ASSESSMENT OF SUGARCANE FARMS IN TERMS OF THE CONSERVATION OF AGRICULTURAL RESOURCES ACT 1983

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Abstract

The Conservation of Agricultural Resources Act promulgated in 1983 changed the requirements for field protection for all agricultural areas. The sections of the Act which apply to sugarcane are described. Land users are now required to provide protection for their land and water resources at all times. The original programme, set up in 1987 by the Lower Tugela Conservation Committee to assist growers in the area to compare their farming practices with those required by the Act, is described. A standard format has been developed for all farm visits. Soil protection works, spacings of these works, grassed waterways, field roads, stream banks, drains, wetlands and invader weeds are all assessed during the farm visit. The methods used to assess farms in other areas are described. The results of all the assessments are given. The use of the technique to help the new Environment Committees evaluate conservation requirements in their areas is discussed.

Introduction

Conservation methods have changed with time. As a better understanding of the mechanics involved in the erosion process has evolved, conservationists are able to avoid potentially hazardous field operations. Early methods of soil protection relied on reducing the length of overland water flow by using graded water carrying terraces or banks. The run-off water was then discharged into prepared grassed waterways. This method worked successfully on flat to gentle slopes, but on moderate to steep cane areas was largely ineffective. A method of protection, which used the good conservation qualities of the sugarcane crop to control run-off, was developed by the introduction of a comprehensive research programme (Platford, 1979). The programme measured actual soil and water losses from catchments and run-off plots in a bare fallow condition and from the same areas when planted to cane.

Conservation of Agricultural Resources Act

Conservation of soil and water in the agricultural areas of South Africa is controlled by the Conservation of Agricultural Resources and Water Acts. Prior to 1983, soil erosion had to be visible before any prosecution under the relevant Act could take place. This was unrealistic as large soil losses by sheet erosion could take place with very little visible sign of wash on the ground surface. Generally under these conditions, by the time signs of erosion were apparent, very large amounts of soil had been lost. It also encouraged bad farming practices, because farmers were often unaware that their resources were poorly protected. As heavy rainfall may occur at random, a farm could escape damage for long periods before severe damage was caused.

In 1983 a new Conservation of Agricultural Resources Act was promulgated, which made the land user responsible for the protection of the resources on the farm. This was done by making the user provide protection practices which would reduce the potential for erosion. It recognised for the first time that the agricultural crop and practices used in growing the crop played an important role in the protection process. For the first time, a land user could be prosecuted for carrying out farming practices which could lead to soil erosion, although no signs of erosion might be visible.

The new Conservation of Agricultural Resources Act (1983) made provision for the protection of the soil by setting a number of requirements. Not all the practices were applicable to the sugarcane crop but those which are include the following:

Structures and waterways to control concentrated flows

Conservation structures generally reduce the velocity of run-off water in cultivated fields to an acceptable minimum. The design and spacing of these structures is related to the soil form, ground slope and crop management practices. Terraces are designed to intercept run-off water from the area immediately above and to convey it at an acceptable velocity to suitable discharge points, usually waterways. These are hydraulically stable structures, with the surface protected by grass and designed to convey the discharge safely from storm water drains, terraces and infield areas in a specific catchment, to natural streams and rivers.

Limited cultivation techniques

Limited cultivation techniques, i.e. no tillage, minimum tillage, or reduced tillage are effective methods of preparing the soil for replanting the sugarcane crop. Although more commonly associated with steep land, minimum tillage can be used on any slope. Land of more than 12% to 20% slope, depending on its erodibility, should not be ploughed. A common minimum tillage practice is to use the herbicide glyphosate (Roundup) to kill the old crop. The new crop is planted between the original rows, using the old crop's surface residue and root system to help reduce erosion during the critical months of re-establishment. Other major benefits of the system are a large reduction in moisture lost to the atmosphere, and the opportunity for the grower to establish his new crop during the summer months, when soils are highly vulnerable to erosion (Iggo and Moberly, 1976).

Surface mulches

Applying a surface mulch of dry leaves and crop residues (trash) at harvest is a cost effective way of reducing soil erosion. The surface mulch protects the soil from the damaging effect of the energy held in every rain drop. This system cannot be used in areas that are 500 m above sea level or in wet valley bottoms, because soil temperatures are reduced, which inhibits germination of the crop. At times of lower than average rainfall trashing will also reduce moisture loss due to evaporation, which helps with rejuvenation of the next ratoon and with the suppression of weeds, thus reducing spraying costs of herbicides (Thompson, 1966).

Planting in strips

Strip planting is the practice of replanting one or alternate inter-terrace panels during any one season. These panels run horizontally across the slope. Where water carrying structures and grassed waterways are constructed and minimum tillage is practised, a maximum of three adjacent panels may be planted in any season. If any of the standards are changed, replanting on a hillside should be confined to a single panel.

Combination of practices

Each of the above practices may not be adequate in specific situations, and it is often necessary to combine two, three or all to obtain adequate protection. Strip planting may be needed with minimum tillage, thereby eliminating panels under bare fallow. On steep erodible soils it may be necessary to use minimum tillage, strip cropping, terrace banks and grassed waterways.

Water Act

The protection of stream lines and rivers is also important in the holistic approach to catchment protection. The Water Act of 1956 (Act 54) provides appropriate controls.

Use and protection of water courses

The Act restricts the land user from changing the vegetation in a vlei, marsh or water sponge, and within an area 10 m horizontally outside the flood area of a water course, in a manner that may cause deterioration of or damage to the natural agricultural resource. However, he must restrict vegetation in a water course on his farm unit so that it will not constitute an obstruction during a flood. The Act requires that all undisturbed areas must remain in their natural state, unless the land user has obtained written permission from the executive officer to drain or cultivate the area. If, when the regulations were implemented, an area had been drained or was in a cultivated state, it could continue to be cultivated, provided it was adequately protected against excessive soil loss through the action of water. Existing drains must be maintained.

Regulating the flow pattern of run-off water

The Act states that no land owner may divert any water from one water course to another unless a plan has been approved by the Department of Agriculture. Also he may not effect an obstruction that will disturb the natural flow pattern of run-off water, nor permit the creation of such an obstruction unless provision for the collection, passing through and flowing away of the run-off water past the obstruction is sufficient to ensure that no serious erosion will occur. No land user may remove or alter an obstruction in the natural flow pattern of run-off water that would result in excessive soil loss from erosion.

Methods of soil protection in the sugar industry

The first steps taken to control soil erosion in sugarcane growing areas were to use terrace banks and grassed waterways. The spacing of these banks was based on a formula used in annually cropped areas and modified for the perennial crop of sugarcane. The earth banks at low gradients were supposed to allow run-off to be carried safely off sloping land with no damage to the soil surface. Tillage methods were not specified. Very scant data existed to justify this concept which was soon found to be false. The requirements of the Act are not met on slopes over 12% for erodible soils, and over 22% for strongly structured soils, when cultivated by normal ploughing. As research data became available, a set of recommendations for the protection of sugarcane growing land was developed. Minimum tillage, strip planting, trash mulching and terrace banks were used to control run-off and erosion from steep land.

Nomograph

The recommendations now made for sugarcane areas have been developed into a nomograph (Platford, 1987) which, while allowing the grower several options when choosing farming practices, also ensures that the requirements of the Act are met. Certain constraints are imposed on the practices chosen, which may depend on the soil type and slope of the ground.

Conservation Committees

Throughout the country conservation committees, drawn from farmers' associations, government officers and other technical representatives, have the responsibility of applying the Conservation of Agricultural Resources Act, under the guidance of the Minister of Agriculture. As the recommendations for soil protection have changed with time, each committee in the sugarcane areas has had to ensure that the changing practices have been implemented. In 1987, the Lower Tugela Conservation Committee started a scheme to assess whether or not the farms in their area met the standards required. This committee approached growers within their area and requested that they sign a commitment to have their farms assessed by the Farm Planning department at the Experiment Station, and compared with the standards required by the Act. This was done on a voluntary basis and the committee undertook to provide help to partakers. On each participating farm, the soils and slopes were measured. The Nomograph was used to determine the required spacing of terrace banks and waterways. Road standards such as surface, gradient and protection were set, as well as waterway and water course designs and conditions. The presence of alien invader weeds was noted as were the quantities of indigenous vegetation.

Other committees

After the completion of the initial requests from the Lower Tugela Conservation Committee, the principle of assessing farms was adopted for other areas. It was agreed that for the committees to obtain a true picture all farms in the area should be assessed.

Method of Assessment

Office work

After a specialist advisory request for farm assessment is received from an extension officer, farm information pertinent to the visit is transferred to an assessment form. This information includes the grower's name, location and quota numbers, the cane area and the total farm area, elevation of the farm above sea level, average slope per cent and soil parent materials. Soil forms are identified and their erodibility factor ascertained. From the record it is noted whether the quota land has a land use plan.

Field work

On arrival at the farm, the assessor questions the grower about his management practices, e.g. minimum tillage, trashing or burning, strip planting, crop eradication, land preparation and planting dates.

General assessment of the farm

A standard format has been developed for all farm visits. Soil protection works, their spacing, grassed waterways, field roads, stream banks, drains, wetlands and invader weeds are

assessed during the farm visit. This involves driving the responsible specialist around the farm and, where possible, using high points to permit an overview of the conservation of the area. General notes are taken, that help in compiling the report, which is an essential part of the assessment.

Report

Section 1: This section states that an assessment of the layout and management systems is requested, to see whether they fulfil the requirements of the Conservation of Agricultural Resources Act of 1983.

Section 2: General information on the assessed farm is given as described earlier in this paper, but includes the date assessed and by whom and whether or not a land use plan has been prepared for the farm. If a plan has been prepared, an attempt is made to approximate what percentage of the plan has been implemented to date.

Section 3: The soil parent material(s) found on the farm, their erosion hazard and the average rooting depth is assessed.

Section 4: The topography of the area and the range of slope per cent are noted.

Section 5: The general conservation layout of the cane area is dealt with. The area is split if necessary into planned and/or existing areas. This allows the assessment to proceed whether or not a land use plan exists or has been fully implemented.

Section 6: A visual appraisal of invader plants on the farm is given. The invader plants found are recorded and their level of infestation rated as low, moderate or serious.

Section 7: The management of the crop is assessed from information given by the grower. Management is broken down into three phases: crop eradication, harvesting and replanting.

Crop eradication deals with the method by which the grower destroys the old crop, i.e. chemical minimum tillage, hand chipping or shallow mouldboard ploughing, or a combination of all three, and in what areas. Other items covered include percentage crop trashed or burnt and method of replanting, i.e. whether or not the grower strip plants.

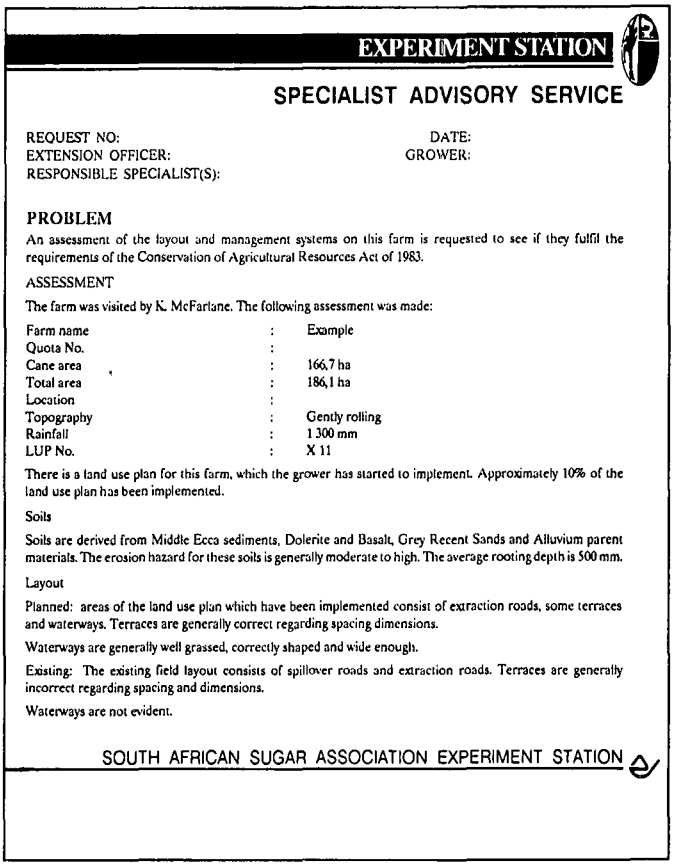
Section 8: This is the conclusion of the assessment. From all the information gained on the assessment visit, the grower is informed whether or not the layout and management systems satisfy the requirements of the Act.

Section 9: At this stage recommendations are made. If the layout or management systems do not satisfy the Act, this section makes constructive comments and recommends actions the grower should take to improve his farm and comply with the Act.

Results

To date, 615 requests have been received for farm assessments. Thirty-four have been cancelled and 67 farms remain to be assessed. Five hundred and fourteen requests for assessments have been completed. Four hundred and sixty-seven (91%) have not conformed completely with the requirements of the Act and 47 (9%) have conformed in all aspects. Information from the reports is entered into a computer and analysed to produce eight criteria, which are used to determine where the problems and weaknesses occur. The eight criteria are:

- Waterways: position, dimension and existence
- Water courses: cane planted into water courses; cane planted within the 1:10 year flood level; water course actively eroding



EXPERIMENT STATION

SPECIALIST ADVISORY SERVICE

REQUEST NO: DATE:
EXTENSION OFFICER: GROWER:
RESPONSIBLE SPECIALIST(S):

PROBLEM

An assessment of the layout and management systems on this farm is requested to see if they fulfil the requirements of the Conservation of Agricultural Resources Act of 1983.

ASSESSMENT

The farm was visited by K. McFarlane. The following assessment was made:

Farm name	:	Example
Quota No.	:	
Cane area	:	166,7 ha
Total area	:	186,1 ha
Location	:	
Topography	:	Gently rolling
Rainfall	:	1 300 mm
LUP No.	:	X 11

There is a land use plan for this farm, which the grower has started to implement. Approximately 10% of the land use plan has been implemented.

Soils

Soils are derived from Middle Ecca sediments, Dolerite and Basalt, Grey Recent Sands and Alluvium parent materials. The erosion hazard for these soils is generally moderate to high. The average rooting depth is 500 mm.

Layout

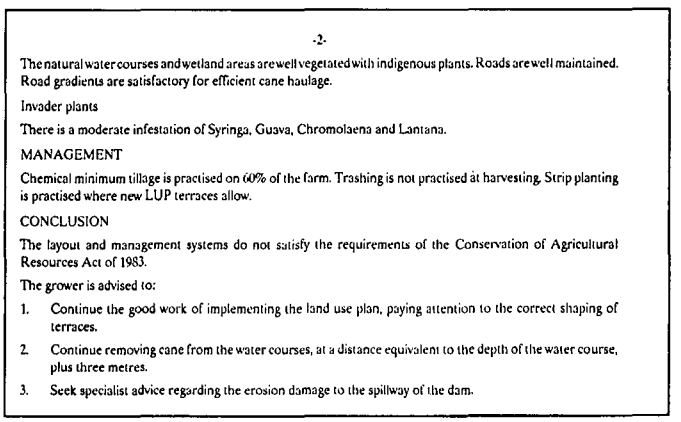
Planned: areas of the land use plan which have been implemented consist of extraction roads, some terraces and waterways. Terraces are generally correct regarding spacing dimensions.

Waterways are generally well grassed, correctly shaped and wide enough.

Existing: The existing field layout consists of spillover roads and extraction roads. Terraces are generally incorrect regarding spacing and dimensions.

Waterways are not evident.

SOUTH AFRICAN SUGAR ASSOCIATION EXPERIMENT STATION



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The natural water courses and wetland areas are well vegetated with indigenous plants. Roads are well maintained. Road gradients are satisfactory for efficient cane haulage.

Invader plants

There is a moderate infestation of Syringa, Guava, Chromolaena and Lantana.

MANAGEMENT

Chemical minimum tillage is practised on 60% of the farm. Trashing is not practised at harvesting. Strip planting is practised where new LUP terraces allow.

CONCLUSION

The layout and management systems do not satisfy the requirements of the Conservation of Agricultural Resources Act of 1983.

The grower is advised to:

1. Continue the good work of implementing the land use plan, paying attention to the correct shaping of terraces.
2. Continue removing cane from the water courses, at a distance equivalent to the depth of the water course, plus three metres.
3. Seek specialist advice regarding the erosion damage to the spillway of the dam.

FIGURE 1 Example of a Specialist Advisory Report.

- Terraces: spacing and dimensions
- Dongas: are there any dongas and have they been stabilised against further erosion?
- Cultivation practices: is conventional or minimum tillage used and where?
- Visible infield erosion: not necessarily dramatic erosion (dongas) but visible erosion such as rills
- Block farming: cultivation still being done up and down the hill and not horizontally
- Strip cropping: not using strip planting techniques.

Figure 2 shows the number of farms that did not conform, e.g. 10% of all farms assessed did not conform because of one of the eight criteria.

Figure 3 shows the number of times the eight criteria were not met. Poor waterways were the main reason for farms not conforming to the Act, accounting for 27% of the total, followed by terraces (21%) and cultivation practices (15%).

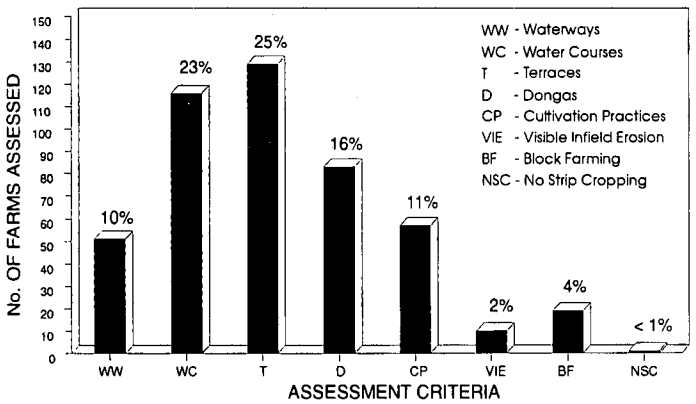

FIGURE 2 Per cent of farms not conforming to criteria.

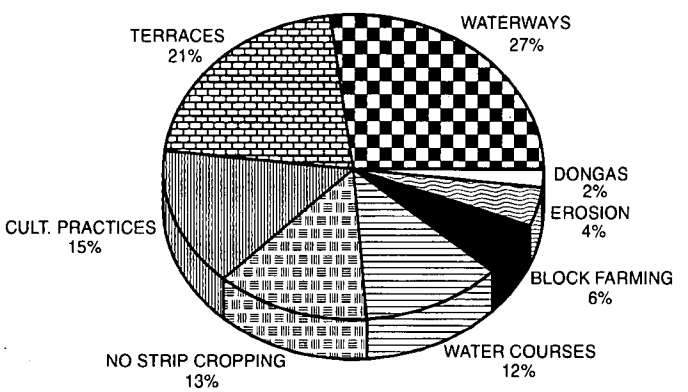

FIGURE 3 Per cent criteria not met.

Local Environment Committees

Conservation committees are appointed by the Minister of Agriculture, and are responsible for the application of the Conservation of Agricultural Resources Act. The regions which they cover often include three of four mill group areas. The South African Sugar Association felt there was a need for closer control in environmental matters at the mill group level. In 1989, the Association initiated a move which gave grower groups the option of forming their own local environment committees or continuing as conservation committees. This new structure in no way compromised the responsibility of the conservation committees, but rather brought the focus to mill group level and gave growers closer contact with environmental control. Local environment committees (LECs) act as the local pressure group for the sugar industry in their respective areas. The committee members are made up of millers, growers, extension staff and any other specific organisation which can contribute usefully. LECs deal with all environmental issues, including cane burning, atmospheric pollution, cane spillage and effluent releases from cane mills. They are closely involved in the sugar industry's Environment Management Plan. Farm assessments help these committees to compile a directory of environmental or focal points in their own area.

Conclusions

The object of the assessment exercise was to ascertain whether participating farms conformed with the Conservation of Agricultural Resources Act. It was not aimed at grading or rating farms. The results showed that the majority of farms assessed did not conform with the Act. Many did not conform because of relatively small anomalies in their field layouts or vegetation. Some farms assessed were well laid out, and had the major infra-structure in position for good conservation. These need only minor alterations to conform, e.g. reshaping of terraces and waterways because of siltation over the years. A number of farms had land use plans whereas, at the other end of the scale, some farms had no conservation layout at all. Most farms lie between these two extremes.

To be of real value to the industry and the new environment committees, each area should request assessments for all the farms in their areas. This would enable them to determine the state of conservation over the whole mill group area. There are about 1 800 quota holders in the industry, with a further 40 000 small growers. To date 513 farms have been assessed. The environment and conservation committees should act now on the assessment reports they have received and should apply pressure to those farms which have not yet been viewed.

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