Chapter 5
Mtibwa Sugar Estate Limited (MSEL)

5.1 Introduction

Mtibwa Sugar Company Limited (MSEL) is a property of Tanzania Sugar Industries Limited (TSIL), which is owned by a consortium of Tanzanian businesspersons from Turiani. MSEL’s headquarters and operations are in the Turiani Wards, the Mvomero district in the Morogoro region. MSEL contracts smallholder farmers (SHFs) who are members of a registered non-governmental organisation (NGO) which is Mtibwa Out-growers Association (MOA). The interaction between MOA and MSEL is dependent on the Sugar Industry Act (2001) that bestows the power on the Sugar Board of Tanzania (SBT) to regulate the sugar industry. Before the opening of the harvesting season, MSEL and MOA agree upon the terms of the contracts based on the nature of sugarcane, which is a major raw material of the sugar-processing factory. MSEL uses sugarcane to produce sugar, bio-energy, animal feeds, fertilisers, and ethanol. During data collection, MSEL was neither using ethanol nor selling it, but there was ongoing research among MSEL, international agencies and the Tanzania Electricity Supply Company (TANESCO) that show the potentials of changing the ethanol into usable bio-energy and other products.\(^\text{37}\) At MSEL, the efforts of the farmers determine the amount, quality, and quantity of sugarcane. All sugarcane products such as sucrose, water, fibres, and other biological contents differ in accordance with the harvesting cycle and from farm to farm.

MSEL offers high prices to SHFs who deliver sugarcane with high sucrose content. The contract between MSEL and MOA members motivates farmers by including a clause specifying that the higher the sucrose levels (sugar content), the higher the price. This implies that with more efforts of SHFs in the farm, the higher the sugar content in

\(^{37}\)URT(s) (2006). EC Response Strategy in respect to Sugar Industry of Tanzania, Sugar Board of Tanzania.
the sugarcane will be. Those who labour much are supposed to earn more, but due to difficulties in measurements, this has not yet been realised by the farmers.

### 5.2 Producing good quality sugarcane

To produce good quality sugarcane that contains more sucrose in order to make sugar as a final product, SHFs must be competent at predicting the sugarcane life cycle. Sugarcane has a life span of three to five years as far as planting and replanting are concerned. SHFs plant sugarcane once within four or five years and harvest once each year within this period.

Harvesting at MSEL’s estate and at SHFs’ farms takes place three or four times before they plant another new “plant crop”. Farmers’ costs, in growing sugarcane, include different kinds of fixed and variable costs. The fixed cost is the farmers’ own labour because the SHF normally does not hire farm workers. He manages his farm himself. However, at different points in time the SHF does hire tractors and borrows farm inputs such as fertilisers and crop pesticides. The SHF weeds, harvests and transports the crops to the factory. The initial investment is high when a farmer plants a new “plant crop” and in the subsequent years costs decrease. Planting involves costs such as clearing the farmland and buying new seeds. The farmer does not incur these costs in the following years.

Yield for a farmer means sugarcane output in tons per hectare. The harvesting takes place when sugarcane matures. The plant crop in the first year yields more sugarcane than the proceeding harvests (“ratatoon crop”), but its return on investment is lower than that of the ratatoon crops. These costs translate into a low return on investment as far as the plant crop is concerned.

The physical appearance of sugarcane is an important but not decisive factor in determining quality. The most important factor for determining the quality of the cane is the sucrose level in the stem. There are different factors, which occur within the lifecycle of sugarcane that affect the sucrose content. These factors are timing to maturity, arrowing (flowering), climatic changes, burning, and agronomic knowledge. Together, these good farming practices yield sugarcane with high sucrose content.
5.3 Effect of seasonal fluctuations on sugar content

Climatic conditions and seasonal weather changes affect sucrose levels.

*Figure 12 Relationship of seasonal fluctuations and quality of sugarcane*

Figure 12 shows the relationship between the dry season (sunshine) and the rain season (wet season) and the level of sucrose in the sugarcane stem.\(^{38}\)

Sucrose levels are at an optimum under the conditions of sunshine, low humidity, low night temperatures, and low rainfall. The year starts with a very dry short period in January, but as this period lasts for only one month, January’s sunshine does not increase the sucrose levels significantly. This short dry period is followed by a long period of

\(^{38}\) This graph is a representation of a discussion with the sugarcane experts at the Sugarcane Development Department at MSEL.
heavy rainfall in February until May. The long dry season starts at the end of May and continues through to September. A long period of rainfall in Tanzania starts at the end of August, but this rain is not sufficient to make the land wet enough to enable the sugarcane roots to absorb much water from the soil. This rain continues until September. A shorter period of heavy rainfall occurs during October until December. In October, rainwater starts to diminish the sugar content as the roots absorb water, which affects the sucrose content. The sucrose levels in the stem of the sugarcane are at the highest from the end of June until the end of September. At MSEL, these months are considered the harvesting season.\(^{39}\)

Sugarcane grows rapidly in the rain seasons between October to January and between February to May. Therefore, many physiological activities take place during these periods and the plant does not store much sucrose in the stem. Instead, it uses sucrose to grow. During the rain seasons, the invertase enzyme (the enzyme that destroys sucrose levels) is more active in the sugarcane plant than in the dry season. Harvesting in the period between June to September is recommended because during this time of year the sugarcane yields the highest level of sucrose in the stem. Many farmers like to sell their sugarcane between August and September. Hence, governing the sugarcane supply chain is about harvesting at that moment when the sucrose levels in sugarcane are at the maximum. However, good farming practices increase sucrose levels in sugarcane regardless of the season. Good farming practices include applying the required amount of fertilisers in the sugarcane farm, weeding, burning, and harvesting at the required time.

### 5.4 Contract of sugarcane

MSEL and SHFs, via MOA, negotiate every year before the opening of the crushing season (May) over the contract between farmers and factory. Among others, the contract specifies prices, credit, and organisation of the harvesting, payment and transport. These items are discussed below.

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39 During the interview, the sugarcane growers called it Msimu. Msimu is a Kiswahili term for harvesting season. At MSEL, Msimu is the time for sugarcane cutters from different regions of Tanzania, contracting transporters, and the machines that process sugarcane to produce sugar in the factory. Indeed, Msimu makes Turiani a lively area economically.
Furthermore, it should be noted that MSEL offers more than only contractual services. The company also clears roads, and on its premises has a school for farmers, a hospital, and a football team (Mtibwa football club).

**Pricing, credit and services (Clause 10)**

MSEL has devised a scheme in which the price of sugarcane depends on the level of sucrose. The higher the sucrose level, the higher the price per ton sugarcane. Sugarcane with a sucrose level below 8% is not accepted. When such sugarcane is delivered, the Mill Operations Committee (MOC, to be discussed below) is obliged to look into the matter and to propose a solution. In the year 2007, sugarcane with an 8% sucrose level fetched 27,464.46 Tshs, while a level of 14% got 44,244.20 Tshs per ton for the sugarcane transported from a nearby zone. This relationship between pricing and sucrose level is linear. The pricing is agreed upon every year, based on the then current sugar prices of the world market.

MSEL offers training, agronomic knowledge and fertiliser on credit in order to support the efforts of SHFs. MSEL employs extension officers who offer training sessions and visit villages to offer specific agronomic advice to individual farmers. The SHFs must allow MSEL staff, government staff, or appointed representatives of MOA to inspect their fields.

MSEL extends credit services to SHFs. Farmers, being a member of MOA, may apply for subsidised fertiliser. The government provides the subsidy. Farmers can get this fertiliser via MOA’s office. MSEL pays for the fertiliser (the non-subsidised part) and transports it to the MOA office. This fertiliser is then to be repaid by the SHFs through a deduction on the revenues of the sale of sugarcane to the factory. Farmers need to apply for subsidised fertiliser in a group of ten or more. The whole group is responsible for repayment of the fertiliser supplied to the group.

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40 MSEL charges transport costs through pricing. The SHFs whose farms are close to the factory pay less transport charges than those whose farms are far-flung. The prices are set according to four zones. Therefore, the price schedule of 2007 showed that the nearest ton of sugarcane fetched the highest price and the most far away ton the lowest price.
Organisation of the harvesting (Clause 14)

MSEL’s extension officers carry out maturity tests in the cane fields (refractometer test) before harvesting in order to monitor sucrose levels in the sugarcane. The officer must take into consideration the time for harvesting and the urgency of crushing. After sampling the sucrose level, the analysis must take place as soon as possible. The result is reported to the MOC and if the cane is mature, and then the farmer receives a notification when his cane is to be harvested.

The Mill Operations Committee oversees the harvesting proceedings. It is a committee, which comprises two people from MOA, two from MSEL and one technical officer of MSEL as chairman. Clause 14 requires the MOC to undertake the scheduling of the harvesting. It sets up weekly harvesting schedules, specifying the required order of sugarcane from both SHFs and MSEL’s cane fields. MSEL organises the transport of sugarcane from the farm to the factory. The contract states that if the sucrose levels fall below an average of 8% in the laboratory analysis, the committee must immediately investigate this anomaly.

Clause 14 also requires the MOC to support the SHFs whose fields accidentally catch fire so that they receive the highest possible priority to harvest their sugarcane, regardless whether or not they are scheduled to be harvested later than that time. When fire accidents occur in cane fields, a farmer has to report to MOA main office. The MOA main office gives him the permission to report to the MOC within 6 to 12 hours after the fire incident. Within that time span, the MOC must decide whether to harvest the burned cane within 48 hours depending on the availability of cutters and other logistical considerations.

Payment (Clauses 27 and 29)

Clause 27 of the contractual agreement compels MSEL to pay SHFs their dues within 30 days after they deliver sugarcane to the factory. From the payment, MSEL deducts any amounts relating to credits and costs of services provided to SHFs by MSEL. Other deductions are statutory such as taxes and MOA levies. MSEL deducts for the following:

- Cane cutting,
- Cane transport,
- Grab loading,
• TASGA\textsuperscript{41} contribution,
• Cess (local government taxes on agricultural produces),
• MOA loaders costs (if one hires a loader from MOA),
• MOA membership.

Clause 29 of the agreement is about the burning of SHFs’ cane out of the harvesting schedule. The affected farmer must pay a penalty of 5\% of the income received after selling the sugarcane. In case of accidental fires, one who is not a member of MOA must pay 7.5\% out of the income obtainable from selling the accidentally burned sugarcane.

\textbf{Transport}

MSEL contracts transporters from any interested party/company owning trucks. During the harvesting season, drivers report to the MSEL’s transport supervisor in the Out-growers Development Department (OGD). They sign the contract and the transport supervisor gives the driver a document containing the designated route of his truck and the schedule. The information contained in the document includes truck, route, and zone, name of the farm and the owner of the farm.

The driver drives the truck to the farm where the sugarcane cutters have already cut the sugarcane. When the driver parks the truck, the cutters help to upload the cane using the cane loaders. After uploading, the drivers transport the sugarcane to the factory. The time it takes to transport the sugarcane from the farm to the Cane Yard depends on the distance of the farm to the Cane Yard.

\textbf{5.5 Managing the value chain}

MSEL controls SHFs during harvesting operations through the Mill Operations Committee (MOC). The MOC schedules zones for harvesting, arranges for the testing of sugarcane maturity, and approves harvesting schedules. It lists the names of the farmers to be involved and gives the SHFs notice of the date and time of harvesting three days before harvesting commences. This gives the SHF time to burn the cane one day before cutting.

\textsuperscript{41}TASGA means Tanzania Sugarcane Growers Association. It is a national umbrella organisation of all sugarcane growers associations in the country.
Burning of sugarcane

Burning is part of the agricultural good practices. The mature sugarcane have dry leaves and green leaves hanging on the plant. Sometimes, it is not easy to see the stem of mature sugarcane due to these leaves. Dry sugarcane leaves release a powdery substance that causes the skin to itch on contact. The burning of these leaves facilitates the harvest of the canes. Burning does not destroy the stem shoot of the sugarcane plant due to the natural water content in the stem.

Burning has the disadvantage of accelerating the inversion rate (that is, the inversion of sucrose into glucose and fructose). Inversion immediately starts after burning. The inversion process completes within 48 hours. Therefore, it is one of the good farming practices for a farmer to burn a controlled acreage of land and to ensure organisation of cutting, logistics, and processing. When cutters cut the sugarcane, they also remove the top part of the plant in order to slow down the process of inversion.

As part of their sucrose level management, both MSEL and SHFs are keen to organise the burning of sugarcane. They make sure that they organise the burning so that labour, trucks, and the capacity of the factory can accommodate to harvest the burned sugarcane within 48 hours. MOC prepares a schedule that takes care of the volume and the weight of sugarcane for each operating day. This schedule helps the MSEL and SHF to minimise the losses that result from any delay after burning.

The MOC ensures that the SHFs and MSEL comply with the harvesting schedule and makes sure that there is no interruption to the Daily Rate of Delivery (DRD). The DRD means that MOC plans towards fulfillment of the factory crushing capacity of 160 tons of sugarcane per hour. The MOC also oversees the measurement of the sucrose levels and the pricing.

Randomised off-loading at the Cane Yard

The trucks off-load sugarcane at the Cane Yard (CY) after driving through the Weighing Bridge (WB), which determines the weight of the cane in the truck. At the WB, the responsible MSEL employee retrieves the information from the computer concerning the truck, based on the document the driver shows at the WB. After registering at the WB, the truck off-loads the sugarcane at the CY and the driver then
goes to the supervisor to take another farm order. The driver does not necessarily return to the same farm, but goes to the farm stated on the document he is given. All the trucks off-load sugarcane at the CY in a random fashion. The truck can off-load its sugarcane on or close to piles of cane previously deposited, or elsewhere. It is common for a pile of sugarcane at the CY to contain sugarcane from different farms, because of the different capacities of the trucks. The trucks have capacities ranging between 8 and 12 tons. Thus, a pile of 50 tons may contain the sugarcane of four to six trucks from different farms. The cane loader loads the cane heap onto the feed table. The feed table is an elevated flat leveled-table, which allows the sugarcane to slide onto a conveyor belt. In July and August, there are many piles waiting on the feed table to be crushed. The conveyor belt takes the sugarcane into the crushing machine. A computerised weighing scale records the number of tons the cane loader lifts and pushes into the crushing machine.

The juice released from the cane in the crushing machine is channeled to a tank. A sugar analyst of MSEL takes a sample of the juice from the channel each time when 50 tons of cane has been crushed. This sample is analyzed on sucrose content in the MSEL laboratory. The outcome of this analysis is attributed to farmers whose cane has been deposited in the CY. As the piles in the CY are randomly formed, the piles are randomly fed on the feed table and the cane of farmers is not clearly identifiable in the piles, the correct attribution of the outcome to specific farmers is not guaranteed. Attribution might even be completely random if many small farmers in the peak season deliver their cane in random fashion to the factory. Especially the smaller farmers suffer from this random attribution. Much larger farms will block a couple of days in the harvesting schedule and be the only one to deliver cane to the factory. The sampling outcome will then not be random.

As the price of the cane is based on the sucrose content in the sample, the actual revenues for a small farmer is also subject to chance. It might be that the revenues do not reflect the sucrose content of his cane but that of another farmer. Depending on the effort and agronomic knowledge of that farmer, compared to his own effort and knowledge, this might yield revenues (grossly) above or below the sucrose content of the cane the farmer actually delivered. For a big farm, this problem is irrelevant as the price is based upon samples that actually correspond to the delivered cane.
5.6 Measurement mistrust and opportunistic burning

The way samples of juice are taken results in random attribution of sucrose content to (small) farmers. It is obvious that when the juice samples are taken from randomly formed piles consisting of different randomly uploaded (parts of) a pile of sugarcane on the feed table, correct attribution is nearly impossible. This gives rise to confusion among farmers. For example, when a farmer receives different measurements of sucrose levels relating to his farm, it raises the suspicion that he is not treated correctly. In a focus group discussion farmers lamented that there was cheating in the measurement system. All the farmers who participated in the interviews claimed to receive low prices. However, one of the MSEL officials complained about farmers’ resistance to change. He said that sugarcane growing started a long time ago in Turiani, but people were still not following good farming practices and this lowers sucrose levels.

The measurement problem is even more pronounced as SHFs strive to sell their sugarcane in the dry season in order to maximise the sucrose levels. In the peak season, small farmers are especially affected by the measurement problems due to random off-loading, piling and sampling. They are too small to prevent the random attribution of sucrose level.

In the interviews, independent (large) farmers said that the difference between sucrose levels in the rainy season compared to the dry season is not that big when good farming practices are followed. They said they sell in the rainy season and then are able to fill the daily crushing capacity of the factory for several days, or even one week, without mixing their harvest with the harvest of any other (small) farmer during crushing. According to them, this eliminates the measurement problem, as the sampling will correctly reflect the sucrose level of their harvest. The smaller SHFs complain about this and say that the independent farmers bribe the employees in order to obtain high sucrose levels. Smaller SHFs thus suspect things as nepotism, corruption, and

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42 Recently, one of the SHF’s reported in The Guardian News Paper of 17 June 2008.
43 “It is better to work with the MSEL under the government, where we were receiving equal payment. Now the measurement is not clear, it is like lottery,” said one of the participants.
44 “We have the problems of dealing with farmers who lack skills of crop husbandry and capital to invest in expanding their farms. So it becomes difficult for us to encourage them to stick to good farming practices.”
patronage by MSEL employees in the allocation of sucrose content. This has created mistrust among the smaller SHFs.

The measurement system demoralises the smaller SHFs. The farmers who labour much in the farm become demoralised when they receive the same prices as other SHFs who do not labour in the same way. MOA members have been complaining about the treatment when it comes to payment. Whatever resources MSEL is employing to create a transparent system of measurement of the sucrose contents, mistrust will stay if attribution of the sucrose content seems more like a lottery. MSEL has failed to create a measurement system that gives an individual farmer a payment based on the specific cane the farmer delivers to the factory.

Another difference between small and big farmers is to be found in the contractual setting. The bigger independent farmers sell sugarcane to the factory without being a member anymore of MOA. They negotiate with MSEL themselves. Those farmers do not even apply for the fertilisers on credit; they buy fertilisers on the market. Smaller farmers do not have the means to be independent from MOA. Normally, MOA negotiates on their behalf with MSEL. As they have no capital to buy fertilisers, they have to apply for subsidised fertiliser via MOA via a group loan and group collateral. In the interview, some SHFs had a dream that when they will have enough capital, they will stop being members of MOA as they think MOA does not help them. Although extension officers of MSEL and the Tanzania Sugarcane Institute train farmers who are members of MOA, the measurement problem stands in the way of consistently improving sucrose levels so that SHFs may profit from their efforts.

MOA members also claim that MSEL does not offer the prices according to the contract. The contract states that where sucrose levels fall below 8% in the laboratory analysis, MOC must hold a meeting immediately to investigate the cause of this anomaly and come to a final decision. The word “anomaly” in this context, means that MSEL does not accept sugarcane with sucrose levels below 8%. For example, farmers who sold sugarcane in January 2007 were assigned sucrose levels ranging from 6.7% to 9.6%. MOC should have investigated the lower yields. However, as the cane has already been crushed and the juice been taken up in the processing, it is impossible to revert the process. As it is unclear to what pile of cane in the CY this sucrose level is attributable to, it is also useless to stop the crushing process, or

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45 This was revealed during a focus group discussion at the MOA office in Turiani in 2007.
if still present in the CY to identify the specific cane. It is therefore hard for MOC to find the cause of this anomaly. The MOC may then decide to pay the farmer according to the pricing relation specified in the contract based upon this sucrose level. Farmers then complain that MOC doesn’t do anything about the low yields they are attributed. Farmers with low yields might then not receive any income as the contractual deductions (e.g. loan repayment, cess, etc.) leave a farmer in net debt.

Race to burn sugarcane

Burning sugarcane is one of the good farming practices. Prior to harvesting, cane is burned in order to remove the cane leaves and facilitate the cutting. However, burning immediately accelerates the inversion of the sucrose into glucose and fructose. To prevent sugarcane from fermenting, the processing must start within 48 hour after burning. Otherwise, the cane ferments and becomes useless for the production of sugar. For farmers, it is interesting to burn the cane when it matures just before the moment of arrowing, because the sucrose level is then at its highest. The peak in the sucrose level in cane is in the dry season, which is the period between June and September.

Farmers are able to rudely gauge and estimate the level of sucrose in their cane. Given the pricing system (price is dependent on sucrose level), it is in the interest of every individual farmer to harvest in the dry season. Although the MOC sets up the harvesting schedule, MSEL cannot process all mature cane that SHFs might deliver in the dry season on a daily basis. If the harvesting schedule on a specific date does not contain the name of the farmer who has his fields full with mature sugarcane, the only possibility of having his cane harvested on time is to “accidently” burn the cane. This will force MOC (according to clause 14) to prioritise the harvesting of those particular fields. However, when the farmer reports the fire accident early in the next morning to the MOC office, he will find many other farmers with mature cane who were also not included in the harvesting schedule and who want to report a similar fire accident. It is not easy to

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46 Causes might be arrowing (blossoming, resulting in a rapid reduction of the sucrose content) of the plant and thus harvesting to late, lousy farming practices or too little effort weeding etc. But each of these causes are difficult to establish ex post.

47 Based on agronomic training and experience over the years, farmers can assess the maturity of cane. See also MSEL report number 1 of 2007 of Mtibwa Sugar Estates Limited Company Brief.

48 According to MSEL officials daily crushing capacity is 160 tons x 24 hours = 3,840 tons.

49 The interviews with SHFs revealed that this has actually happened.
accommodate everybody because unscheduled burning puts pressure on the cutting, transport and processing resources. MOC thus selects to harvest (accidentally) burned sugarcane of a few farmers and is forced to leave the harvest of the others on the field. Those who are not among the few that get their sugarcane harvested, see their sugarcane rotting in the fields. These latter farmers will be impoverished as they will be without any revenue, but still in debt for services, seed and fertiliser supplied to them on credit by MSEL.\(^\text{50}\)

Apart from accidental fires and fires set by farmers themselves, the year 2007 included a third group of participants having an incentive to set fire to the cane. Due to a pay dispute between MSEL and cane cutters, the cutters refused to work on the MSEL farm itself. The cutters held out for higher wages. Because of this, the factory did not get enough sugarcane to run efficiently and MSEL asked the SHFs to start cutting their cane. The SHFs were prepared to pay the cutters twice as much as the rate provided by the MSEL farm. After cutting the cane in farms, cutters set fire to cane fields of other farms at night in order to continue their work at the more attractive rate. This unorganised fire setting proved to be so problematic for the MOC that it could not handle the timely transport of the cane to the factory. Therefore, those farmers that did not have their cane accepted saw their cane rot in the fields.

### 5.7 Summary

MSEL is a case study of contractual relationships between MSEL and SHFs of sugarcane in Turiani Ward. The data collection concerning this case took place between 2007 and 2008. The findings show that producing sugar from sugarcane depends on the knowledge of the sugarcane producers. This makes that MSEL works closely with SHF in order to obtain good quality sugarcane. A farmer who grows good quality sugarcane has agronomic knowledge pertaining to maturity, timing the burning of sugarcane, required agronomic conditions, and the timing of the arrowing (blossoming) of sugarcane. Seasonal fluctuations also matter to both SHFs and MSEL, because it affects sucrose content in the stem of sugarcane. Sucrose content affects the price of sugarcane and the amount of sugar produced in the factory. The higher the sucrose levels in sugarcane, the higher the amount of processed sugar per ton in MSEL factory. MSEL sets prices according

\(^{50}\) Some farmers have been protesting about this in the local newspapers. See The Guardian of 27th January 2007.
to the sucrose levels in sugarcane delivered at the factory. The higher the sugar content in sugarcane delivered, the higher the price per ton the farmer receives.

Unfortunately, the incentive strategy has not yet realised its full potential in Turiani. Although farmers work hard in individual farms, when it comes to payment, they receive prices, which are not what they bargain for due to sampling and measuring problems. Knowing that, farmers postpone selling sugarcane in the rainy season expecting to sell sugarcane in the dry seasons when the sucrose levels in the stems are high in order to increase the chances of getting high prices. Moreover, MSEL and SHFs have agreed on various clauses and one of these is to protect a farmer from accidental fires. This clause has turned out to motivate SHFs to opportunistically burn sugarcane. SHFs are misusing this clause to burn sugarcane out of the schedule knowing that clause 29 of the contract sanctions MSEL to buy their sugarcane in case of a fire accident.