

SMALL FARM SUGARCANE SETTLEMENT SCHEME AT MKWASINE ESTATE IN ZIMBABWE

By J. H. WILSON, A. C. F. WELMAN and R. D. ELLIS

Mkwesine Estate, Private Bag 7012, Chiredzi, Zimbabwe

Abstract

In 1981, 120 planters were settled on 10 ha sprinkler-irrigated plots of sugarcane. Loan finance was provided to cover the initial cropping expenses and the value of the developed land. Field work is the responsibility of the planters to standards set by the Estate. The Estate harvests and hauls the planter's crops and provides an accounting service. The agreement provides a method whereby yield advantage due to time of cutting is regulated. The financial viability has been depressed due to inflated costs and low sugar prices.

Introduction

In line with the intention that 40% of the irrigable land resource on Mkwesine Estate should be devoted to farming by private individuals, 120 planters were settled on 10 ha plots of established sugarcane in the 1981/82 season.

Intensive settlement schemes on sugarcane have been developed elsewhere in Africa notably Mumias in Kenya, Dwangwa in Malawi, Vuvulane in Swaziland, and more recently in Kwazulu in Natal. This paper is a progress report on the Chipiwa Settlement Scheme in Zimbabwe.

Scheme details

The Chipiwa Settlement Scheme is situated in the SE Lowveld of Zimbabwe (31° 52' E; 20° 47' S) at an altitude of 450 m above sea level. The mean annual rainfall is 590 mm falling mainly between October and March. Mean monthly temperatures are 26°C November to February declining to 16,5°C in June and July. Light frosts occur occasionally in the cool dry season but severe frosts are rare.

Soils are generally moderately deep sandy clay loams and sandy clays derived from paragneiss and are suitable for permanent irrigation. Across the scheme there is variation in soil type with total available moisture (TAM) ranging from 50 to 120 mm.

Irrigation water of good quality is supplied by canal from the Manjirenje Dam some 40 km distant. The water is purchased from the Regional Water Authority (RWA) on an annual allocation basis. The scheme is entirely sprinkler irrigated. The area is well suited to sugarcane farming and is served by two sugar mills.

Plot Layout

The scheme is laid out in a series of discreet rectangular fields and two adjacent fields each 30 ha in extent are served jointly by an electric powered pump abstracting water directly from a canal. A buried main line separates the two fields which are served by six hand-moved lateral lines, each 300 m in length with sprinklers on risers at 18 m spacing. The cane rows are at right angles to the lateral sprinkler lines to facilitate the movement of the pipes. Irrigation is designed to take place 24 hours per day at an application rate of 6 mm per hour with set times of 6 to 10 hours depending on soil moisture characteristics.

The length of each main hydrant line is about 1 000 m and each field is divided into three plots of approximately 10 ha each (300 m × 333 m). Each pump house thus serves about 60 ha (6 plots) in two separate 30 ha fields and each farm is allocated a sprinkler line.

The two fields comprising a pump house unit were not planted simultaneously and can therefore be harvested at different times of the year. The growth stage therefore differs from field to field, although the three plots within a field, being cut in quick succession, are always at a similar stage of development.

Housing

At the time of occupation, each planter was provided with a brick under asbestos core dwelling house consisting of two rooms with a shower/toilet, and serviced with electricity, and purified and raw water. Residential plots are a half hectare in extent with vegetables and poultry being produced. No livestock are allowed. The residential plots are arranged in groups within easy walking distance of the sugarcane plots.

Labourers employed by the planters are accommodated in permanent housing near the fields.

Agricultural Practices

The sugarcane (NCo 376) is planted in rows 1,5 m apart and is cut on an annual cycle. Yields on the scheme have averaged approximately 115 tons cane/ha over the past four years, varying from 65 t/ha to 162 t/ha. The principle causes of this variation are soil type, time of cutting, and other management factors, such as the standard of weeding, irrigation, and fertilization attained on the individual plots.

The Estate provides agronomic advice and guidance based on the officially recommended practices supplied by the Zimbabwe Sugar Association (ZSA) Experiment Station, through the Estate Agronomist and Agricultural Production staff.

Irrigation is scheduled according to Class A pan evaporation taking account of the soil water holding capacity in the conventional way. During the prescribed irrigation periods the planters are responsible for the proper operation of the lateral sprinkler lines and their movement, following a programme and standards laid down by Estate staff. Weeding is done by hand and is the responsibility of the planter and is similarly controlled.

Fertilizer recommendations are issued by the Estate Agronomist based on foliar analyses. Nitrogen fertilizer is applied by hand as top dressings after ratooning. Applications of potassium have not been necessary but maintenance dressings of phosphate are applied as required.

Planters' fields are inspected regularly by the ZSA Experiment Station staff for smut incidence and roguing is practised by the planter as required. Strict control of smut is exercised with compulsory ploughout if levels exceed 4%, but levels have seldom exceeded 0,2%.

No chemical ripening is practised because it has not been possible to demonstrate conclusive benefit in yield at commercial field level on the Estate.

Harvesting

Fields are harvested in sequence according to a cutting programme on an annual cycle. Burning of the cane in preparation for cutting is the responsibility of the planters under direction from Estate Agricultural Staff. This takes place in the late afternoon preceding the day of cutting.

The Estate employs labour to cut and stack the burnt cane into bundles weighing between 5,0 and 6,0 tons. Each bundle upon completion is clearly labelled to identify the plot owner. Each plot is completely harvested within as little as a day and a field of three contiguous plots is usually completed between 3 days and a week.

Haulage

Upon completion the bundles are removed from the field to the nearest rail loading zone by Estate Perry trailers. Cranes then load the bundles onto conventional flat bed 40 ton rail wagons for transport to the Hippo Valley Mill and the Triangle Mill by the National Railways of Zimbabwe, 50 km and 75 km distant respectively. The Estate undertakes the haulage work as it is envisaged that it would not be economically warranted for planters to invest capital in their own haulage equipment.

Sociological

Agreement

The scheme enjoys the full support of the Ministry of Lands, Agriculture and Rural Resettlement. The plots were advertised in the national press and the settlers were selected by the Ministry. Successful applicants were required to enter an agreement with the Estate, the essential elements being:

- (1) The Estate provides training and supervision for the planters in sugarcane husbandry during a probation period of one year. If the planter's performance is judged unsatisfactory during this period, his tenure can be terminated.
- (2) The planter is provided loan finance to cover both short term cropping requirements and long term capital requirements.
- (3) The planter is required to practice recognised proper crop and soil husbandry to maintain the plot in a vigorous and fertile condition. Should the planter fail to meet the required standards of crop husbandry, the Estate can undertake to remedy such failures entirely at its own discretion, all costs being to the planter's account.
- (4) The Estate undertakes all harvesting and haulage of the planter's cane to the planter's account, and to transport the cane to the mills.
- (5) Irrigation water is supplied by the Estate at a duty of 15,9 kilocumes per hectare per annum (about 1 000 mm) and this is paid for whether used totally or not. This includes an allowance for water used on the residential plot.

The unit cost of water is set by RWA and reviewed as necessary.

Equalisation Formula

There is sound long term evidence that sugar yields tend to vary over the harvest season in relation to the time of cutting. Early season cane (April/May harvest) is generally high yielding but low in sugar content giving rise to mediocre sugar yields. Optimum sugar yields are obtained from June to September when cane yields and sugar content are usually both high. Late season cane (October/November harvest) is

commonly low yielding and of low sugar content, resulting in poorer returns. Since this variation is entirely due to natural seasonal effects and beyond the control of the grower and, since the scheme requires that each planter's plot is cut wholly on a regular annual cycle, the Agreement provides an equalisation formula to compensate for any advantage or disadvantage due to time of cutting. This formula takes the following form:

$$\frac{\text{Planter's yield ERC t/ha}}{\text{Group's yield ERC t/ha}} \times \text{All Planters' yield ERC t/ha}$$

Planters are grouped by month of cutting and a planter's realisation is derived by adjusting the mean yield of all the planters over the season according to the ratio of his actual yield to that of the group of planters whose plots were cut during a similar period. Whilst this adjustment is designed to regulate variation due to time of cutting, it is also designed to retain any effect attributable to the planter's level of crop management. Unfortunately it does not take account of variation in inherent soil fertility between plots which, in practice, is not insignificant.

Communications

The Planters came from widely divergent backgrounds. Few had previous experience of sugarcane farming and many had no meaningful experience in formal agriculture. Hence they needed to be organised into a community as soon after occupation as possible and this was the function of the Estate Settlement Liaison Officer. They were guided into electing a representative committee at a very early stage for communication purposes with the Estate Management and the Ministry of Lands, Agriculture and Rural Resettlement, and this function has continued successfully with interim re-elections. All communications between Estate Management and the planters are channelled through this committee with regular meetings as well as *ad hoc* meetings when necessary.

Initially the attitude of the settlers towards the Estate was hostile and suspicious, presumably because they had had little previous experience of business administration. The Estate persevered with its communication policy channelled through the Settlers Committee with emphasis on joint problem solving. The planter's belligerent attitude gradually subsided and their confidence and trust increased with the realisation that the Estate was committed to the success of the scheme.

Group activities

Early official Ministry policy was that the planters should form themselves into a Production Cooperative sharing the total proceeds from the scheme. Such a development would have greatly simplified the accounting service for the scheme and eliminated differences due to land potential and time of cutting between growers, but the concept was rejected by the planters who elected to farm their plots autonomously as individual farmers. They did, however, form themselves into a mill group known as the Chipiwa Mill Group.

The group has constructed a Primary Health Clinic and two Primary Schools with assistance from Government and the local Rural Council. These facilities are intended to serve the planters and their labourers.

Settlement Management Staff

Two Section Managers under the direction of the Settlement Manager control 600 ha each and are responsible for ensuring that the desired standards of agricultural practice are attained by the planters. They also control the harvesting and haulage work on the plots.

The Settlement Accountant, also employed by the Estate, maintains the accounts of each planter separately and trains the planters in business matters. A Settlement Liaison Officer is also employed to assist in communication and public relations work and to ensure that matters outside of agriculture on the scheme are in accordance with official policy.

The costs of employing the Settlement Manager and the Settlement Liaison Officer are shared between the Estate and the Settlement Scheme while the Estate carries the costs of the Settlement Accountant and Section Managers fully.

Communication between the Estate and the planters is co-ordinated by the Estate Secretary. Policy decisions with respect to the Scheme are determined by the General Manager and the Executive Committee of the Estate.

Financial

Loan Finance

The scheme was initially financed by the Estate but more recently the Agricultural Finance Corporation has accepted responsibility for the short term cropping finance, recovery being facilitated by the fact that all revenue is directed through the Estate. Interest is payable at ½% more than the commercial bank rate. The settlers were not expected to provide any of the finance necessary.

The short term loan for cropping expenses in the first year was capitalised and repayment with interest was spread over the next four years to allow the financing of the second and subsequent crops from surplus revenue.

The long term loan to each planter embraces the cost of the land, irrigation works, roads, establishment of cane, and the dwelling. This amounts to approximately Z\$25 000 which is repayable over 15 years commencing in the fifth year when the short term loan has been repaid in full. Interest charges on the long term loan are levied throughout the lease period.

Revenue

Revenue is derived from the sale of sugar manufactured by the mill from the planter's cane. Upon receipt of the planter's cane at the mill, the consignment is weighed and sampled for Brix, Pol, and Fibre analysis. These components are then substituted into an agreed formula to give the Estimated Recoverable Crystal percentage (ERC %). The sugar extracted is marketed by ZSA Sugar Sales and the proceeds are credited when received to the planter's account by the Estate Accounts Department. Sales of the sugar are usually extended over a year or longer. The molasses derived from his cane is also sold to the credit of the planter's account. The revenue from the sale of sugar and molasses is apportioned on the basis of 65% to the grower and 35% to the miller according to an agreement between Government, Millers and Growers.

Apportionment of Costs

All cropping costs which accumulate through the Estate are debited to each individual planter's account on a monthly basis. Such costs are charged in different ways.

Fertilizer is purchased annually in bulk together with the Estate's requirements in order to avail the planters of the favourable early and bulk purchasing discounts. The requirements of each grower are charged to his account at the time of purchase.

Each grower is charged monthly for water at a cost rate set by RWA on the basis of an annual water allocation of 15,9 kilocumes per hectare.

Each planter employs two labourers primarily for irrigation work. An amount to cover their wages is paid to the planter each month by the Estate and debited to his account. Wages of other Estate employees considered essential for the proper running of the scheme, such as Pump Hands, Tractor Drivers and Clerks are apportioned to the planters on a per hectare basis.

Road, village and drainage maintenance costs are apportioned to the planters on a per hectare basis. The transport costs of deploying fertilizer to storage sites or to the field and that of conveying irrigation piping for repair purposes are similarly charged.

The harvesting cost to each planter is calculated as the product of his tons harvested and the mean cost per ton of all cane harvested across the Estate and the Settlement scheme in that particular year. Actual seasonal costs of haulage of all the cane from the Estate and the Settlement Scheme are used to calculate the mean haulage cost per ton per kilometre for that year. This mean cost is then used as a charge-out rate for all the Chipiwa cane transported in that year and apportioned on the basis of tons of cane hauled from each plot. The adoption of this method effectively removes discrimination between plots as regards distance from the loading zone.

The sprinkler irrigation equipment including switchgear, pumps, motors, pipes and sprinklers is supplied by the Estate and remains the property of the Estate. The Estate subsidises 60% of the maintenance costs to this equipment and the electric power consumed in pumping, the remaining 40% being apportioned on a per hectare basis to each planter.

Other minor costs including administration are apportioned on a per hectare basis or on a per planter basis, depending on the nature of the cost.

Annual Operating Budget

An annual budget of expected costs and revenue is prepared for each planter by the Estate's Settlement Accountant for the year commencing at the beginning of April. Monthly advances are paid to the planter against his budget to cover cost of wages and a living allowance. When harvesting of his plot is complete and the expected revenue is more accurately known, his budget and payouts are adjusted accordingly. A further adjustment is made at the end of the harvesting season when the equalisation formula is applied to all accounts.

An example of an average budget for the 1985/86 crop is given in Table 1.

Table 1
Average 1985/86 Crop Revenue and Expenditure budget for a 10 hectare plot.

Revenue			
(10ha × 107t/ha cane × 12,3% ERC × Z\$260 × 65% plus molasses)		Z\$24 000	
Expenditure			
Cropping costs	- Water	1 500	
	- Wages	2 900	
	- Fertilizer	2 500	
	- Power and Irrigation maintenance	1 400	
	- Other cropping costs	900	9 200
Harvesting			1 900
Haulage			4 100
Long term loan, interest			3 700
			Z\$18 900
Profit to Planter			Z\$ 5 100

Discussion

As is to be expected, there exists a significant variation across the scheme in factors affecting productivity and profitability. For example, whilst size averages 10.0 ha, individual plots vary from 8,8 to 11,3 ha in extent. Variation in soil fertility is exemplified by the range in TAM over the plots from 50 to 120 mm. The actual plot cane yields in the 1985 harvest season ranged from 74,6 to 139,5 t/ha, while ERC % varied from 9,9 to 13,8 %.

The difference in cropping cost from Z\$8 160 to Z\$10 296 was not unexpected while the costs of harvesting and haulage varied from Z\$4 343 to Z\$9 126 per plot, reflecting the range in crop size.

Revenue in the 1985/86 crop year varied greatly from Z\$16 463 in the poorest case to Z\$32 389 in the best case. Profit for the year ranged from Z\$12 796 in the most prosperous case to a deficit of Z\$1 224 in the worst case. One of the planters was in deficit and a further eight planters earned less than \$2 000 profit.

When planned originally there was little doubt of the financial viability of the scheme. Interest rates on loan capital were 7 %, input costs were relatively low and a sugar price of Z\$300 per ton pertained. The annual average profit to the planter was estimated to be approximately Z\$8 000 before interest charges when the scheme was launched in 1981. However, the rapid inflation of input costs over the intervening years and the fall in sugar revenue have diminished viability significantly.

The exceptional drought to which the area was subject in the 1982/83 season and the subsequent shortages of irrigation water (65 % of normal annual allocation in 1983/84 and

40 % in 1984/85) resulted in further setbacks, particularly for those farms on shallower soils.

However, there has been an increasing acceptance by the growers of the need for effective levels of crop management and this has been strongly supported by the Estate in its training programme and in the subsequent monitoring work by Estate Agricultural staff.

No provision was made in the original design to adjust plot size according to variation in potential agronomic productivity, because no historical yield data existed for the land in question. There may have been advantage in increasing farm size on the poorer soils and decreasing the area on the better soils. The plots were allocated originally by drawing lots but it is to be expected that in time when the farmers take title to their land, there may be a degree of consolidation by those who have been more successful.

The equalisation formula also makes no provision for adjusting yield advantage due to soil fertility differences between farms. Such an adjustment would be desirable.

Despite the production and financial constraints the growers have had to endure over the five years of the scheme's existence, there is strong evidence of increasing affluence, manifested by the numerous building extensions to houses, the growing number of motor vehicles owned by the settlers, and the acquisition of electrical goods including television. Part of this growing prosperity is undoubtedly due to the sale of vegetable and poultry produce from the residential plots but the extent of this revenue is unknown since it is entirely independent of the Estate.

The Estate is planning to settle a further 71 planters under similar conditions over the next three years.