# MAKING USE OF RAINFALL AT SPRING AND SUMMER TIME (CONT.)

is measured as depth in millimetres (mm). Without getting in all details of calculating effective rainfall, on average

**Figure 5: Protection of installed rain gauge**

3mm of rainfall is considered to be not effective. Therefore, it is expected that from any rainfall collected from a rain gauge, 3mm must be subtracted. What remains is the effective rainfall. The effective rainfall should then be added to the available moisture in the soil .

**Waiting period guide**

For those growers who are not yet fully practising proper irrigation scheduling, they can follow a guide developed by the South African Sugarcane Research Institute (SASRI) as shown in **Table 2**. Although the guide developed by SASRI is for the sugarcane irrigated areas of South Africa, it is relevant for the Swaziland sugar industry because Swaziland is within similar climatic conditions as those areas in South Africa. **Table 2** shows the days to wait before another irrigation is applied in a particular month of the year depending on the amount of rainfall collected. This means without a rain gauge, the guide in **Table 2** cannot be of benefit to a grower. Growers are encouraged to buy rain gauges in order to make use of this information and benefit from any rainfall received. **However, it must be noted that this guide is not a substitute for proper irrigation scheduling as it does not take into consideration all the different factors considered when practising scheduling**. Growers can use it while means towards proper scheduling are being sought and implemented.

**Table 2: A guide to resumption of irrigation after rainfall events**

| Rainfall collected (mm) | Number of days to wait before resuming irrigation for a particular month below | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Less than 6 | 0 | 1 | 0 | 1 | 1 | 2 | 2 - 3 | 1 | 0 | 0 | 0 | 0 |
| 6 to 10 | 1 | 1 | 1 - 2 | 2 - 3 | 2 - 3 | 4 | 4 | 2 | 1 - 2 | 1 - 2 | 1 | 1 |
| 11 to 15 | 2 | 2 | 2 - 3 | 4 | 4 | 6 | 6 | 3 - 4 | 2 - 3 | 2 - 3 | 2 | 2 |
| 16 to 21 | 2 - 3 | 3 | 4 | 6 | 6 | 8 | 8 | 5 | 4 | 4 | 3 | 2 - 3 |
| 22 to 27 | 3 - 4 | 4 - 5 | 5 | 8 | 8 | 8 | 8 | 6 - 7 | 5 | 5 | 4 | 3 - 4 |
| 28 to 34 | 4 - 5 | 5 - 6 | 6 | 8 | 8 | 8 | 8 | 8 | 7 | 6 - 7 | 5 - 6 | 4 - 5 |
| More than 34 | 6 | 6 | 7 | 8 | 8 | 8 | 8 | 8 | 7 | 7 | 6 | 6 |

*By Patrick Mkhaliphi (Irrigation Officer)*

# CORRECT TIMING OF PRE-EMERGENT HERBICIDES

The average day temperatures have picked up already. No doubt weed pressure will take its toll on growers. For growers to be on top of the game, pre-emergent herbicides will have to be applied on time. Once pre-emergent herbicides are applied, the soil should not be disturbed otherwise the efficacy of the herbicide is broken. For example, if a combination of ***Ametryn*** and ***Acetochlor*** is used, the expected period of control is 9 weeks. Any weeds emerging before the 9 weeks elapse should be killed by spot spraying with a post-emergent herbicide as opposed to hand hoeing.

Growers are encouraged to avoid using full-cover spray at application of pre-emergent herbicides mixed with a post-emergent herbicide when the crop is fully emerged. There is no doubt that there is an appreciable loss in cane growth even though the crop may recover later on. In such situations, direct sprays with protective shields are recommended. The best practice is to apply pre-emergent herbicides before the crop overshadows the soil on the row, otherwise

**Figure 6: Cane scorched by a post-emergent herbicide**

the chemical is intercepted by the cane leaves.

Figure 6 shows cane scorched by a post-emergent herbicide applied in combination with pre-emergent herbicides. Growers are encouraged to seek advice from Extension Officers in their respective areas.

*By Njabulo Dlamini (Crops Agronomist)*

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SWAZILAND SUGAR ASSOCIATION TECHNICAL SERVICES

# EXTENSION NEWSLETTER

Number 56 2nd Quarter 2014/15

INSIDE THIS ISSUE:



*Read on the benefits of organic matter in the soil*

**Organic matter**

**"Organic matter is at the heart of soil health"**

**Irrigation Scheduling**

**"The best way to maximize benefits of rainfall is proper irrigation scheduling."**

**Pre-emergent herbicide**

**"Once pre-emergent herbicides are applied, the soil should not be disturbed..."**

# SOIL ORGANIC MATTER, WHAT IS THE STORY?

**Background**

In recent years, there has been so much emphasis on building-up organic matter in the soil. A grower may ask "what is the story about this soil organic matter (SOM)?" This article will try to answer some of the questions growers may be asking on this issue of SOM.

**What is organic matter?**

Organic matter, in the broadest context, may be referred to as the total complement of organic substances present in the soil. These include living organisms of various sizes, plant and animal tissues at different stages of decomposition and the dark-coloured humus consisting of non-humic and humic substances. Humus is the fairly stable amorphous brown to black material bearing no trace of the anatomical structure of the material from which it was derived.

**What are the benefits of organic matter?**

There is so much discussion of soil health in the corridors of conservation agriculture (CA), soil fertility and crop nutrition. At the centre of these discussions is SOM. Dr Neil Miles (SASRI Soil Scientist) found that scientific research repeatedly concludes that '***organic matter is at the heart of soil health***'. OM in the soil:

- Improves soil structure.
- Supplies soil nutrients especially nitrogen, phosphorus and sulphur.
- Improves the cation exchange capacity (CEC) and pH buffering capacity on the soil.
- Increases soil water holding capacity.
- Offers resistance to compaction.
- Binds soil particles together thus reducing erosion.
- Encourages build-up of beneficial soil micro-organisms.

**What is the OM content of my field?**

The amount of OM cannot be estimated by the naked eye, laboratory tests are necessary. Different laboratories express SOM levels in different units including organic matter content, carbon content and humus content. In most soils 1% organic carbon is approximately equivalent to 1.72% organic matter, while humic substances may be 60 to 80% of total SOM. Growers are encouraged to check OM content of their fields.

Again, different laboratories use different methods to estimate total SOM. For example, the two laboratories, RSSC lab and SASRI FAS lab, use the Walkley-Black and Mid-infrared Spectroscopy techniques, respectively. This underlines the different results obtainable from different laboratories even when soil samples are derived from the same composite sample.

**What are the SOM contents for the industry?**

A total of 206 soil analysis results of samples submitted for non-routine analysis at RSSC lab (through SSATS) last season (2013/2014) showed that 80 percent of the fields had OM content in the range of 2.0 to 3.0% (Figure 1). The results also showed that 15 percent had OM content less than 2.0% while 5 percent had OM content above 3.0%. In South African scenario, the SA fertilizer handbook indicates that in that country 4% of the arable soils contain more than 2% C, and 58% of the soils contain less than 0.5% organic C. The remaining 38% of soils contain between 0.5 and 2% organic C.

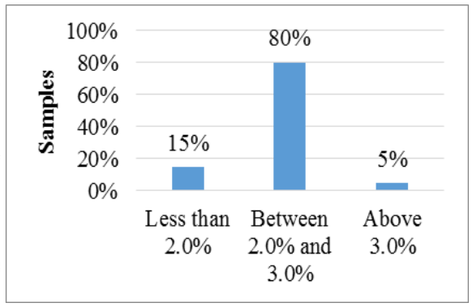


**Figure 1: Organic matter content**

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# SOIL ORGANIC MATTER, WHAT IS THE STORY? (CONT.)

### Do similar soils have the same OM content?

The total content of SOM is affected by a number of factors which may be categorised into two: site related and management related. Site related factors include climate, landscape and texture whereas management related factors comprise inputs and soil disturbance. While the site related factors are beyond the control of the grower, it is pertinent to comprehend that the grower is in charge of the latter. This therefore implies that though soils may be similar in classification (similar parent material) but due to the different conditions they are subjected to, the OM content may not be the same.

### Can SOM be improved?

The answer is a BIG resounding YES. Growers are encouraged to invest in practices that enhance OM content in soils. Such practices include trashing, green manuring, addition of organic amendments and minimum tillage.

### What is trashing?

Trashing refers to the practice of retaining sugarcane residues in-field after harvesting. It is well established in many research work that green cane harvesting and maintaining the trash blanket on the soil surface improves SOM content and consequently increases soil productivity. It is encouraging to note that some growers in the industry are adopting this practice. Another practice embraced by growers who routinely burn cane prior to cutting, is that of retaining cane tops after harvesting operations. Many studies have also recorded beneficial effects of this practice relative to the removal or burning of this organic material after harvesting. Trashing beside the advantage of adding OM into the soil provides other related benefits such as increased soil microbial activity, improved soil chemical and physical properties such as enhanced soil structure and reduced soil erosion.

### Why green manuring?

The sugarcane yield decline resulting from the loss of the productive capacity of soils is much associated with the long-term sugarcane monocropping. Green manuring, the practice of ploughing in green crops has proven to enhance the OM content of soils. A study carried out in the duplex soils of the industry indicated that sunn hemp (*Crotalaria* spp) as a green manure crop improved mean sugarcane yields by 45.6% in the plant crop, with residual effects of 24.3% and 23.9% measured in the first and second ratoon crops, respectively (Table1).

Research done in the north coast of the South African sugarcane industry to simulate the economic impact of green manure fallow period concluded that even the longest (10 months) fallow, green manuring economically outperformed both weed fallowing and straight plough-out and replanting.

Close to the practice of green manuring is that of planting of cover or break crops in rotation with sugarcane. While green manure crops return extra OM to the soil, cover crops are used for soil protection and weed suppression. Both are beneficial in breaking pest and disease cycles.

**Table 1: Effect of green manuring on cane yield**

| Crop | Fallow green manure | Non-fallow | % difference |
|---|---|---|---|
| Plant | 150 | 103 | 45.6 |
| 1st ratoon | 119 | 95 | 24.3 |
| 2nd ratoon | 109 | 88 | 23.9 |
| 3rd ratoon | 90 | 86 | 4.7 |

A study done in the Australian sugar industry showed that up to four sugarcane harvests following a legume break crop yields were at least 20% more than four sugarcane harvests after a traditional plough-out and replant.

Preliminary results of an on-going trial in Mauritius revealed that the incorporation of a legume break crop prior to planting increased yield of the plant cane without nitrogen (N) fertilizer and the first ratoon crop which received only half the amount of normally recommended N.

### What are organic amendments?

According to Miles, additions of organic materials such as animal manures, compost, mill ash, and filtercake from sugar mills, are beneficial to soils, as are management practices that conserve or build SOM levels, such as no-till cropping or pasture rotations. Some of these organic materials have proven to provide amelioration effect in the soil. A laboratory experiment conducted at SASRI on different textured soils showed that organic amendments improve bulk density of coarse (light) textured soils.

### What is minimum tillage?

Minimum tillage refers to reduced cultivation or soil disturbance necessary for crop production. A study carried out in Mauritius to ascertain the influence of manual cropping and mechanical cropping showed that with manually-cropped soil, OM content was found to decrease with cropping in the topsoil, but to increase in the subsoil as a result of soil mixing through tillage. Microbial biomass also decreased in the topsoil as the microbial population had less OM to feed on. When manually-cropped soil was compared to mechanically-cropped soil, both OM and microbial biomass tended to decrease with mechanization as the soil was highly disrupted following land preparation. This may be remedied by trash blanketing, addition of substantial amounts of organic wastes, and the incorporation of leguminous green manures with the cropping cycles, among others.

***By Njabulo Dlamini (Crops Agronomist)***



# MAKING USE OF RAINFALL AT SPRING AND SUMMER TIME

### Crop water demand

The spring (September to November) season is the time when crop water demand (ET) starts to increase and peaks during the summer time (December to February) as shown by the long term mean (LTM) values in **Figure 2** for the major met sites of the Swaziland sugar industry. It is very important to apply the first irrigation within a week after harvesting to enhance ratooning because any regrowth under very dry conditions results in die back which in turn will have adverse effects on the plant population and the intended yields.

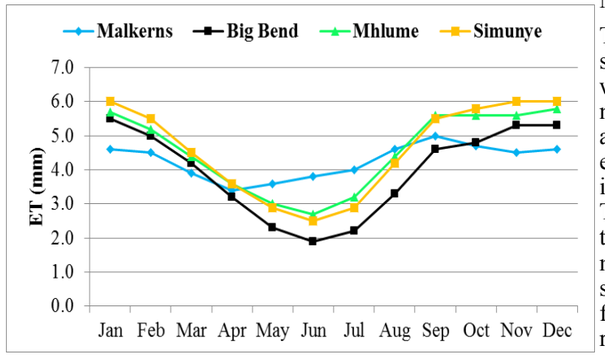


**Figure 2: LTM crop water demand for the Swaziland sugar industry**

### Rainfall

Also at spring time substantial rainfall is expected to start and increase as it gets into summer (November to January) as shown in **Figure 3**. Rainfall at times is ignored yet it plays a vital role in sugarcane growth. There is a need to make use of the rainfall in order to maximize crop growth and consequently increase yields. Rainfall uniformity is better than that of irrigation. Rainfall water also has an advantage of adding, although in small quantities, some micronutrients. As rain falls through the atmosphere it picks up valuable micronutrients, which become part of the soil water and therefore made available for plant growth. It is important to reduce or stop irrigation when there has been rainfall received to ensure that the sugarcane benefits from the rain water. Continuing with irrigation even when there has been sufficient rainfall results in the loss of benefits of the rainfall. Besides losing the benefits of the rainfall, continuing with irrigation after having received substantial rainfall can lead to over application of water. Excessive water causes drainage problems, leaches nutrients, increases weeds and diseases incidences and causes poor growth which results in low yields.

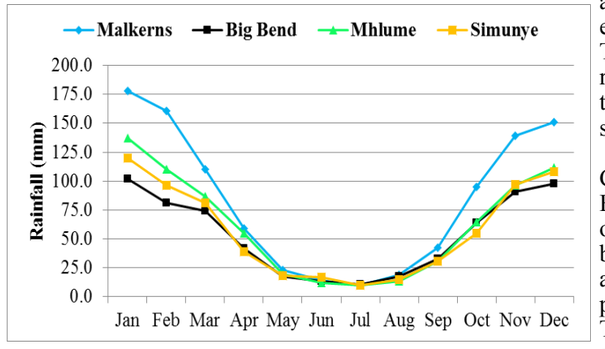


**Figure 3: LTM rainfall values for the Swaziland sugar industry**

### Measuring rainfall

The best way to benefit from rainfall is to properly schedule irrigation. Proper scheduling ensures that the water requirements of the sugarcane crop are met. Unnecessary over irrigation is a waste of electricity and also increases irrigation labour costs. Every grower is encouraged to practice some form of irrigation scheduling so that there is a benefit from any rainfall received. The starting point to benefit from the rainfall received is to know its amount on a particular rain day. Rainfall is measured by a rain gauge. A rain gauge must be installed in a proper site. A proper site is one that is away from any obstruction that can disturb the collection of rainfall. The rain gauge should be fastened upright on a pole and be more than a metre above the ground. If vandalism is not a problem it should be sited within the field vicinity. **Figure 4** shows a rain gauge that was well sited and properly installed. It is advisable to have a rain gauge after every kilometre. This is because rainfall distribution varies over a small radius.

**Figure 4: Properly sited and installed rain gauge**

Currently, the cost of one rain gauge does not exceed E40.00. Growers are also advised to buy the plastic type of rain gauge as opposed to the fibre glass type. This is because the fibre glass material easily cracks under heat and during storms. Other growers have improvised by putting a rain gauge inside a pipe as shown in **Figure 5**. This helps to minimize damage by storm, reduces wear-and-tear due to heat and also reduces vandalism and stealing as it is not easily visible.

The measured rainfall from the rain gauge forms what is called a gross rainfall. Out of the gross rainfall an effective rainfall must be calculated. Rainfall in a rain gauge