THE ADAPTATION OF PROGRAMME PLANNING TO SUGAR FARMS AND ESTATES IN THE SOUTH AFRICAN SUGAR INDUSTRY

By R. H. PAXTON and A. LAMUSSE

South African Sugar Association Experiment Station, Mount Edgecombe

N. A. JOHNSTON

Umzimkulu Sugar Company, Port Shepstone

Abstract

It is generally accepted that the need for programme planning in the South African sugar industry is a vital one. The nature of the crop, with predetermined periods for harvesting and crushing, facilitates the introduction of planning. With advances in the purely technological aspects of cane production and the gradual move away from a labour intensive industry to increased mechanization, the design of management must change if full use is to be made of these advances in technology, and the resources now available to the grower. Two systems of programme planning are discussed, both using visual aids as a means of assessing requirements and evaluating progress.

SYSTEM I

Introduction

This method was originally designed by the Extension Service of the South African Sugar Association Experiment Station, and it endeavours to encourage the cane grower to examine past performance, take meaningful decisions in preparing his programme during the so called off-season and attempt to cover all known factors which will allow him to achieve his objectives. The necessary operations will be arranged throughout the harvesting season to allow for the best use of all the resources available.

It is assumed that the objective will be to increase profitability, through increasing yields by the most efficient and economic methods and by aiming at the climatic potential for the area.

Method

In practice this management programme will involve the completion of the following steps:

(a) collecting and recording all relevant information and achievement in the form of field records,
(b) using these field records in drawing up a cutting and ploughout programme, which will be the basis for
(c) the completion of an overall operations programme;
(d) an analysis of expected resource requirements to carry out the above programme and,
(e) finally, recording the actual performance in comparison with the planned operations on the overall operations programme.

A. Field records

The collection and recording of field histories are basic necessities in the drawing up of the programme and should include:

- Field facts: soil type, area, average slope, variety, etc.
- Field history: planting and harvesting dates and performance in terms of yield/ha, yield/ha/month, expressed as mass of cane and of sucrose, and yield in terms of rainfall efficiency, i.e. tons/ha/100 mm rainfall (and/or irrigation).
- Standards of performance: the labour requirements for planting, weeding, draining, etc, in man days/ha, and the machine requirements for ploughing, cultivating, etc, in tractor hrs/ha.
- Other information: occurrence of frost, waterlogging, erosion, etc.

Up-to-date field records will enable the first crop yield estimate to be prepared before the opening of the harvesting season, and will be essential in the preparation of the cutting and ploughout programme.

B. Cutting and ploughout programme (Appendix 1)

Once the first estimate has been completed, a daily rateable delivery is worked out by dividing the total estimated yield by the expected number of crushing days (usually 200 to 210).

Now an order of harvest of the fields to be cut is decided upon, considering such factors as ploughout time, age of cane, varieties, occurrence of frost, etc. This having been done, a more accurate final estimated yield is calculated by using previous yield performance figures, together with a growth factor, which is a measure of how the current crop is rated in comparison with that previously cut from the field. The expected age at harvest and the area of the field concerned are also used in this calculation.

The number of weeks required for harvesting each field can also be calculated. A critical examination of fields and a reference to farm records will be essential when drawing up this programme, and will ensure that all harvestable fields are taken into account and are cut at the optimum time, and that the estimate is an accurate one.

The cutting and ploughout programme forms the basis for the next step.

C. The overall operations programme (Appendix 2)

The operation programme is presented in the form of a large, colourful and relatively simple visual aid, divided into the months and weeks of the year. Each operation, including harvesting, is depicted by a colour as reference and, by means of standards formulated by recording on the field record cards, the time required for the completion of any particular operation can be indicated on the programme.

Particular attention will be focussed on the ploughout fields, as it is these fields on which operations will be concentrated, e.g. drainage, conservation works, elimination of old crop, planting, etc.

It is not unlikely that a provisional operations programme will be necessary to avoid clashes in operations and to ensure the optimum use of resources, before a final plan is completed. This will be followed by the:
The operations pegboard is made up in the following way:

(a) All fields are recorded down the left side of the board directly opposite a horizontal line of peg holes, with area and ratoon number as in the cutting programme previously prepared.

(b) The remainder of the board is divided, from left to right, into the months of the year, each perpendicular line of peg holes representing the weeks of that particular month.

(c) Each operation planned for the coming season is given an appropriate colour, with pegs coloured accordingly. The code is shown at the bottom of the pegboard.

The operations are recorded in the following way:

(1) The harvesting operation for the season is plotted, making use of the estimate and daily rateable delivery to calculate the time of completion of each field.

(2) This is followed by plotting the ploughout and planting operations, using standards of performance previously established.

(3) All consequent operations, such as windrowing, cultivating, fertilizing, are then plotted according to set standards except where it is known that additional time will be required to complete particular operations, e.g. extra drainage, bad weeds, etc. Adjustments are made after re-examination and assessment, spreading the work programme where necessary and considering the purchase of additional equipment if required. On completion of the operational pegboard, work sheets Nos. 1 and 2 (Appendices 5 and 6) are prepared, No. 1 being a detailed programme of individual field operations, showing total units of labour required and necessary materials such as fertilizer, seedcane, etc, and No. 2 a monthly labour forecast for each field.

Comparison of monthly labour requirements with estimated availability and performance may necessitate adjustment to the operations pegboard. After final adjustments to the pegboard, this programme is recorded on the operations schedule provided by the South African Sugar Association Experiment Station (Appendix 2) which is used simply as a record of the annual plan in its original form.

The Section’s annual budget is prepared from Work-sheets Nos. 1 and 2 (Appendices 5 and 6).

B. The monthly programme

During each month, as the operations are completed, the appropriate pegs are removed from the pegboard. At the end of each month an assessment of progress is made and the pegboard is adjusted accordingly, taking into account such factors as changes in the rateable delivery of cane.

Actual work performance in each field is recorded in field records, which permit standards of performance to be adjusted or verified. The actual operations performed each month are recorded against the original planned operations on the operations schedule (Appendix 2). This is done at each month end during the year, and serves as a quick visual comparison of operations actually performed against operations planned. Performance is also measured each month by comparing actual costs and standards with planned costs and standards.

Summary

In both the systems discussed the cutting and ploughout programmes are the basic requirements in the preparation of the operations programme. In order to prepare a satisfactory cutting and ploughout programme, adequate field records are
The annual plan or operations programme is used essentially in the preparation of financial and resource requirements for the total season.

The monthly plan will differ from the annual plan, in that unforeseen circumstances will arise, but at least all the operations included in the annual plan should be completed by the end of the year.

Comments

The methods of programme planning adopted by any particular grower will depend on his own personality and the objectives he wishes to achieve, but the fundamental principle of first assessing the resources required and then planning to use them in the most efficient manner will not change.

The presentation to the grower of more sophisticated systems of management planning in this form could result in their rejection and, initially at least, proposed systems should be designed to be compatible with the administrative resources available to the cane grower concerned.

An additional value of programme planning must be recognised: where an extension or advisory officer introduces the system, he can become wholly involved in the management of the farm or estate, and is thus far better equipped to assist the grower in assessing the strength and weaknesses of his operation.

Acknowledgements

We acknowledge, with appreciation, the co-operation and encouragement of the General Manager, Umzimkulu Sugar Company.

Appendix 1

### PLOUGH-OUT & CUTTING PROGRAMME

<table>
<thead>
<tr>
<th>Field</th>
<th>Area (ha)</th>
<th>Variety</th>
<th>Crop</th>
<th>Age at 1 April</th>
<th>Rating of present crop (%)</th>
<th>Fields to be ploughed</th>
<th>Order of harvest</th>
<th>Month of harvest</th>
<th>Estimated yield at harvest</th>
<th>Number of weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>tc/ha</td>
<td>tc/ha/mth</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Detailed instructions for the use of this form will be found overleaf. Please read them carefully.

**HOW TO USE THIS FORM:**

(a) Complete columns 1, 2 and 3, listing all fields to be worked in the milling season.

(b) Indicate in column 4 whether the crop is plant (P), first ratoon (1R), second ratoon (2R), etc.

(c) Complete columns 5 and 6. If you already have details of tc/ha/mth (column 6), then columns 6a and 6b need not be completed.

(d) In column 7 rate the present crop in relation to the previous one, in terms of percentage. Thus, a poorer crop might be defined as 85% and a better one as 110%.
Having completed columns 1 to 7:

(e) Decide which fields you intend ploughing-out and mark each one in column 8 with an "X".
(f) Now decide the order of harvest and list in numerical order in column 9.
(g) When this has been done, work out (one field at a time) columns 10, 11 and 12.
(h) Yields are calculated by adding to the age on 1 April, the number of months to the time of harvest, and then multiplying this sum by the multiple of columns 6e and 7.
(i) The number of weeks for harvest is determined by dividing the yield (column 11) by the rateable daily delivery, the latter being an estimate based on the rate for the previous season.

N.B. To extend the columns, fold back the top of the next sheet where indicated and attach to the bottom of the completed sheet.

### Appendix 2

**OPERATIONS PROGRAMME**

<table>
<thead>
<tr>
<th></th>
<th>MAY</th>
<th>JUN</th>
<th>JUL</th>
<th>AUG</th>
<th>SEP</th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- cutting
- ploughing

### Appendix 3

**REQUIREMENTS**

<table>
<thead>
<tr>
<th>Operations</th>
<th>Field</th>
<th>Area</th>
<th>Materials</th>
<th>Tractors &amp; Drivers</th>
<th>Working Days per month</th>
<th>Tractor hours (8 hr = 1 day)</th>
<th>Labourers</th>
<th>Working Days per month</th>
<th>Labour Days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 4

OPERATIONS PLANNING
(PEGBOARD SYSTEM)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>201</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>202</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>203</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>204</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>205</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>206</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>207</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>208</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>209</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>210</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>211</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>212</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Harvesting: Trash; Fertilizer: Ploughing; Land preparation and layout including Draining; Weeding; Herbicide: Roguing; Firebreaks; Planting; Scarifying

Appendix 5

UMZIMKULU SUGAR COMPANY LIMITED
FIELD PROGRAMME

Year — 1st April, 19... to 31st March 19...

Section Field No. Total Hectares
Date Planted Plant / Ratoon
Remarks

|-----------|---------|----------------|------|------|-------|-------|-----|------|------|------|-------|------|------|------|

Labour Requirements — Man Days

<table>
<thead>
<tr>
<th>Plant Cane Ha</th>
<th>Weed Control, etc</th>
<th>Ratoon Cane Ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearing:</td>
<td>Weed:</td>
<td>Trash Management:</td>
</tr>
<tr>
<td>Ploughing:</td>
<td>Chemicals:</td>
<td>Hand Weeding:</td>
</tr>
<tr>
<td>Surveying:</td>
<td>Scarifying:</td>
<td></td>
</tr>
<tr>
<td>Cutting and</td>
<td>Mules / Tractor:</td>
<td>Scarifying: (Mules / Tractor):</td>
</tr>
<tr>
<td>Treating Seed:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planting:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crops:</td>
<td></td>
<td>Chemicals:</td>
</tr>
<tr>
<td>Draining:</td>
<td></td>
<td>Other:</td>
</tr>
<tr>
<td>Chemicals:</td>
<td></td>
<td>Top Dressing:</td>
</tr>
<tr>
<td>Fertilizer:</td>
<td></td>
<td>Draining:</td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Man Days</td>
<td>Total Man Days</td>
<td>Total Man Days</td>
</tr>
</tbody>
</table>

Fertilizer: (type, tons per hectare = total Tons)

<table>
<thead>
<tr>
<th>Plant Cane</th>
<th>Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planting Application:</td>
<td></td>
</tr>
<tr>
<td>Top Dressing:</td>
<td></td>
</tr>
<tr>
<td>Ratoon:</td>
<td></td>
</tr>
<tr>
<td>Top Dressing:</td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td></td>
</tr>
<tr>
<td>Ratoon Cane:</td>
<td></td>
</tr>
<tr>
<td>Pre-emergent:</td>
<td></td>
</tr>
<tr>
<td>Post-emergent:</td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td></td>
</tr>
<tr>
<td>Other Items:</td>
<td></td>
</tr>
<tr>
<td>Seed Cane Required:</td>
<td></td>
</tr>
<tr>
<td>Lime:</td>
<td></td>
</tr>
</tbody>
</table>

* Indicate source of supply, if own Company state
Field No. and Section

(Note — Exclude Headman and Water Bearers)
Appendix 6
Labour requirement forecast

FIELD No.:

<table>
<thead>
<tr>
<th>Month</th>
<th>Land Prep.</th>
<th>Weed Control</th>
<th>Harvesting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Plant Cane</td>
<td>Ratoon Cane</td>
</tr>
<tr>
<td>April</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>June</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>July</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>August</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>September</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>October</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>November</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>December</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>January</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>February</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>March</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>