A SURVEY OF THE USE OF COMPUTERS IN THE PROCESSING OF CANE TESTING DATA, IN SOUTH AFRICA

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ABSTRACT

The distribution of sucrose among individual cane growers and the preparation of cane and sucrose delivery schedules dealing with more than 18 000 individual field and farm accounts involves a massive amount of clerical work. The task is complicated by the various methods of calculation of sucrose weights at sidings and by the diversions of cane from one mill to another. It is a natural consequence that the modern computer be adapted to this work. It took almost 2 years to design the system which is now in effortless routine - the complete data output is produced with a speed and efficiency far in excess of possible manual attainment. Of real interest is the fact that this system is but the beginning. It has captured primary source data which can be used to benefit in other directions. The possible advent, in the not too distant future, of teleprocessing terminals at the mills communicating directly into a large central computer would facilitate a centralised and specialised servicing of industrial requirements. There are a host of avenues of application to be explored.

INTRODUCTION

During a typical season in the South African sugar industry, 8 000 growers will deliver 800 000 consignments to 20 mills for the processing of 17 million tons of cane. Consignments are individually sampled whenever possible and then analysed for pol, non-pol and fibre content. A computer is used to process all information, producing management control and accounting reports in the process.

INPUT TO THE SYSTEM

a) From the mill weighbridge

Each consignment is identified and massed. Information such as field number, variety, vehicle type, vehicle number, driver's code, point of loading, time of harvesting, time at weighbridge and so on is immediately encoded and sent to the laboratory.

b) From the sidings

There are many growers who, by contract with the miller, still deliver their cane to the sites of old factories which have since closed. The cane is massed at these points (now termed sidings) and all consignments are paid for on the basis of their mass at the siding. The miller bears the loss of all cane between the siding and the mill and there are at present 33 such sidings. Five distinct methods of payment are in operation, all of which are based on the general principle of application of pol % cane test average at the mill to the weight of cane at the siding. The input to the system from these sidings is very similar to that at a mill weighbridge, except that the mill to which the cane is despatched is also recorded.

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c) From the pools

At some mills there are groups of growers who deliver directly to the mill where only their cane weights are recorded. The cane is then mixed in a community pool and group tested. At the end of the milling season the total tonnage of pol which has accrued to this community account is then distributed amongst the members of the pool.

d) From the Central Board

Changes of farm ownership, the registration of new quota land, as well as the allocation of basic and provisional quotas are all incorporated into the system.

e) From the laboratories

Once a consignment has been sampled and analysed, the basic instrument readings such as saccharimeter, refractometer, and drying oven pan weights are recorded. The code of the actual instruments used in the analysis (cold digester, drier, etc) is also recorded.

Various analyses and masses throughout the factory process are encoded on appropriate input documents.

f) From the farmer

Although not yet in operation, provision has been made for obtaining the following data from individual farmers for each field-time of planting, time of ploughing, cross-cutting information, rainfall, soil type, fertilizer application and soil analysis. It is intended to form the basis of a more meaningful system of reporting to growers.

THE SYSTEM

All processing is performed on an IBM S370 model 135, 192K. Direct access devices are exclusively used for all operative files. No historical data is lost as the full input details are archived on magnetic tape. A set of utility programs operating under parameter specification will access the tape archives and produce specified work files containing selected historical data.

As a by-product of the change from the Java Ratio to Direct Analysis method of sucrose distribution, the system is able to process both types of input from the laboratories. Further, two of the sugar mills are co-operative societies paying for cane on an approximate sugar determination, the calculation of which involves both purity and extraneous matter penalties. The system also accepts data for these calculations.

All programmes are written in ANS COBOL and are therefore as compiler independent as possible. No programme contains any constants or literals — an initialisation phase in each programme accesses a central systems index file and updates necessary areas in the problem programme. The systems index is updated by a special routine at regular intervals.

Each programme generating a report obtains from the system's index information on the number of copies of the report required as well as the industrial destination of each such report. The report is then generated onto a direct access device. At the conclusion of all the report generation phases the system takes each industrial destination in turn, ascertains the reports available for it, and generates one consolidated book sequentially numbered,
with a page index showing each report’s name and page number. To re-route a report, or to provide extra copies, simply involves changing the appropriate index and has resulted in a considerably improved distribution of the output.

OUTPUT FROM THE SYSTEM

a) To Growers

Each grower in the industry is provided with a comprehensive weekly advice note reflecting detailed descriptions of all consignments delivered during the preceding week, together with monthly and seasonal totals. Deliveries are shown in groups by crushing mill, followed by siding deliveries and amendments, if any. Delay times, in hours, between harvesting and loading point, loading point and weighbridge, as well as weighbridge and mill carrier are shown for each consignment. A summary reflecting average pol, fibre, non-pol and purity for each variety is also provided. Any consignment for which the analysis seems to be untoward in relation to the grower’s average cane quality is flagged. A summary of all such flagged consignments is routed by the system to the relevant cane testing chemist who immediately investigates and reports to both the grower and the cane testing head office.

Advice notes are generated for either individual fields or complete farms depending on the farmer’s requirements. The following additional items of information are to be provided in the near future:

1) Tons cane and sucrose per hectare.
2) Tons cane and sucrose per hectare per month.
3) Tons cane and sucrose per hectare per unit of rain.
4) Percentage of area harvested per year.
5-7) The above information presented for each variety, soil type and ratoon.

b) To the Cane Testing Laboratories

A few of the reports are mentioned:

i) Detailed ledgers reflecting all input data submitted are provided for documentation purposes.

ii) Standard deviations of all variables (moisture, fibre, non-pol, pol, purity, estimated recoverable sugar) are calculated for each grower to assist in assessing consistency of quality.

iii) Each test is classified into a category of variation from that grower’s average cane quality.

iv) Varietal and transport summaries are provided for the week’s crush as well as for growers.

v) Updated master lists of total deliveries for each grower are supplied.

vi) Summaries reflecting factors and average temperatures for each laboratory instrument are calculated to aid in the detection of malfunctioning equipment.

vii) Histograms reflecting the quality of cane (in terms of a pol factor, fibre factor, purity and moisture) for each 12-hour period of delay between two distinct points are calculated to aid in the assessment of deterioration factors.

viii) Loss in transit reports are generated showing cane lost between sidings and mill weighbridges.


ix) A factory monitoring report is printed supplying various statistics and masses throughout the factory process. Of particular use is certain comparative factors between mass balance and direct testing determinations in the investigation of faulty equipment or procedures.

c) To the Cane Testing Head Office

All reports produced are immediately microfilmed and the cartridges are indexed. It is now possible to obtain full visual information on any particular consignment (for any particular season) in a matter of seconds.

Although the bulk of the reports generated for the head office are of a one-time nature, special management summaries are provided on a cyclic basis to enable consistent and effective monitoring of the total cane testing service.

All costs concerning the running of the cane testing service are also fed into the system. Costing reports provide information on the running costs of individual instruments through to complete laboratories.

d) To Individual Milling Companies

Standard summarised reports reflecting deliveries by each grower are generated for each milling company. These reports also show the transport used and different delivery routes. These summaries form the basis of cane payments.

Reconciliation summaries are also provided and take as their starting point the tons of cane and sucrose actually crushed by each mill. From this total is subtracted the amount of cane and sucrose crushed belonging to other mills (inward diversions). The amount of cane a mill’s own growers had crushed elsewhere (outward diversions) is then added. Mill weights of siding deliveries are then replaced by the actual siding weights thus yielding the cane payment total reflected on the first mentioned reports.

Structured files on magnetic media are also made available to milling companies as input to their own computer systems.

e) To the Central Board

All deliveries are reconciled under the appropriate quota and schedules are provided showing the registered quota land, quota, current and previous season’s deliveries for each quota holder. In times of restricted deliveries the system is thus able to provide information on the completion of allocated delivery quotas. At the end of the season all quotas are automatically re-calculated and letters are printed by the system informing each farmer of his new quota.

f) Sundry Reports

The availability of data on a detailed consignment level lends itself to many diverse avenues of application. Special programmes have been written to provide cyclic information to haulage contractors, statisticians, economists, etc. During the recent investigations into the feasibility of an estimated recoverable sugar as a possible basis for cane payment, the system was able to provide detailed analyses showing the financial implications for individual growers if such a system were to be adopted.
CONCLUSION

The 2 phases of the system which are most time-consuming are the transportation and key-punching of data. At present a thorough investigation into the various aspects of teleprocessing is being made. A teleprocessing system would connect the laboratory (and other departments at a mill) to a large central computer and permit direct communication using terminal consoles. Each test would be sent directly via the terminal to the computer as it is performed thus enabling immediate validating. The volume of output could be considerably reduced and replaced by various enquiry methods. Such focalised processing at a central computer will provide the advantage of ready co-ordination of allied data from different sources.

REFERENCES


REVISION DEL USO DE COMPUTADORAS PARA EL PROCESAMIENTO DE DATOS PARA EVALUACION DE LA CAÑA EN AFRICA DEL SUR

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RESUMEN

La distribución de la sacarosa correspondiente a cada cañicultor y la programación de la entrega de caña perteneciente a más de 18,000 cuentas individuales de distintos campos y haciendas representa un trabajo sumamente voluminoso. La tarea se complica por la diversidad de métodos para el cálculo del peso de sacarosa en estaciones de transbordo y por el desvío de cañas de un ingenio a otro. Es pues una consecuencia lógica que la computadora moderna se haya adaptado a este trabajo. Tomó casi dos años diseñar el sistema que se ha convertido hoy en una simple rutina — los resultados se obtienen con una rapidez y una eficiencia que sería imposible de lograr trabajando manualmente. De mucho interés es el hecho de que este sistema es sólo un principio. Ha captado informaciones primarias que pueden ser utilizadas en otras direcciones. El posible advenimiento, en un futuro no muy distante, de terminales de teleprocesamiento en los ingenios comunicados directamente a una gran computadora central facilitaría el establecimiento de un servicio industrial especializado y centralizado. Hay una serie de posibilidades que se pueden explorar.