lenghts would have advantages in obtaining better and easier incorporation of plant residues: quicker breakdown of the plant material now and even more important factor in disease control, and fewer problems with euipment in the following operations.

The purpose for which these machines were purchased has largely been achieved. Three machines were used to shred 2,400 ha in the first season and 1,300 ha this year. We have used the machines purely as shredders - and not with any bedding attachments mounted as our requirement was to shred the area required in the shortest possible time and follow with other equipment.

The machines have been operated on 24 hr shifts and have achieved their production objectives we initially set for their operation. Maintenance of the machines is a critical factor in their operation, and we adopted a policy of sharpening the chopper every 30 hours of operation and carrying out any other programmed maintenance at the time intervals specified. This attention is required to maintain the productivity of the machines and obtain the quality of the work in the field.

All machines work better in ideal conditions and the same applies to this equipment. Problems have been experienced when plants are to the side of the bed and volunteer plants not in the row. Plants that have branched out after insect attack are also a problem. Using the machines early in the season we have not experienced yet any problems with plants that have been affected by frosts.

REBEDDING

During the period of our involvement with permanent bedding our endeavours have been directed to reforming the beds and incorporating the trash in one pass- an objective we have yet to achieve for a number of reasons, which are:-

1. The varying soil moisture conditions which can occur during the period.
2. The use of 12 row equipment and particularly the power required to operate equipment of this size.
3. The type of equipment available either from recognised manufacturers or made in the farm workshop.

In respect to soil moisture conditions I am particularly referring to the influence moisture has on working the soil types on "Iffley".

At the time of the year we have commenced our Permanent Bedding operation i.e. during picking, one would hope that soil conditions are as dry as they have been for the whole season and it is in these circumstances we have had the most difficulty in finding sufficient loose soil to rebuild the bed and incorporate trash.

Our first attempt in dry conditions during April, 1985, was with a standard 12 row Lister on a 4 W.D. tractor. This proved to be impossible to pull and could not get sufficient soil to rebuild beds. The machine was reduced in size to six row and a chisel point placed in front of the lister bottom. This improved the operation and we had no other alternative but to keep going with this operation, but not without considerable problems with breakages of the implement. We decided on the purchase of an implement that would rip through the centre and reform the bed in one pass. However, we never saw the machine working in the dry situation as we recorded 5 inches of rain within a week of ordering the machine. The operation then reverted to a 12 row basis using the conventional lister to rebuild the beds.

The advantage to us in that season was in the fact that we did have beds partly built and were able to take advantage of soil moisture conditions that developed to achieve our desired high, consolidated bed and provide the best tilth for planting we had experienced.

During the current land preparation season which until recently again remained very dry we were able to use the machine purchased the previous year. This implement is fitted with ripper shanks in the centre of the bed and discs attached to the shanks to reform the bed in one pass.

The machine is a 6 row linkage unit and we operate it with a 260 HP 4 W.D. tractor.
With this operation we also applied Anhydrous Ammonia.

The 6 row unit is as much as the tractor can comfortably handle so we still have to make a second pass to reform the rows into sets of 12.

The centre ripping of the bed does create a lot of airspace (in fact quite large cavities) in the bed. Fortunately, the recent rains which have totalled 75 mm have penetrated sufficiently to overcome this problem.

For this season and last our operations to "bed up" have been the first pass with the shredders followed by two passes to rebuild the beds and for our particular situation reform them into sets of 12.

We have yet to experience a totally wet season using a permanent bed system so our operations in such a situation have not yet been finally determined. We do see however considerable advantages in not having to plow down as a part of land preparation as this can expose us to many risks with rain and wet country.

Our first reaction would be to stay off the fields as long as possible. We would also not rip the centre of the bed. It is most probable that conventional equipment such as lister or go-devils if dry enough would be used to reform the beds and hopefully incorporate the stubble.

SOME OTHER ASPECTS OF PERMANENT BEDDING

In our relatively short experience with Permanent Bedding Systems we have become aware of one factor one must keep in mind when making any decision as to how and when to work country. That is compaction.

During the season just passed, wheel track compaction was noticeable in varying degrees throughout the farm. There were two periods during the course of the season when the problem was created - the first after rains in July, 1985 when still rebuilding the beds and the second following rains in November and early December when cultivation was delayed.

The cause was obviously working when conditions were too wet. The effect was to restrict water penetration in the wheel track furrows (remembering that with our high volume systems the water run on 1,000 metres takes only 5-6 hours). This was further compounded by the fact that we had decided to water run urea as a side dressing and not only was water penetration restricted but the quantities of Nitrogen applied as well. We therefore had quite a marked difference in plant growth and development in the centre four rows of each set of twelve.

The real problem is in dealing with this situation in a permanent bed system where cotton is to follow cotton.

In our situation we elected to Permanent Bed the least affected fields and revert to traditional methods including ripping on the more severely affected fields.

Time and rotation may well fix compaction problems and while we have introduced rotation for this season, our cotton fields for this season are still in a continuous cotton scene.

We have not found the answer to fixing this problem once created using Permanent Bedding methods. We are however acutely aware of how fragile our soils are in this respect and one can only say that the best answer is not to create the problem.

A second problem we experienced and is probably more associated with the combination of permanent bed and high volume irrigation systems is the colume of trash washed out of the fields.

We experienced considerable difficulty with our Tail Water Return systems choking up and tail ends of fields being inundated. The seasons can help with the breakdown of trash. However, incorporation is essential and with the high volume systems keeping the water flow down each furrow to the minimum that can be practically handled is also essential. Otherwise, the trash has to be removed from the system by physical or mechanical means to prevent problems developing within the fields.

SUMMARY

Taking into account all the factors affecting cotton production and Permanent Bedding Systems as they affect "Iffley", we see the advantages of such system as being:-

1. More suited to either wet or dry land preparation conditions where soil of fine tilth is maintained to allow better Herbicide incorporation and planting conditions, giving better weed control and better germination and plant establishment.
2. On the consolidated beds planters operate better and seed depth is more accurately controlled.
3. Quicker breakdown of remaining plant material assisting in disease control.
4. A short term fallow effect improving soil structure.
5. Consolidated beds giving better control of water in High Volume systems.
6. A possible accumulation of moisture from winter rains and having beds up earlier.
7. While it is difficult to quantify in our situation these systems of land preparation cost less. The biggest benefits however are agronomic and in protecting the soil as a resource.

As a final comment, it is the rebedding equipment we are now giving more attention to, to have suitable implements to rebuild beds and incorporate plant material for the range of soil moisture conditions that can be experienced.