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To: All Tobacco Growers
Contractors
Merchants
Agrochemical Companies

Dear Grower

RE: MANAGING DROUGHT IN TOBACCO PRODUCTION

1. INTRODUCTION

The Meteorological Services Department has predicted an erratic 2018/19 rainfall season, with a normal to below normal precipitation, and this is attributed to the El Nino Effect. Not only is rainfall expected to be lower than normal, it is also forecast that it will be erratic in space and time. Tobacco growers should, therefore, be appropriately prepared especially for dry land crops. Most importantly, for successful drought mitigation, growers must consider the time of the drought in relation to the crop growth stage, and the conditions before and after the drought. This article will, therefore, highlight some important drought mitigation techniques and tips that will help growers produce a profitable crop in the face of adverse weather.

2. PRE-SEASON CULTURAL PRACTICES

Cultural practices such as early and deep ploughing before the end of the rains mitigate the effects of drought in the subsequent tobacco crops by ensuring that there is sufficient residual moisture at the time of planting. Linking this residual moisture with planting water ensures good crop establishment and subsequent

uniform early growth because plant roots are allowed to grow deep into the soil and access this residual moisture. Practices such as ripping and using a chisel plough are also very useful in tobacco production because these operations shatter the compaction layer allowing roots to grow deeper into the soil profile. In compacted soils, tobacco tends to exhibit J-rooting of the tap root and horizontal fibrous roots growing parallel to the compaction layer. This shallow root system predisposes the crop to succumb to drought.

3. EARLY-SEASON DROUGHTS

These are droughts that occur before the plants have started their period of major growth. In normal rainy seasons, the major growth phase starts at about 3-4 weeks after planting. In drought years, the start will be delayed until good rains are received. Early-season droughts should not have any ill effects on the crop provided the plants stay alive. Weaker plants, poorly planted ones and those on heavier patches around termite mounds will usually die or be severely set back, resulting in an uneven crop stand.

3.1 PRECAUTIONS AGAINST EARLY-SEASON DROUGHTS

- Select seedlings carefully and only plant well-hardened and strong seedlings of the right size.
- Make sure that adequate planting water is applied to link up with residual subsoil moisture.
- Make sure that the seedlings are planted straight down and not layered or slanted into the soil. This will ensure that the roots are placed in a zone of soil that will not dry out completely, even if rain is delayed for 7 to 8 weeks.

3.2 CULTURAL PRACTICES DURING EARLY-SEASON DROUGHTS

- Keep the crop completely free of weeds. Any weeds that germinate should be controlled by light scraping with a swan-neck hoe rather than by deep cultivation with a badza. Deep cultivation will expose moist soil to the atmosphere and cause loss of moisture. Dry soil acts as a mulch and minimizes moisture escape from the soil.

- Do not re-ridge during the drought. This operation will again cause moisture to be lost from the soil.
- Applying any top-dressing of nitrogen (ammonium nitrate or calcium nitrate) to the crop should be avoided. Doing so during drought in most cases will be harmful and may kill/burn the plants. During a drought, roots will continue to grow downwards into subsoil moisture, and a good root system will develop.
- When rains eventually come, the plants will make maximum use of all available nutrients and top-dressing nitrogen may be applied.
- Tie-ridging or pot-holing should be carried out in readiness to capture the first rains after the dry spell. This will ensure that any rain percolates into the soil and is not lost through run-off.
- If the drought persists and transplants begin to wilt severely, pot-holing between plants and applying 1-2 litres of water is advisable to save the plants. If rains are not received in two weeks, this operation can be repeated.

4. DROUGHTS DURING THE MAIN GROWING PHASE

The effects of drought during the main growing phase of the crop depend entirely on what happened to the crop before the drought.

4.1 DROUGHT FOLLOWED BY DROUGHT

If an early-season drought is broken by good rain, the crop will start to grow rapidly. Where this rain is followed by another period of drought the following will occur:

- Initially the crop will grow fast. New leaves will be initiated and lower leaves will expand rapidly.
- As conditions become drier, growth will slow down. New leaves will continue to appear, but will not expand and grow. The crop will turn dark green and have a Christmas tree appearance, with increasingly smaller leaves towards the top.

- The crop will wilt severely in the heat of the day but will recover somewhat at night. Scorching will start on the lower leaves. The bud will appear but will be slow to extend above the upper leaves.

4.1.1 CULTURAL PRACTICES FOR DROUGHT FOLLOWED BY DROUGHT

- All the cultural practices for early-season droughts apply here as well.
- The plants must be topped as soon as possible. In such situations, topping usually has to be carried out over an extended period as plants grow unevenly and become ready for topping at different times. However, each plant must be topped as soon as possible to minimize wilting and scorching.
- Maturity of leaves will be delayed considerably and they will not ripen at the normal time. Reaping must, therefore, be much later than normal.
- If the drought extends much beyond topping time, the lowest leaves will scorch before ripening but there is no point in reaping them green as they will not cure properly.
- Though the bottom leaves may turn yellow, they ripen very slowly indeed and only very light selective reapings have any chance of curing well.
- When rain does fall, the crop becomes greener and further delays ripening as the plants begin to uptake nitrogen. Upper leaves expand and the appearance of the crop improves dramatically. Test reaping of a few leaves should be made daily during this phase. Leaves should be placed in a drawer and examined for "colouring". When definite signs of colouring are seen after 48 hours, it is time to start reaping again. However, reaping should still be very light and selective and only ripe leaves should be picked.
- The speed of ripening will be slow initially and, if conditions remain dryish after the greening-up period, ripening will remain slow. If this occurs, reaping must continue to be light and selective. Plants will eventually lose their green appearance and become paler. **This is not necessarily a sign of fast ripening,** but rather an indication that excess nitrogen is no longer available. Ripening will now be more normal, but care must still be taken to reap ripe leaf only. Extended colouring time in barns will be an indication that leaves were reaped too green.

- Very acceptable quality can be produced from crops that have experienced these conditions, provided that reaping-ripe rule is adhered to. Green reaping will result in harsh-natured, lemon tobacco. A softer-natured, better coloured product with reasonable texture is obtained if only ripe leaves are picked.
- Root-knot nematodes are a problem in such seasons. Care must be taken not to confuse the yellow leaves on nematode-infected plants with fast ripening of the crop as a whole. Nematode infected plant leaves turn yellow much earlier, and normally within two months of transplanting, and in severe cases "rimfiring" occurs, which is necrosis of leaf tips and margins.

4.2 WET START FOLLOWED BY DROUGHT

The most damaging drought is the one that occurs after excessive early rains. Under these circumstances the crop has usually made good early growth, has well-expanded lower leaves but looks rather pale in colour when the drought sets in.
The excessive early rains will have leached much of the nitrogen out of the root zone. Upper leaves are initiated but, under conditions of nitrogen deficiency, they do not expand. The difference between drought after excessive early rains and previous examples is in the availability of nitrogen, both in the plant and the soil. In this case drought occurs while plants are under conditions of nitrogen deficiency but top-dressed nitrogen cannot be taken up in the absence of sufficient soil moisture.
Under these conditions the cell walls in the leaves become rather thick in relation to the size of the cells. This results in narrow leaves without much potential for expansion.

When it eventually rains, the crop can take up any available soil nitrogen again. It becomes greener but the middle and upper leaves do not expand; instead they become longer and thicker. When good rains are received for a prolonged period, a leaching adjustment may be applied if necessary, depending on the growth stage of the crop.

As with all droughts, maturity is delayed. Lower leaves which developed under reasonable conditions of nitrogen availability cure reasonably well if not too badly affected by scorch. However, middle and upper leaves tend to produce a large amount of thick off-type, grey, slatey tobacco.

4.2.1 CULTURAL PRACTICES FOR WET START FOLLOWED BY DROUGHT

- Try to ensure that plants have adequate supplies of nitrogen by top-dressing during the early wet period. This is not always successful during periods of excessive rain due to extreme leaching.
- As with all droughts, top early to give the leaves the best possible chance to expand.
- After the first few reapings, this tobacco ripens slowly. Make sure that it is reaped fully ripe. If reaped green, it will always give off-type tobacco.
- Allow full colour to develop in the barns and then **dry slowly.**
- If a lot of grey, slatey tobacco is still produced, then extend the colouring period for another 12 - 24 hours after full colour has been attained.
- If wilted leaves are reaped, apply water to the floor of the barn to increase the humidity in the barn and ensure good colouring without drying the leaves, reducing the risk of fixing green when the wilted leaves lose the little water that they have.
- This tobacco is very high in starch since the leaves developed under conditions of nitrogen deficiency. The objective of the very-ripe-reaping, extended colouring period and slow drying is to allow the starch to break down to sugars before the leaf is killed by drying.

Conclusion

In general, managing drought in tobacco crops is growth stage specific, and interventions target specific problems. It is, therefore, very important to know the specific remedial action to take at each particular growth stage of the crop cycle, including reaping and curing. Tobacco plants will tolerate moisture stress in the first four to five weeks after transplanting, however, after this stage, severe yield and

quality loses will occur if the crop does not receive sufficient moisture from either supplementary irrigation or rains and this is more so for dry land crops. Only reap ripe leaves and ensure careful curing, especially the colouring stage.

For more information, growers are urged to contact the Tobacco Research Board's Liaison Division on telephone # (04) 575 289/94 or toll-free, 08004511 or Email: tobres@kutsaga.co.zw or visit Kutsaga Research Station.

Yours faithfully

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Liaison Division