SEEDCANE SCHEMES: A PREREQUISITE FOR DISEASE CONTROL AND VARIETAL PURITY

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Abstract

The quality of seedcane used by cane growers in South Africa has not reached the standards necessary to contain the spread of diseases and maintain varietal purity. Since the formation of Local Pest and Disease Control (LP & DC) Committees in 1982, a number of grower groups have established formal seedcane schemes to try to improve the quality of seedcane. Six schemes are described. Each scheme has been structured to overcome the particular problems for its area and accommodates the needs of the group. The practices and requirements necessary to maintain the purity and quality of seedcane at acceptable limits are described as well as the relative advantages and disadvantages of the schemes from the results achieved.

Introduction

The production of certified seedcane for the purpose of propagating or 'bulking-up' good quality seed for commercial planting has been neglected in the South African sugar industry. Because sugarcane germinates fairly easily, grows well under normal conditions, and had a relatively low incidence of pests and diseases before the mid-1970's, cane growers tended to select seedcane when it was needed according to its visual appearance and without any special cultural practices or preparations. In 1970, the South African Sugar Association (SASA) Experiment Station introduced a formal certified seedcane scheme (Anon[1]) because it had become apparent that ratoon stunting disease (RSD) was prevalent throughout the sugar industry and, only with the use of hot water treatment (HWT) and carefully managed nursery hygiene, could it be brought under control. However, because this disease does not exhibit clear symptoms and causes reduced damage to the crop in seasons of good rainfall, the scheme was used on a limited and inconsistent basis. Participation in the scheme was voluntary, and most growers were only interested in it when they had poor seedcane themselves. Registered producers received erratic orders and so their quantities and prices were not guaranteed. Under these circumstances, the number of certified nurseries remained very low. By 1980, 34 nurseries were registered with a total of 192 ha and in 1981, 26 nurseries were registered with a total of 420 ha.

During 1980 the Extension Officers of the SASA Experiment Station helped to establish Seedcane Improvement Schemes in certain areas of the sugar industry (Tucker *et al*[2]) to stimulate the use of good quality selected seedcane. However, only limited success was achieved as participation in the schemes was voluntary and the use of certified seedcane from which to propagate commercial seedcane was not compulsory.

A number of developments have occurred in recent years resulting in the need to improve seedcane quality and production. These included outbreaks of smut (*Ustilago scitaminea*) which became a major problem in the northern areas and were seen as a threat to the southern areas (Bailey[3]); the spreading of mosaic in the high altitude areas; and RSD becoming more widespread (Bailey and Fox[4]). Variety NCo 376, which is susceptible to all these diseases, comprised a very high proportion of the area under cane in the sugar industry. The sugarcane borer, *Eldana saccharina* Walker, spread into new areas (Paxton[5]), partly because there was no control over the movement of seedcane.

In 1982, formal LP & DC Committees were formed (Paxton[6]) for each mill group to campaign against the deteriorating pest and disease situations. Regulations were established for the control of quality and movement of seedcane. Furthermore, the new, potentially superior varieties were promoted and the need to protect their purity and quality was emphasised. Six such schemes are described, together with the details of the different methods used by each grower group in designing the scheme to suit the particular needs of the locality and its members. The advantages and disadvantages of the schemes and their relative impact are discussed.

Method

The seedcane schemes which are described were formed for the Eastern Transvaal, Umfolozi, Amatikulu, Felixton/Empangeni, Entumeni and Tala Valley areas.

Onderberg Seedcane Scheme (Eastern Transvaal)

This scheme was proposed by the LP & DC Committee in 1983 to ensure that all potential seedcane originated from officially approved nurseries to try and counteract the escalation of smut and RSD in the area (Anon[2]). The Lowveld Cane Growers' Association accepted the proposed scheme in 1984 and it is now in operation. The scheme requires the participation of all growers but it will only become mandatory in the 1987/88 season.

A HWT tank was located in a central position at the Transvaal Suiker Ko-op Beperk sugar mill for all the growers to use. However, growers may use their own HWT facilities provided they are registered to grow seedcane. There are eight privately owned HWT tanks in operation at present, in addition to the principal tank at the mill.

Rules and regulations were established to ensure that seedcane producers and buyers follow the correct procedure. The Pest and Disease Officer administers the scheme for the LP & DC Committee by processing the order forms, collating orders with the seedcane producers, and arranging inspections of nursery sites and potential seed. The scheme is funded by means of a compulsory levy, based initially on 1 % of cane payments, but this has recently been reduced to 0,8 % as funds had accumulated due to growers not taking their full entitlement. The funds are administered by the Secretariat of the Lowveld Canegrowers' Association.

The price paid to the seedcane producer is based on the projected average mill price which is calculated on the ratio of total tons of A and B pool cane delivered in that season. A premium of 33 % was added as an incentive to the producer. The buyer pays the average mill price less 13 % directly to the producer. The difference, which is 46 % of the average price, is made up to the producer from the fund.

The seedcane producer is required to have the estimated quantity of seed to be sold verified by the purchaser and the administrator of the scheme before payment is authorised. The levy provides an incentive for both seedcane producers and growers to purchase their requirements through the scheme if they do not wish to produce their own seedcane. No guaranteed sales are given by the scheme but the producer is assisted in contacting additional buyers and advised on the probable quantity of seed required.

A seedcane producer, using his own seedcane, is also paid in the same way, provided that he has met all the requirements of hygiene and standards of cleanliness of the seedcane.

Umfolozi Seedcane Scheme

The benefits to both miller and grower in a co-operative milling company by improving the quality of seedcane were recognised and in 1981 a decision was taken to construct a HWT tank at the mill for treating and supplying the full seedcane requirements of all the Co-op members. The seedcane scheme was organised by co-operation between the management of the mill and the local Extension Officer. The primary objective was to establish an accelerated replanting programme using certified seed of the 'new', more smut-resistant varieties. It was a voluntary arrangement whereby the growers purchased the seedcane they required from the miller-cum-planter at a price determined by the producer.

The production target was 5 000 t of certified seedcane per annum and the first nurseries were planted in 1982. The demand for certified seedcane however far exceeded the supply because the cane in the nurseries was stressed due to the continuing drought of 1980. To meet the increased demand, alternative sources of seed were sought from selected commercial cane but the quality and quantity of seed were not adequate. In February 1984, cyclones Demoina and Imboa destroyed the nurseries and the LP & DC Committee had to obtain sufficient alternative seedcane which could be passed as commercial seedcane, using the maximum permissible level of 0,5 % for off-types and diseases.

In October 1985, the LP & DC Committee reassessed the seedcane situation and a formal scheme is now envisaged where all growers will become involved in a programme to produce high quality commercial seedcane grown from certified seedcane.

Entumeni Seedcane Scheme

A voluntary seedcane improvement scheme planned by the Extension Officer had been operating in the area for three seasons when the LP & DC Committee evaluated the quality of seedcane being produced. Although most growers had been using the group-owned HWT tank sited at the Entumeni mill, the amounts of RSD, mosaic and mixed varieties that were occurring were not acceptable. The main reason for this was the poor quality of seed being used and the lack of hygiene in the nurseries.

The LP & DC Committee proposed an official seedcane scheme for the 24 growers in the mill group and this was approved by the members in 1984. Standards were set for acceptable disease levels and varietal purity but apart from this there are no formal rules. Because of the small number of growers involved, liaison between growers and producers is satisfactory, particularly as the LP & DC Committee regularly monitors progress and commitment by growers to the scheme.

Two growers co-operate in producing certified seedcane under irrigation. Orders are placed according to the needs of the growers one year in advance. The seed is planted in the farm nurseries and it is checked by the inspection team and passed if levels of diseases of off-types are below 0,1 %. The price for certified seedcane is set by the LP & DC Committee and it is based on the projected A pool price plus 20 % per ton. With the approval of the mill group members, another function of this seedcane scheme is the rebulking of newly released varieties by the scheme's producers, before release to the individual growers.

No levy is imposed for funding the scheme and growers are responsible for payment to the co-operators at the agreed price.

Tala Valley Seedcane Scheme (Umlaas Planters' Association)

The need to improve the quality of seedcane by introducing a seedcane scheme was promoted in the area by the Extension Officer, and accepted by the Umlaas Planters' Association in 1982. It is a small group comprising 16 growers and although all growers are encouraged to participate it is not obligatory.

Six growers who have irrigation on the farm undertake, in turn, to grow seedcane for the scheme. The cane is hot water treated at the Tongaat-Hulett Midland Estate, Thornhill, before being planted in the nurseries. One producer plants half the required nursery area annually while another supplies seed from the first ratoon of the previous year's plant crop. The seed is produced to certified seedcane standards and growers place their orders for their total commercial seedcane requirements one year in advance. In this scheme intermediate nurseries are not required on each farm.

The Extension Officer plans the planting programme each year and is responsible for administering the scheme while the co-operators are responsible for distributing the seedcane to the individual growers. Only the varieties recommended for planting in this area are planted in the nurseries. Newly released varieties are rebulked by the co-operators before a grower takes delivery of his entitlement. Nurseries are planted in August and seedcane is available the following August or September to coincide with the time of planting necessary to reduce mosaic infection. By arrangement with the Mill Group Board the co-operator ceases sending his commercial crop to the mill and instead supplies seedcane to the growers based on the co-operator's daily delivery rate to the mill. In this way the amounts of seedcane can easily be handled for planting by the growers. The producer only resumes supplying commercial cane to the mill once the seedcane deliveries are complete. The price is agreed in advance by the group and is based on the A pool price plus 10 %. Growers are responsible for payment to the producer on delivery of the seed.

Amatikulu/Emoyeni Seedcane Scheme

This scheme is more formal and strictly regulated than the two previously described schemes. It was initiated by the LP & DC Committee in 1983 after the results of the seedcane improvement scheme run by the Extension Officer for the previous two years had been assessed. As participation in the latter scheme was voluntary, the success both in participation and quality of seedcane was limited, particularly because insufficient attention was given to the quality of the initial seedcane used. The Committee therefore decided to organise a formal seedcane scheme in which all growers should participate to produce certified seedcane from selected nurseries. This recommendation was referred to the two mill groups who approved it and a formal resolution was passed binding all growers. A sub-committee was formed comprising both growers and extension staff to plan the scheme. Subsequently the two committees combined to form one seedcane committee responsible to the two mill groups and the LP & DC Committee.

The minimum tonnage of commercial seedcane required annually was calculated from an assumption that the area to be replanted was 12 % of the total area under cane. This tonnage of seedcane is produced in farm nurseries planted with certified seedcane supplied each year and distributed to every grower through the scheme. The nurseries are monitored and controlled by the Pest and Disease Officer from preplant field hygiene to final approval or rejection. The grower is required to order 12 months in advance the minimum amount of certified seedcane needed for his nurseries but may order additional seedcane if he wishes.

The seedcane committee compiled the rules and regulations so that the required standards would be maintained and the committee also appoints and controls the producers of certified seedcane. These producers are either commercial co-operators who produce seedcane for the scheme or private co-operators who produce certified seedcane for their own needs. In this way growers may remain independent. The co-operators follow the requirements of the certified seedcane regulations as formulated by the SASA Experiment Station. Plant and first ratoon crops are taken for seed from the certified and farm nurseries, thus only half of the nursery area for both seedcane categories are replanted each year. The maximum permissible level for disease and off-types is 0,1 %. A timetable of procedures is followed to ensure that all operations from seed orders, nursery site preparations through to inspections and releases are carried out timeously.

The seedcane scheme data was entered onto computer by a grower member of the committee who acted as the co-ordinator of the seedcane scheme, but in early 1987 an administrative officer was appointed to handle mill group affairs and one of his responsibilities is to administer the seedcane scheme.

Funding of the scheme is by means of a levy which is included in the annual mill group levy. This levy accounts for the cost of the minimum tonnage of certified seedcane decided on by the committee for each grower and this is based on the grower's A pool allocation. The co-operator is paid, from the scheme's fund, the average A pool price plus 50 % per ton for seedcane ordered and delivered.

Felixton/Empangeni Seedcane Scheme

The results of the 1980 pest and disease survey indicated that 22 % of potential seedcane in the area was infected with RSD so the Extension Officer started the Zululand North Seedcane Improvement Scheme in 1981 to improve the quality of seedcane. Participation in this scheme was voluntary but all growers were encouraged by the Extension Officer to have their seedcane inspected and approved before being used. After three years of concerted effort all the growers in the area were involved.

Although there was a marked decline in the levels of RSD and the newer disease-resistant varieties were being planted, only 30 to 40 % of the seedcane inspected reached the standards for approved seedcane, as described by the Experiment Station during this three-year period. The reason for this was that growers were seldom using certified seedcane or even good quality seed to establish their commercial nurseries, and few carried out satisfactory methods of seedbed hygiene.

In 1984 the LP & DC Committee decided to establish a formal seedcane scheme. After considerable discussion with the two groups involved, a seedcane sub-committee comprising grower respresentatives and Experiment Station staff was formed to make recommendations and a part-time secretary was appointed to administer the scheme. The sub-committee modelled its constitution on the Amatikulu/Emoyeni scheme with some modifications. The proposed scheme was approved by both mill groups and it was introduced on a voluntary basis for the 1986 season. It will be compulsory in 1987.

The system of seedcane production is almost the same as that for the Amatikulu/Emoyeni scheme. Certified seedcane is produced to order by commercial or private co-operators and is based on a minimum annual area to be replanted of 10 % for each farm. The certified seedcane is then propagated for one year in farm nurseries to produce the required amount of seedcane for commercial planting. All farm nurseries are subject to stringent hygiene measures before and after planting to ensure that the commercial seedcane meets the required standards of levels of 0,1 % for diseases and off-types.

This scheme is funded by the two groups contributing to the administrative costs through their general levies, but the costs of the seedcane are to be recovered through cessions on cane payments deducted by the miller in July each year, thus guaranteeing full reimbursement by the co-operators. The arrangements and approval of the payment by cessions are made by the secretary. The price of certified seedcane is based on the average A pool price plus 50 %.

Results and Discussion

The Onderberg Seedcane Scheme

In 1985, 167 ha had been established as registered commercial nurseries which, after the necessary inspections, were approved as commercial seedcane. This was sufficient to meet 50 % of the total requirements for the scheme in the following season. This seedcane consisted of variety N14 (67 %) and N17 (23 %). By 1987, 350 ha of registered commercial nurseries had been established to produce almost the full requirements of growers' commercial seedcane.

The occurrence of smut, recorded in surveys conducted in 1986 by the LP & DC Committee, had dropped significantly from 0,9% in commercial seedcane nurseries and 4,2% in commercial cane fields, to negligible amounts in commercial seedcane nurseries and 2,2 % in commercial cane fields. The combined effects of using smut-resistant varieties and correct methods of nursery hygiene are the main reasons for this.

The impact of the scheme so far has been the stimulation of grower awareness in using good quality seedcane from an approved source, and providing a method of supplying that seedcane. Future improvements to the scheme will be to provide officially certified seedcane and to make it compulsory for all growers to take their full seedcane requirements. Without a committee to administer the scheme, too much responsibility is carried by the extension staff and there is need for more authoritative control.

The Umfolozi Seedcane Scheme

This scheme started well with 19 ha of certified seedcane established primarily with the newer varieties. By January 1984, 2 232 tons of certified seedcane (30 % of the full requirement) had been planted out by growers. Thereafter two cyclones and two severe droughts affected the area and most of the certified nurseries and its established cane was either lost or seriously damaged, but an emergency plan provided 17 000 tons of commercial seedcane of the newer smut-resistant varieties for planting. In this case the maximum acceptable limits for diseases and off-type varieties were set at 0,5 %. In 1986, 18 ha of certified nursery was planted and new regulations were formulated for stricter control of the scheme. From 1983 to 1985 the planting of the newer varieties, encouraged by extension staff in the rainfed areas,

increased from 50 to 80% and in the irrigated areas from 30 to 80%. During this period, smut levels in the newer varieties decreased from 1,6 to 1,0%; while the smut levels in the older varieties increased from 3,7 to 4,0%.

A serious disadvantage of the Umfolozi scheme is inadequate distribution of the nursery sites throughout the area. Wider distribution would make the scheme as a whole less vulnerable to changes in climatic conditions. Furthermore, there is no controlling committee to administer the scheme. Future plans include a better distribution of nurseries in 1987 and compulsory participation by growers.

The Entumeni Seedcane Scheme

Certified seedcane nurseries in 1984 totalled 3,2 ha, while in the following two years the totals were only 2,4 and 2,8 ha. By 1986 all growers in the area were participating in the scheme and farm nurseries were planted with seedcane drawn from the producers. The maximum acceptable levels of diseases and off-types for both certified and farm nurseries has been set at 0,1 %. Surveys by the local pest and disease control inspection team resulted in the certified seedcane being approved each year, but the seed in the farm nurseries did not rate well when inspected. Levels of diseases were generally within the acceptable limits but, in most cases, levels of off-types were too high and numerous nurseries had to be rejected.

In 1984, 16% of the farm nurseries were approved on the first inspection. A further 19% had disease or off-type levels between 0,1 and 0,5% and were rogued by the grower before being passed after a second inspection. In 1985, similar pass and failure rates were recorded, and in 1986 a small improvement was achieved when 18% passed the first inspection and a further 21% passed after roguing. Obviously there is a need for further improvement. While disease levels are generally acceptable in these nurseries, it appears that inadequate hygiene in clearing the nursery seedbed of volunteer cane before planting the certified seedcane is the major reason for the high numbers of off-types recorded.

The Tala Valley Seedcane Scheme

Because participation in the scheme is voluntary only 12 of the 16 growers are involved. Being a small group, the need for strict controls was not considered necessary and, with effective liaison between extension staff, seedcane producers and co-operating growers, the system works well. Its disadvantage, however, is that not all growers participate in the scheme.

In 1984, the first certified seedcane was released, having been passed at the required level of 0,1% for diseases and off-types. Approximately 2 870 tons of seed were produced from 32 ha of certified nurseries. In subsequent years, smaller quantities of certified seedcane were purchased; 915 tons being planted out in 1985 and 595 tons in 1986. The reduced demand was the result of smaller replanting programmes.

This scheme differs from others in that the certified seed goes straight into commercial fields without the intermediate stage of farm nurseries. The advantages of this method are that it enables a rapid introduction of high quality seedcane into commercial fields, and it accelerates the change to new varieties. The disadvantages are that it is more costly to run and it requires larger areas of certified nurseries (including a heavy demand for HWT facilities over a short period).

The Amatikulu/Emoyeni Seedcane Scheme

From 1984 onwards the production of sufficient quantities of certified seedcane was planned to provide all growers with their full requirements of chosen varieties for planting into commercial farm nurseries. This amounted to 19,2 ha in 1984; 15,6 ha in 1985, and 18,0 ha in 1986.

Before this seedcane scheme started, the Extension Officer's seedcane improvement scheme resulted in only 17% of the nurseries being approved at the maximum permissible level of 0,1% diseases and off-types in 1983. By 1985, when all but 8% of the growers were participating in the seedcane scheme, 47% of the 108 commercial farm nurseries were approved within the specified limits and a further 24% were approved subject to roguing. In 1986, only 2 of the 87 growers did not participate in the seedcane scheme. The number of commercial farm nurseries planted with certified seedcane increased to 143 in 1986 but the proportion of nurseries that passed inspection for diseases and off-types declined, only 21% being approved at the specified level and a further 32% having levels between 0,1 and 0,5% and therefore requiring roguing. The major reason for the decrease in quality and the high failure rate was the widespread occurrence of off-types at a mean level of 0,9%.

Despite the succession of severe droughts in this area, the seedcane scheme has been successful in ensuring a reliable flow of certified seedcane onto all farms. This has been particularly so for the new varieties N12 and N16. The strict control exercised by the seedcane committee has ensured that nearly every grower is involved and that the required standards at all stages to commercial field planting are maintained.

The Felixton/Empangeni Seedcane Scheme

This scheme was also preceded by a seedcane improvement scheme run by the local Extension Officer. In 1984 when the acceptance levels for disease and off-types were set at 0,5%, 35% of the 273 fields inspected for use as potential seedcane were passed. The levels for acceptance were lowered to those required for certified seedcane from 1985 onwards, when only 17% of the nurseries were approved. In 1986 this increased to 24%. The major problem was the unacceptably high level of off-types present in the nurseries.

In 1985, 40 ha of certified nurseries were planted and seed was distributed for planting into commercial farm nurseries in 1986. No results from inspections are available as yet. A further 56 ha of certified nurseries were established in 1986 and this seedcane will be sufficient to provide the full nursery requirements for all the growers when the scheme becomes compulsory in 1987.

Although this seedcane scheme is in the early stages of development, the strict control by the seedcane committee will ensure that the quality of all commercial seedcane is high once the scheme is in full operation.

Conclusions

The introduction of formalised seedcane schemes has benefited a number of districts but there is still a shortage of good quality seedcane in many parts of the industry. This is especially true of the newer varieties, so that growers are not able to exploit these varieties as they should. Formalised seedcane production, carefully monitored and controlled, may be the solution.

Administering a seedcane scheme

An official seedcane committee, appointed by the grower group, assisted by both the Extension and the Pest and Disease Officers, should work together to enable the scheme to function with the necessary authority. A set of rules and procedures is necessary to provide guidelines for the committee and each stage of the scheme must be carried out to the required standards. The rules should define the committee's responsibilities, and the requirements expected of

both the grower and the certified seedcane producer (co-operator). The selection and appointment of co-operators is also an important aspect of the scheme. Growers with adequate facilities, such as a HWT tank, irrigation and good management, must be appointed and offered sufficient incentives. Flexibility is necessary to allow individual growers to produce their own certified seedcane as private co-operators, providing they follow the same procedures as the commercial co-operators. Further protection of co-operators is necessary in respect of orders for a guaranteed minimum tonnage of certified seedcane at a prescribed and adequate price. The lack of guarantees for seedcane orders and price in the past were the main reasons producers losing interest.

A timetable of the necessary procedures enables the committee to ensure that all decisions and operations are carried out at the correct time. A secretary for the committee should be employed to undertake the task of administering the routine work. This function should not be left to the extension staff or grower members of the committee.

Programming seedcane production

In practice the method established by the Amatikulu and Emoyeni groups appears to be very effective because its 2-stage operation facilitates an efficient method of seedcane propagation at relatively low cost. For the initial planning of the scheme it is necessary to determine the total area of commercial planting which is to be done annually. Once the percentage area to be replanted is assessed, the amount of seedcane required annually can be calculated, as well as the area of commercial farm nurseries required for this. As it is accepable to take seedcane from both plant and first ratoon crops of the certified and commercial farm nurseries, which have the necessary approval, the amount of new nursery plantings each year is relatively small and easy to manage.

Stage I of a seedcane scheme is the propagation of sufficient certified seedcane by the co-operators to provide seedcane requirements for the commercial nurseries on each farm. Stage II is the propagation of seedcane in the farm nurseries to provide the requirements for the commercial planting programme the following year. Seedcane is normally grown over a 12-month period and planting is carried out in the spring or early summer. Seedcane schemes also need to prepare for the gradual change that is taking place towards mid or late summer planting with minimum tillage methods, and careful programming for this is important to synchronise supplies with demands.

To ensure that all growers participate, it is necessary for the mill group to legislate accordingly because voluntary schemes, such as Tala Valley, lose effectiveness when growers fail to co-operate.

Financing a seedcane scheme

It is essential for the seedcane committee or mill group to determine in advance a set price according to an agreed formula. The price should be sufficiently attractive to co-operators that they will want to produce certified seedcane of the highest standards. The average A pool price for the season could be the base, with an incentive premium ranging from 10 to 50% above this.

The specific levy which is incorporated into the overall mill group levy, as practised by the Onderberg and Amatikulu schemes, is the most positive way of ensuring that all growers are included. However, this method depends on estimates of costs and the income varies with the size of the crop, making the exact final figure unpredictable. In the Felixton/Empangeni scheme the cession on cane payments for the certified seedcane to be received and collected by the miller one month before the seedcane is supplied, ensures a precise transaction which has to be arranged through the secretary of the scheme.

Nursery hygiene

The major disadvantage in all these schemes has been the failure of growers to eradicate volunteer varieties from all nurseries which resulted in the seedcane not passing inspection because the off-type levels were too high. The difficulty experienced in destroying the old crop is the primary cause of this. Most of the more recent seedcane schemes require the use of Roundup on the old crop during the preceding summer unless an adequate fallow period has occurred or an alternative cash crop has been planted. A pre-plant inspection of a nursery following an adequate fallow period is essential to ensure the seedbed is clean. Routine inspections by the local pest and disease control teams must be carried out according to the specifications defined by the SASA Experiment Station for certified and commercial seedcane.

It is important for the grower to ensure that any diseased stools or off-types identified in the inspections are promptly and effectively removed. Furthermore, for a successful seedcane operation the staff must be suitably trained so they can recognise diseases and varieties and carry out inspections and roguing operations in addition to those done by the local pest and disease control teams.

Only when these hygiene procedures are conducted through every stage of the seedcane scheme will the full benefits of good quality seedcane be realised.

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