TOBACCO GROWERS GUIDE

AS RECOMMENDED BY TOBACCO RESEARCH BOARD

PLEASE REMEMBER TO ALWAYS READ THE LABEL BEFORE USING ANY CHEMICAL

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SEEDBEDS

Deep plough as early as possible (while soil is still moist), so maximum decomposition of plant residue takes place. The site should be kept free of weeds between ploughing and fumigation.

Preparation for fumigation should begin in May if sowing in June for early planted, irrigated tobacco. For later beds, fumigation will be delayed accordingly.

Listed below are all the fumigation options, seedbed fertilizers and chemicals:

SEEDBED FUMIGATION

Chemical	Rate/ha of crop	Mixing Instructions	Application Time	Pest/Disease
Metham Sodium (Herbifume)	16.2lts/ha (include 35% extra for roads and pathways)	Bring site up to just under field capacity 7 days before planned fumigation. Drench with Metham Sodium at 100mls in 4lts water/m^2 and immediately irrigate with 6mm irrigation. Immediately seal the site with polyethylene fumigation tents for 7 days. Beds may be sown 3 weeks after treatment on light soil and 4 weeks after on heavy soils.	1 month before sowing beds	Nematodes and grasses
Basamid GR	10kgs/ha (include 35% extra for roads and pathways)	Keep seedbed well-watered to activate weed seed, nematodes, fungi and soil insects. Stop watering 3 days before application. Spread Basamid GR evenly at 60g/m^2 and mix in with a hoe to 200mm deep. Irrigate to 60% field capacity and cover with tent for 7 days. Sowing can start after 28 days.	1 month before sowing beds	Nematodes and grasses
Velum 500SC	60mls/ha	Mix 10-15ml Velum 500SC in 60lt water and drench standard bed (30m^2). Apply either 1 day before sowing seed or immediately after sowing seed to moist soil followed by light irrigation. Do NOT mix Velum with seed in same can and do NOT apply to mulch. Velum and Confidor are compatible and can be applied together.	Day before or after sowing	Nematodes
Clomazone 480EC	12mls/ha	Apply 3mls per bed in 20lt watering can at sowing. Mix thoroughly.	At or just after sowing	Annual grasses and some broadleaf weeds

SEEDBED FERTILIZERS

Fertilizer	Rate/ha of crop	Mixing Instructions	Application Time
Maguires Compound S 7.21.7 (9S 0.05B)	10 to 20kgs/ ha	Apply 1kg/6-11m^2. After applying evenly incorporate by chopping in with a hoe.	After making bed and before sowing
Maguires Ammonium Nitrate 34.5%N	1.08kgs/ ha	Apply 360g per 36m^2 seedbed. Can do up to three applications starting when seedlings are 3-4cms in diameter. Dissolve AN in water and apply, followed by watering.	When seedlings are 3-4cms in diameter
OR			
Maguires Calcium Nitrate	2.16kgs/ ha	Apply 720g per 36m^2 seedbed. Can do up to three applications starting when seedlings are 3-4cms in diameter. Dissolve Calcium Nitrate in water apply before daily watering.	When seedlings are 3-4cms in diameter

SEEDBED CHEMICALS

Chemical	Rate/ha of crop	Mixing Instructions	Application Time	Pest/Disease
Confidor 70WG	30g/ha	Mix 30g per 200lt water and drench at 2lts per m^2.	After sowing and before mulching	Aphids/Ants and Termites
OR				
Thunder 1450D	110mls/ha	Mix 60mls per 100lt water and drench at 1.5lts per m^2.	After sowing and before mulching	Aphids/ Cutworm/Ants and Termites
OR				
Decis Forte	7.5mls/ha	Mix 5mls per 60lt water and drench each 36m^2 bed with 30lts	After sowing and before mulching	Cutworm
Bravo (Chlorothalonil)	200mls/ha	Mix 200mls per 16lts water. Apply 16lt knapsack over 3 beds (108m^2).	From 2 weeks after germination spray weekly	Alternaria
Copper Oxychloride 85WP	1kg/ha	Mix 200g per 16lts water. Apply 16lt knapsack over 3 beds (108m^2).	From 4 weeks after germination spray weekly and after each clipping	Angular and Alternaria
Twist 500SC	120mls/ha	Mix 200mls per 10lt water. Apply 2lts per bed with knapsack. Alternate with contact fungicide. Maximum of 3 sprays.	From 4 weeks after germination	Alternaria
Thunder 1450D	200mls/ha	Mix 12mls per 20lt water and drench on 20lts per bed. Apply after 3pm.	At 5, 8 and 11 weeks. After sowing	Budworm and Aphids
Triadimenol 25EC (Shavit)	200mls/ha	Mix 30mls per 20lt water and drench on 20lts per bed. Apply after 3pm.	Apply 2 days prior to transplanting	Soreshin
Baytan 150FS	720mls/ha	Mix 330mls per 100 lt water and drench on at 2lts/m^2 (½ rate on second year beds).	Apply 2 days prior to transplanting	Soreshin
Galmano Plus	650mls/ha	Mix 300mls per 100lt water and drench on at 2lts/m^2.	Apply 2 days prior	Soreshin
No Blite	144g/ha	Mix 200g/100lts and apply 1lt per float tray	When seedlings are 4-6 weeks	Pythium Root Rot with floating trays
Metalaxyl	144g/ha	Mix 200g/100lts and apply 1lt per float tray	When seedlings are 4-6 weeks	Pythium Root Rot with floating trays

LANDS

Soil texture, which is a measure of the clay, silt and sand proportions in a soil, is an important factor in determining whether a soil should be ploughed early or late. The inherent fertility, which is usually related to texture must also be considered. As a general rule, more fertile and heavier textured soils are best ploughed late. Early ploughing, before rains end has many advantages over late ploughing. These include lower costs, greater uniformity of land preparations and early decomposition of organic matter and hence more readily available nitrogen at planting time. It also makes conditions more favourable for water planting.

A deep plough and good land preparation are essential for maximum yield and quality. As a rule, a plough should never be less than 23cms. Another popular method is “rip and rhome” which is also done early in the year followed by further discing to keep the land free of weeds. With this method if there is under composed materials in the land at ridging the land must be considered as late ploughed.

Tobacco is grown on ridges for two major reasons:

- To promote good surface drainage.
- Ridges provide a good growing environment for early growth of crop.

PLANT POPULATIONS PER HECTARE

Average Row Spacing (cms)	Plant Spacing (cms)					
	46	49	52	55	58	60
110	19763	18553	17483	16529	15674	15152
115	18904	17746	16722	15810	15992	14493
120	18116	17007	16026	15152	14368	13889
125	17391	16327	15385	14545	13793	13333
130	16722	15699	14793	13986	13263	12821
135	16103	15117	14245	13468	12771	12321
140	15527	14577	13736	12987	12315	12346
145	14996	14074	13262	12539	11890	11904
150	14492	13605	12820	12121	11494	11111

FERTILIZATION OF LANDS

Your 3 main nutrients are Nitrogen, Phosphate and Potassium.

NITROGEN requirement (including available nitrogen in soil) is 120 to 150kgs/ha. More will be needed in leaching rains.

PHOSPHATE requirement is 20 to 35kgs/ha but will require 100 to 125kgs/ha as phosphate is inefficient.

POTASSIUM requirement is 150 to 200kgs/ha.

MAGNESIUM requirement is 13 to 20kgs/ha.

LIME should be applied at between 600 to 1000kgs/ha if your pH is below 5.5.

SULPHUR requirements +50kgs/ha.

BORON is essential on Zimbabwe soils for tobacco and a compound with boron must be used. Requirement is adequate using +450kgs Maguires High C (6.28.23).

The above requirements will usually be met by using the following on an early well ploughed land:

- Upwards of 450kgs/ha of Maguires High C (6.28.23)
- 300 to 500kgs/ha of Gypsum
- 120 to 150kgs Maguires Ammonium Nitrate (34.5%N)
- Alternate source of nitrogen instead of AN (34.5%N) is Calcium Nitrate (17%N) and Potassium Nitrate (13%N)
- If crop is pale or leached at topping stage you can apply 100 to 150kgs Maguires Calcium Nitrate (17%N)

FERTILIZER CUP AMOUNTS

This table is a useful guide for amounts of fertilizer applied by cup. The rates are calculated for a level cup of dry material. These can be affected by moisture, incomplete stands and careless application.

Fertilizer materials applied (kgs/ha) with cups of different size (ml)																
Ridge Spacing (cm)	Between Plants (cm)	Population (plants/ha)	Ammonium Nitrate			Calcium Nitrate or Potassium Sulphate			Urea			Granular Compounds				
			2	5	8	2	5	8	2	5	8	5	8	16	22	30
137	61	11966	23	56	90	30	74	118	18	46	73	64	103	206	283	386
152 + 122	61	11966	23	56	90	30	74	118	18	46	73	64	103	206	283	386
122	61	13427	25	63	101	33	83	133	21	51	82	72	116	231	318	433
107	61	15231	29	72	115	38	95	151	24	59	94	82	132	264	362	494
120	56	14881	28	70	112	37	92	147	23	57	91	80	128	256	352	480
137	46	15868	30	75	119	39	98	157	25	61	97	85	136	273	375	512
152 + 122	46	15868	30	75	119	39	98	157	25	61	97	85	136	273	375	512
122	46	17819	34	84	134	44	110	176	28	69	109	95	153	307	421	575
107	46	20317	39	96	153	50	125	201	32	79	124	108	174	350	480	656

LANDS CHEMICALS

Control of nematodes can be obtained by growing nematode resistant crops in your tobacco rotation. Some of the suitable crops are:

- Emelo Weeping Lovegrass
- Umgeni Weeping Lovegrass
- Katambora Rhodes Grass
- Sabi Panic Grass (Panicum Maximum)
- Sunhemp

Nematacides:

Chemical	Rate/ha of crop	Mixing Instructions	Application Time	Pest/Disease
Velum 500SC	900mls/ha	Mix 200mls in 100lt water and apply 30 cup into planting water or add 24mls in 2000lts water cart when using 5lts water in plant hole at transplanting.	At planting	Nematodes
Metham Sodium (Herbifume) Very Corrosive	45-120lts/ha	Apply 375 to 1250mls/100m ridge at 30 to 35cms below ridge surface. Needs water after application to activate. Rates are dependent on nematode infestation.	21 days before planting	Nematodes
Oxamyl Granules	20kgs/ha	Apply into planting hole after planting but before covering. Use a filed 2 cup.	At planting	Nematodes
Solvigo 100EC	3lts/ha	Mix 675mls in 100lts water and apply 30 cup into planting water in hole.	At planting	Nematodes

Supplementary Nematacides:

Chemical	Rate/ha of crop	Mixing Instructions	Application Time	Pest/Disease
Velum 500SC	450mls/ha	Mix 100mls in 100lts water and apply 30 cup at base of plant	Between 5 and 7 w.a.p	Nematodes

Herbicides:

All herbicides below should be mixed with 300 to 500lts water per ha unless stated otherwise

Chemical	Rate/ha of crop	Mixing Instructions	Application Time	Pest/Disease
Clomazone (Command)	1.5 – 1.75lts/ ha	Sprayed onto surface of soil over seedling after transplanting. Lighter soils at 1.5lts per ha and heavier soils 1.75lts per ha.	As soon as possible after planting	Annual grasses and some broadweeds
Dual Magnum (Metolachlor 960EC)	1.5lts/ha	Sprayed onto surface of soil over seedling within 5 days of transplanting. Land must be free of weeds before spraying.	Within 5 days after planting	Annual grasses and some broadweeds
Frontier Optima (Dimethenamid-p)	1.5lts/ha	Sprayed onto surface of soil over seedling with 5 days of transplanting. Land must be free of weeds before spraying.	Within 5 days after planting	Annual grasses and some broadweeds
Bateleur Gold 650EC	1.5lts/ha	Sprayed onto surface of soil over seedling within 5 days of transplanting. Land must be free of weeds before spraying.	Wtihin 5 days after planting	Annual grasses and some broadweeds
Authority (Sulfentrazone)	450mls/ ha	Sprayed onto surface of soil over seedling within 4 days of transplanting. Needs rain or irrigation to activate.	Within 4 days after planting	Annual grasses and some broadweeds, nutsedges
Fusilade Forte (Fluazifop-p-butyl)	0.85-1.0lts/ha	Can be directed onto the grass weeds or spray over the tobacco at any time after transplanting. Mix with 100lts water/ha.	Post emergence spot spray	Annual grasses and some broadweeds, nutsedges
Servian	50g/ha	Can be directed onto the grass weeds. Must be shield sprayed from the tobacco. Mix 50g/200lts water per ha.	Post emergence spot spray	Nutsedges

Suckerides:

Chemical	Rate/ha of crop	Mixing Instructions	Application Time	Pest/Disease
N-Decanol	5lts/ha	Mix at 4lts per 100lts water and cup on with a cup that the suckeride just reaches base of plant. Mix at 3lts per 100lt if using on very early topping.	At topping	Suckers
Accotab	2.7lts/ha	Mix at 1.5lts per 100lts water and cup on with a cup that the suckeride just reaches base of plant. Use 1 week after final topping.	After whole land has been topped	Suckers

Insecticides and Fungicides:

Chemical	Rate/ha of crop	Mixing Instructions	Application Time	Pest/Disease
Confidor 70WG	280g/ha	Mix 60g in 100lts water and apply 30 cup into planting water or add 7g in 2000lts water cart when using 5lts water in plant hole at planting	At planting	False wireworm, whitegrub, aphids and termites
Thunder 145OD	900mls/ha	Mix 200ml in 100lts water and apply 30 cut into planting water or add 24mls in 2000lts water cart when using 5lts water in plant hole at planting. Check water pH.	At planting	False wireworm, whitegrub, aphids and cutworm
Folicur 250EW	1lts/ha	Mix 220mls in 100lts water and apply 30 cup into planting water or add 27mls in 2000lts water cart when using 5lts water in plant hole at planting.	At planting	Soreshin
Trichoderma	250g/ha	Mix 55g in 100lts water and apply 30 cup into planting water. Very good application through pivot irrigation with settling in irrigation.	At planting	Soreshin
Nativo 300SC	600mls/ha	Mix 130mls in 100lts water and apply 30 cup into planting water or add 16mls in 2000lts water cart when using 5lts water in plant hole at planting.	At planting	Soreshin
Previcur N	9lts/ha	Mix 600mls per 10lts water. Soil drench on 10mls per plant.	Within 4 days of planting	Black shank
Decis Forte	50mls/ha	Mix 12mls in 100lts water and apply 30 cup over new planted seedling or can be mixed with herbicide application.	Immediately after planting	Cutworm
Karate Zeon SCS	120mls/ha 175mls/ha for spraying	Mix 25mls in 100lts water and apply 30 cup over new planted seedling or can be mixed with herbicide application.	Immediately after planting (Check water pH)	Cutworm
Fastac 10EC	50mls/ha	Mix 13mls in 100lts water and apply 30 cup over new planted seedling or can be mixed with herbicide application	Immediately after planting	Cutworm
Lambda 50EC	200mls/ha	Mix 48mls in 100lts water and apply 30 cup over new planted seedling or can be mixed with herbicide application.	Immediately after planting	Cutworm
Belt 480SC	37.5mls/ha	Mix 15mls per 100lts water and spray 250lts mixture per ha or 11mls/100lts water and apply 30 cup over plant. Suitable wetter helps to penetrate the bud. (Aqua Right 5)	After first sign of budworm	Budworm
Larvin 375SC	660mls/ha	Mix 265mls per 100lts water and spray 250lts mixture per ha or 275mls per 100lts water and apply 16 cup over plant.	After first sign of budworm	Budworm
Steward 150SC	300mls/ha	Mix 120mls per 100lts water and spray 250lts mixture per ha or 72mls per 100lts water and apply 30 cup over plant. Suitable wetter helps to penetrate the bud. (Aqua Right 5)	After first sign of budworm	Budworm

Insecticides and Fungicides:

Chemical	Rate/ha of crop	Mixing Instructions	Application Time	Pest/Disease
Thunder	330mls/ha	Mix 200mls per 100lts water and spray 150lts mixture per ha or 75mls per 100lts water and apply 30 cup over plant.	After first sign of budworm	Budworm
Belt Expert 480SC	120mls/ha	Mix 80mls per 100lts water and spray 150lts mixture per ha or 27mls per 100lts water and apply 30 cup over plant.	After first sign of budworm	Budworm
Calypso 480SC	60mls/ha	Mix 40mls per 100lts water and spray 150lts mixture per ha or 14mls per 100lts water and apply 30 cup over plant.	After any sign of aphids	Aphids
Acetamiprid 20SP	60g/ha	Mix 40g per 100lts water and spray 150lts mixture per ha.	After an sign of aphids	Aphids
Thunder 145 OD	330mls/ha	Mix 220mls per 100lts water and spray 150lts mixture per ha or 75mls per 100lts water and apply 30 cup over plant.	After any sign of aphids	Aphids and budworm
Belt Expert 480SC	120mls/ha	Mix 80mls per 100lts water and spray 150lts mixture per ha or 27mls per 100lts water and apply 30 cup over plant.	After any sign of aphids	Aphids, budworm, laceworm
Belt 480SC	37.5mls/ha	Mix 15mls per 100lts water and spray 250lts mixture per ha or 11mls per 100lts water and apply 30 cup over plant. Suitable wetter helps to penetrate the bed. (Aqua Right 5)	After first sign of laceworm	Laceworm
Larvin 375SC	660mls/ha	Mix 265mls per 100lts water and spray 250lts mixture per ha or 275mls per 100lts water and apply 16 cup over plant.	After first sign of laceworm	Laceworm
Belt 480SC	37.5mls/ha	Mix 15mls per 100lts water and spray 250lts mixture per ha or 11mls per 100lts water and apply 30 cup over plant. Suitable wetter helps to penetrate the bud. (Aqua Right 5)	After first sign of tuber moth and leaf miner	Tuber moth and leaf miner
Larvin 375SC	660mls/ha	Mix 265mls per 100lts water and spray 250lts mixture per ha or 275mls per 100lts water and apply 16 cup over plant.	After first sign of tuber moth and leaf miner	Tuber moth and leaf miner
Ampligo	250mls/ha	Mix 166mls per 100lts water and spray 150lts mixture per ha or 56mls per 100lts water and apply 30 cup over plant.	After first sign of tuber moth and leaf miner	Tuber moth and leaf miner

CONTROL OF DISEASE AFTER HAIL:

Chemical	Rate/ha of crop	Mixing Instructions	Application Time	Pest/Disease
Bion and Twist	60g/ha 180ml/ha	Mixed with at least 200lts water per ha	After hail	Disease caused by hail damage

ALTERNARIA AND FROGEYE CONTROL:

Chemical	Rate/ha of crop	Mixing Instructions	Application Time	Pest/Disease
Bion 500WG	60g/ha	Mixed with at least 200lts water per ha.	Up to 4 sprays from 6 w.a.p	Alternaria and frogeye
Twist 500SC	180mls/ha	Mixed with at least 200lts water per ha.	Up to 2 sprays from 6 w.a.p	Alternaria and frogeye
Folicur 250EW	500mls/ha	Mixed with at least 200lts water per ha.	Up to 2 sprays from 6 w.a.p	Alternaria and frogeye
Nativo 300SC	600mls/ha	Mixed with at least 200lts water per ha. No added wetters and no aerial spraying.	Up to 4 sprays from 6 w.a.p	Alternaria and frogeye
Ortiva 250SC	400mls/ha	Mixed with at least 200lts water per ha.	Up to 2 sprays from 6 w.a.p	Alternaria and frogeye
Amistar Top	500mls/ha	Mixed with at least 200lts water per ha.	Up to 4 sprays from 6 w.a.p	Alternaria and frogeye

SHEDS AND BARNS FOR TOBACCO BEETLE:

Chemical	Rate/ha of crop	Mixing Instructions	Application Time	Pest/Disease
Cislin 25EC		Add 60mls per 5lts water and apply 5lts per 100 square meters of shed.	Prior to storage and grading	Tobacco beetle
Decis Forte 100EC		Add 15mls per 5lts water and apply 5lts per 100 square meters of shed.	Prior to storage and grading	Tobacco beetle

IRRIGATION

PRE IRRIGATION

The land must be uniformly wet to a depth of 1000mm before ridging. Wherever possible, this should be done within two months of planting and the land kept free of weeds after irrigating. The amount of irrigation necessary to wet to depths of 1000mm will depend on soil type and whether the plough was early or late. Below is a rough guide to amounts required depending on soil type and whether it was an early or late plough.

Amount of water required to wet 1000mm depth of soil to field capacity		
Soil Type	**Early Plough**	**Late Plough**
Sand overlying sand	50mm	100mm
Sand overlying sandy/loam/sandy clay loam	60mm	120mm
Sandy loam overlying sandy clay loam	60mm	120mm
Sandy clam loam		150mm

SETTLING-IN IRRIGATION

The settling-in irrigation must achieve the following:

- Settle soil around roots
- Provide adequate moisture for faster root development
- Cool soil, increase humidity and reduce transpiration
- Reduce leaf scalding and transplanting shock
- Activate herbicide

No more than 15mm should be applied.

FIRST IRRIGATION

The first irrigation after stress period is important to get land back to field capacity. Too little irrigation at this stage will lead to uneven crop as tobacco on the heavier soils will sit, whereas tobacco on the sandier soils will start growing. It is recommended that this first irrigation should be no more than 25mm net on light soils and up to 35mm net on heavier soils.

IRRIGATION TO A ROUTINE SCHEDULE

Pre-Irrigation	50-150mm (see chart above)
Settling in Irrigation	15mm
First Irrigation (4-5 w.a.p)	25-35mm
Second Irrigation (1 week later)	15-20mm
Up to button stage	15-20mm every 4 to 5 days
Button stage to second harvest	25-30mm every 4 to 5 days
From second harvest onwards	35mm every 7 to 8 days

PRIMING DRY LAND CROP

Percentage Leaf (L) grades may be increased by correct management of plant population, nitrogen and in particular, topping. Priming on the other hand, will not influence leaf percentage significantly, what it will do is virtually eliminate the dry natured, shatter primings. Many growers who primed last season found the P grade eliminated from their Sales sheets.

Removal of the lower leaves when the plant is at a specific stage of growth has been referred to as priming, pruning, stripping etc. Experience has suggested that it has a number of advantages:

- The value of the first reapings from a primed crop is a significant improvement on an unprimed crop. It seems that as long as the filler grade is clean, good sized, unblemished cured leaf it does have reasonable value.
- Priming significantly delays the first reaping of that crop, increasing the gap between the irrigated and dryland crops. Often the top of the irrigated crop is reaped immature in an effort to avoid losing too much on the bottom of the dryland and this leads to quality problems. Delaying the onset of ripening of the dryland crop will permit reaping the irrigated crop at the correct stage. Similarly, by removing 6 to 8 reapable leaves from the dryland crop, losses from over ripening are virtually eliminated.
- The fact that the dryland crop will not have overripe leaf on the bottom appears to reduce the risk of disease in that crop. Fungal diseases like Frogeye and Alternaria are diseases of senescence. In other words, the diseases are more prone to attack the overripe leaf. This means that by removing the leaf earlier, the reservoir of disease spores that overripe leaf contains is much less. (Note: that this does not preclude the need for a timely, efficient spray programme to reduce these diseases in susceptible areas.)

It is clear therefore, that priming has a number of advantages. The following guidelines are recommended for those who wish to prime their crops:

- Confine the practice to the early dryland crop (October and early November crops). Growers who have primed crops planted late have experienced variable and disappointing results.
- Prime early in the crop's life. When the plant reaches the 8 to 10 reapable leaf stage it should be primed. Experience suggests that it is better to prime when the plant is fresh i.e. following irrigation or rain as it is easier to remove the leaves when the plant is turgid. Remove seedbed leaves plus 6 to 8 reapable leaves. Suggest leave the bud plus 1 or 2 leaves on the plant and remove the rest.
- The leaves that have been removed will have used some nutrients. Most probably these leaves will have taken up no more than 40 to 50% of their N requirement suggesting that around 8 to 10kg/ha of N will need replacing. This indicates that a 2 cup AN or 5 cup Calcium Nitrate will be sufficient.

As indicated above, priming will not play a significant role in altering the grade spread on the floors, this is influenced more by topping. It is therefore very important that the primed crop is bud topped at 18 leaves. The priming will help to improve crop uniformity and therefore topping should be completed in as short a time as practical.

TOPPING AND SUCKERING

TOPPING

The importance of bud topping in improving yield, percentage of leaf grades and nicotine content of the leaf cannot be over-emphasized. Equally important is to complete the task of topping in a particular field in as short a time as possible. All too frequently the early topping is done well, but the land is only closed out 3 to 4 weeks later. On an even land the task should be completed in 7 days, while if the crop is not even, topping should be completed in 10 to 14 days, meaning that the smaller plants should be topped at a lower leaf number.

- Aim to top at between 18 and 20 leaves. The more vigorous the plant the higher the leaf number. The lowest leaf that should be counted is the first reapable leaf, i.e. the first true priming. If the crop has been primed, suggest aim at no more than 18 leaves, the first leaf being the lowest remaining on the plant after priming. However, if the crop is unusually vigorous, top one or two leaves higher.
- Topping may be done by leaf count but is slow and often inaccurate if labour is not well trained. This approach to topping is often the reason why the operation is completed late.
- Bud topping is best done using a measuring stick.
    - As the plant grows bud leaves tend to fall away from the bud once they reach 3cm to 5cm in length.
    - When the 18th leaf on standard varieties falls away the bud can be removed without damaging the leaf.
    - Count leaves from the first true reapable leaf (do not include seedbed leaves).
    - When 10% of plants have reached the 18 leaf stage, cut a measuring stick to the height of the shortest plant at this stage. Measuring the stick to height of the bud is difficult. The 3 or 4 leaves that surround the bud leaves are all of the same height when these leaves are held vertically. These provide a suitable measurement for the stick size. Place the stick on the ridge between the plants and mark the height to the top of the leaves of the plant selected as ready for topping and cut the stick to this size. Cut as many sticks as necessary to issue to each topping worker and ensure that the foreman has one as well.
    - Top all plants that are at this height and above, removing the bud.
    - Note that for each topping round, the measuring stick may need to be changed as the plant develops, check this before each operation.

SUCKER CONTROL

- When bud topping, it is risky to apply the full rate of N-decanol or local systemic (pendimethalin – Accotab) over the topped plant, the top leaves will be burnt or distorted.
- Growers who favour an N-decanol/Accotab mix will need to apply the suckeride on a leaf axil below the top to avoid damage and then apply a smaller amount of the mix over the top when the next round of topping is done. The squeeze bottle method suits this approach. Unfortunately, if not done correctly, leaf axils are often missed.
- N-decanol may be poured over the top if diluted to 1:50-70. Experiment with the rate and apply that that burns the suckers but does least damage to the top leaves. As a general rule the more rapidly the plant is growing, the more dilute the suckeride should be. When poured over the top there is less chance that axils are missed.
- When diluted to this rate, effectiveness is reduced to 7 to 10 days.
- There are 2 options:
    - Repeat the dilute rate on every plant until topping is complete (no plant should receive more than 3 doses).
    - Apply the full rate of N-decanol (1:25) on all plants topped the previous week, by this stage the top leaves will have developed sufficiently to avoid damage.
- A week after topping is completed, apply a local systemic to all plants.
- If experience has indicated that late suckers are a problem, repeat the local systemic treatment 2 weeks later.
- Regardless of efficiency, misses always occur. Remove these by hand as early as possible, treating the axil using a sponge or some other suitable appliance with Accotab.
- If topping when there is a threat of rain around, it is good practice to mix a sticker with the suckeride.

COAL STOKING PROCESSES AND RECOMMENDATIONS

AUTOMATIC STOKER OPERATION

- Ensure that an adequate air supply is maintained to the fire bed.
- Ensure sufficient coal is fed into the furnace through the under feed auger.
- Once a fire bed is created, ensure that this fire bed is kept heaped and not allowed to collapse.
- Do not allow solid clinker to build up and thereby restrict the air flow upwards through the fire bed.
- The fire should be attended to on a regular basis, perhaps three times every hour.
- Care should be taken when pulling out the ash from the fire.
- As a guideline, only fine white ash should be taken out.
- Ash piles should be checked, any dark, unburnt coal should be put back into the hopper for re-use.

HAND STOKED FURNACES

- Again make sure an adequate supply of air is fed into the fire.
- Fresh coal should be placed directly in front of the fire bed and not straight onto the fire.
- Only when the gases have been burnt out from the fresh coal will this coal be moved onto the fire bed.
- Once again, this fire bed should be kept heaped up and not allowed to collapse.
- Care should be taken when pulling out ash, again the ash sample should be fine and white.
- Any unburnt coal should be put back onto the fire bed.

CURING

Tobacco curing is an extension of senescence (ripening). Therefore, the metabolic deterioration that is senescence must be occurring when the leaf is removed from the plant and placed in the curing structure. During ripening, enzymes in the leaf start to break down chlorophyll and the leaf begins to lose its green colour. Also starch, accumulated following the end of the growth phase is broken down gradually by enzyme action. Judging the correct stage of this process to achieve the optimum yield and quality is the challenge that faces growers. Leaf colour, leaf angle, leaf appearance are subjective means of determining ripeness and tend to vary with season and leaf position. The most reliable assessment of ripeness is barn colouring time as follows:

- Lower third of the plant 60 to 72 hours
- Middle third 48 to 60 hours
- Top third 36 to 48 hours

The shorter the period the better the quality, especially in the middle and top reapings.

Flue curing tobacco requires manipulation of air and heat in such combinations that the leaf is kept alive until specific chemical changes (activated by enzymes) occur. Thereafter, the leaf is preserved by drying. Different leaves (plant position, maturity/ripeness, growing conditions – climatic, soils and/or management) require differing changes in this process to achieve the best result. Recognizing these differences and adjusting accordingly is the "art" of curing. A number of key stages are identifiable and successful control of these will ensure a high quality product.

COLOURING

- Historically, colouring in traditional hand stoked flue barns is started at 28 to 30ºC usually for the first 24 hours. Temperature is then increased to 32ºC until a third to half the leaf is coloured and colouring is then completed at 35ºC. This regime minimizes fixing green on the bottom tiers, a consequence of radiant heat from the flues at higher temperatures.
- This procedure is less than ideal because the optimum temperature for the enzyme chlorophyllase, responsible for breaking down the green colour in leaf, is 35ºC to 38ºC. It therefore stands to reason that colouring will be most efficient in this temperature range. The regime outlined above would take longer to complete because at lower temperatures the enzyme's activity is significantly slower.
- **In a forced air system, where radiant head is not an issue, it is therefore logical to start the cure at 35ºC and colour at 35 to 38ºC.**

WILTING

- Curing is a process of controlled drying, albeit very slowly in the beginning to allow necessary enzyme activity to be completed.
- To ensure that the next stage can be successfully managed, curing leaf must lose at least 25 to 30% of its moisture during the colouring stage.
- Typically at the end of colouring the leaf should have the appearance and feel of a wet cloth.
- The wet and dry bulb thermometer is a useful tool to monitor this. At the start of the colouring the wet bulb will be 1ºC below the dry bulb, increasing gradually through the colouring phase until at the end of colouring the deficit will be 3ºC.

LAMINA DRYING

- Arguably the most important phase of the curing process because it is during this stage that damage to quality is most likely. However, it is worth noting that this can be successfully completed only if the previous two are managed correctly.
- THE RATE AT WHICH LAMINA IS DRIED IS DEPENDENT ON THE NATURE OF THE LEAF. Ignore this and quality may be severely compromised.

  As a general rule, the thicker the cell wall, the slower the drying. As reaping moves up the plant, leaf becomes more bodied and therefore should be dried slower. This is especially important for upper leaf that has been subjected to moderate moisture stress during expansion and tends to be close grained. Typically, this type of leaf is very susceptible to sponging.

- Normally sponging is associated with drying leaf at high temperatures, causing the moisture to be evaporated from the leaf too rapidly. However, it is also possible to cause sponging when the drying capability of air moving over the leaf surface is too aggressive. This too, may remove moisture too rapidly. (Growers with tunnels will have seen that the leaf tends to sponge on the sides of trolleys in the passages, because the air moves more freely down these passages. Curtains in the passages tend to reduce this problem.)
- The ability of air to dry is dependent on the energy that is supplied to it. Obviously, the higher the air temperature the quicker it will dry. Similarly, the higher the mechanical energy imparted on that air the greater its ability to remove moisture. Therefore it is important to moderate both heat and air to ensure the correct drying regime. Even then, in a forced air continuous system (cascade ("chongololo") or tunnel), modifying heat and air only may not be sufficient, air humidity also plays a role. (See diagram below).
- In an individual forced air system (billy barn, downdraft, bulk curer) air in the barn is recycled by manipulating ventilation, even during lamina drying. Research has demonstrated that keeping the web bulb temperature between 35 and 38ºC during this stage provides the ideal drying regime (for a well grown, correctly fertilized and ripe leaf). Therefore, it stands to reason that in a continuous system recycling humid air from the colouring end will provide a better drying regime. The diagram below clearly illustrates this.
- In summary, for thin lower reapings or fast grown tobacco the web bulb should be maintained at 34ºC to 35ºC whereas for more bodied leaf, especially if close grained, the wet bulb should be 38ºC to 40ºC. In the continuous system this is done by regulating the amount of humidity recycled.

MIDRIB DRYING

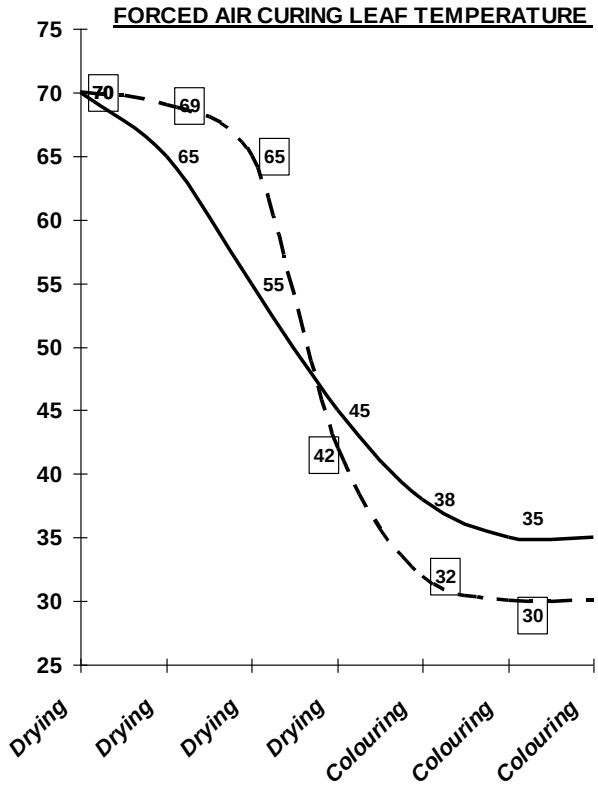
- The dense, woody nature of leaf midrib, especially on middle and upper leaves, requires high temperature and relatively little air to remove moisture. Therefore when this stage is reached, temperature is increased to 70 to 75ºC and ventilation significantly reduced to "sweat" moisture out the midrib. The continuous system is different only in so far as air moving through tobacco during midrib drying is used efficiently later in the cure and therefore reducing air in unnecessary.

CURING CURVES

The diagram below identifies two different scenarios found in continuous curing systems. It should be noted that the "ideal" curve (solid curve) is applicable to any curing system from traditional barn (with the provisor that colouring temperatures are lower to reduce risk of fixing green on the bottom tier when flues are not shielded) to bulk curers.

The "common" curve (dotted line, temperatures in squares) describes the continuous system when inlet temperature (70ºC) is correct and sufficient air is employed to ensure wilt at the end of colouring (around 43ºC). Rapid cooling of the air as the leaf dries results in colouring temperatures of around 30ºC or less depending on ambient conditions, significantly slowing enzyme activity. The tobacco is cold and turgid during (often prolonged) colouring. Towards the end of this phase, temperature begins to rise as moisture is gradually lost, and then accelerates rapidly as drying air removes moisture from the leaf. This is not usually a problem on this leaf (lower reapings, tobacco from fast growing areas and/or seasons, especially if soil nitrogen is on the high side). However, on bodied leaf, particularly if growing conditions results in close grained tobacco, this steep curve frequently causes sponging, often severe.

Research has demonstrated that by introducing humidity into the inlet air, drying capacity of that air may be considerable influenced. The same research also showed in a continuous system that by recycling humid air from the exhaust end, colouring temperatures will be raised. By managing this recycled air it is therefore possible to ensure that colouring temperature are maintained at the ideal for colouring viz. 35 to 38ºC. Also recycling, by modifying the drying rate of the air, will mean a more gradual increase in temperature through the drying phase. This is well illustrated by the "ideal" curve (solid line, temperatures open) – below:



Higher colouring temperatures result in more rapid colouring. Also, despite the fact that the air stream is carrying more moisture, higher energy levels contribute to a more efficient wilt at end of colouring.

Under certain conditions the air at the start of colouring may become saturated (wet and dry bulb temperatures the same). If this continues well into the colouring phase, barn rot (particularly fungal) becomes a problem. This is more likely if colouring is longer than normal, e.g. unripe reaping.

Both forms of barn rot (fungal – "hairy" and bacterial – "dripping") are more aggressive at higher colouring temperatures which is why they often appear worse using the ideal curve. This problem is solved by bleeding hot air into the saturated air stream. In the cascade system this is done by cracking hot vents into day 2 or 3 after loading and in the modern tunnel design, judicious use of the auxiliary hot air duct and vent system during colouring. Bacterial barn rot is increased significantly if leaf is loaded wet after rain. Again introducing hot air to dry the leaf surface immediately following loading will help.

As outlined above, the slower drying of the ideal curve is critical in avoiding sponging of bodied tobacco. Growers' experience has demonstrated that tobacco cured using this curve resulted in a richer coloured leaf with more "lustre" and less blemish. A word of warning, in thin, low starch tobacco (usually heavily fertilized tobacco in good growing conditions, especially from the lower half of the crop) slower drying may increase losses through overcolouring. In this case, it is advisable to bleed hot air into the end of the colouring phase to accelerate enzyme activity and wilt, but to restrict recycling to dry as rapidly as possible.

THE GRADING PROCESS

Given the buyer's technical considerations and requirement, five major aspects determine the grade of a leaf. These are:

- Plant position or group
- Style Factor
- Colour
- Quality or degree of waste
- Length

PLANT POSITION AND COLOUR

As already stated leaves from different plant positions must be kept separate. Separation into groups should present in one season let alone in one run of tobacco.

The following colours should be recognized:

- Pale lemon 'E'
- Lemon 'L'
- Orange 'O'
- Mahogany light 'R'
- Mahogany dark 'S'

The colour refers to the basic colour of the lamina; blemishes within the lamina will determine the quality of the leaf (an aspect explained below under the heading quality).

STYLE FACTOR

After a decision has been made on the colour of the leaf, the next aspect which determines the grade of a leaf is the style factor. Style refers principally to the texture and maturity of tobacco. Style differences occur as a result of variations in plant growth due to differences experienced in terms of weather conditions, soil nutrient status and cultural practices. Four basic styles are recognized, these being:

- Ripe/Soft style or 'F'/'FA' style – these are full coloured, open-grained, ripe and soft natured.
- Standard style refers to tobacco which is slightly close-grained but not slick or flattish in appearance with normal or average maturity and an average colour.
- Close-grained, slick or slately style or 'K' style – refers to tobacco which is close-grained and immature, having a smooth to flat surface and a relatively pale or dull colour becoming distinctly grey in the middle to lower qualities.
- Extra factor – having decided on the main style of the leaf a further separation that is based on presence of extra factors is necessary. More than one extra factor may be present and you may have to decide on the most prevalent. An extra factor describes a superficial but specific side to a grade, which is significant in it. The following extra factors are recognized:
    - Spot 'A': this spot is normally associated with tobacco grown in fast ripening areas. It occurs on the leaf as a small brownish blotch with an off-white center. Tobacco with spot in excess of 5% of leaf area should be separated into a spot grade.

- Harsh natured or sun baked ‘D’: this refers to tobacco which is harsh natured and lifeless due to lack of oil caused by dry conditions or baking. Such condition can occur to ripe open grained, standard or close-grained ‘K’ styles.
- Scorched ‘Q’: this is tobacco showing a noticeable degree of red caused principally by raising barn temperatures before the removal of excess moisture in the leaf.
- Greenish ‘V’: any tobacco which as a greenish tinge or cast to it. It is normally referred to as running green, i.e. the green will not be apparent after further maturity.
- Green ‘G’: any tobacco which contains a set green on the leaf surface. Generally speaking visible green can occur on the whole range of colour, styles and qualities but it would not be practical to suggest a complete duplication of grades for green. Light or running green should at least follow the main colour and style separations where such differences occur. Heavy or fixed green should be graded by colour and by the amount in the leaf. Because greens are the most severely price discounted grades on the market, greater attention should be given to these grades by ensuring firstly that amounts are minimized (that is by checking that no ripe or mature styles are included with immature ‘greens’). Secondly that the heavier or cruder green is removed from the lighter green grades. Where green is a problem a solution may be to remove all greens into a few colour and style categories for finer grading later on.
- Guinea fowl spot ‘Y’: a blemish on tobacco appearing as a speckling of small greenish-black or black dots which are distinctly different from other spot diseases.

These extra factors must be shown to new or inexperienced graders. The graders must be quite clear in their minds what is meant by the various extra factors and able to divide each of the basic colours into the four styles and then the extra factors. So a pile of say lemon coloured leaf may be divided into lemon standard with spot; lemon ripe with spot; or lemon K with V etc. The same may be done in the case of orange coloured leaf, i.e. orange ripe with spot; orange H or orange K green.

QUALITY

Quality or finish is the term used for the degree of blemish, waste or injury. When grading on the farm three qualities are recommended, these being:

- 1 = fine – good
- 2 = fair
- 3 = low – poor

LENGTH

Generally speaking if grading is approached as described above, length should present no difficulty. If however, the variation in length of graded leaf is too great, shorter and longer leaf must be kept separate. The length variation of leaf within a bale of graded tobacco must not exceed 75mm for leaf under 400mm and 125mm for leaf over 400mm length.
To summarise, although each decision that must be made has been dealt with separately the grader’s decisions on the grade of a leaf are virtually made simultaneously. When a leaf is picked up for grading the decision is made for example on the following lines:
“orange” ripe with spot, second quality “long”. The leaf will then be allotted to its appropriate position on the grading table. With a little practice the grader will soon gain confidence and his output will increase. The above procedure should be practiced and established before the start of the grading operation and also before grading a fresh run of tobacco.

GRADING OF STRIP AND SCRAP

The grading strip and scrap is very much easier since tolerances are greater. Strips and scrap are usually graded into light, dark and greens.

STRIP

It should be of the same plant position but can contain bordering colours and qualities. Two thirds of the mid-rib and all signs of barn rot, stem rot or mould should be removed. It can contain some large clean scrap of the same type.

SCRAP

Must be clean and free of foreign matter. It should be seized by screening. Scrap of the same appearance from cutters, lugs and primings can be blended together but scrap from thin leaf grades and bodied leaf and tips should be kept separate.

SAMPLE GRADING

The art of good grading is to produce a manageable number of grades easily identifiable as separate grades with a high degree of consistency within each grade. To grade too finely is to invite a problem with too many small lots of different grades. Sample grading is therefore necessary to establish the number of grades required. The sample grading is carried out by the grower with his foreman master blender and check graders before the commencement of the grading operations as well as each time a fresh run of tobacco is encountered. The rough graders are then shown the grades, which are placed in the appropriate place on their tables for reference purposes during grading.

CHECKLIST OF DO'S AND DON'TS IN GRADING

- ✓ DO keep reapings separate and unless lands are of the same soil type and planted at the same time grade reapings from different lands separately.
- ✓ DO keep different VARIETIES and tobacco from different CURING SYSTEMS separate (different varieties should never be graded together but the same tobacco from different curing systems can be graded together).
- ✓ DO make sure the tie-leaf same as the rest of the bale. Short leaves in the grade can be used for tying and thereby increase uniformity.
- ✓ DO pay equal attention to lower quality grades since this end of the market has larger prices variability especially between ripe and less mature styles.
- ✓ DO check greens and if these have been held back to the end of the season, a light regarding of greens which have run and those which have not is advisable.
- ✓ DO make sure that strip and scrap is free of loose midi-ribs, foreign matter and mould
- ✓ DO check that the sizes of the butts are between 25mm and 28mm.
- ✓ DO keep separate leaves differing in colour groups, style qualities and length.

- × DO NOT mix broken long leaf with short leaf and do not allow the inclusion of bent over stems in the butts. These practices affect the tipping and threshing properties of a grade and apart from the probability of rejection, they spoil presentation and lower the commercial value of a bale.

BALING AND PRESENTATION

Neatly baled tobacco immediately attracts the buyer's eye. Even before inspecting the tobacco, his interest is aroused. It is very important to create a good impression. Well graded and carefully presented tobacco will encourage the buyer to buy with confidence your tobacco to the best advantage. The use of twine from hessian or jute is prohibited, as are polypropylene twine and monofilament. The recommended space between stitches is 40mm and the use of lock stitches at the ends of the bale and in the centre is essential to avoid the stitching running to the floor when a bale is opened for inspection prior to sale. If a metal bailing box is used be sure to clean the inside surface frequently. Gum from the tobacco deposits on the metal can rub off onto the tie leaves leaving the tobacco looking as if it has been contaminated by grease. Bales so marked can be turned down as damaged. Make sure the bales are not overweight and that the maximum dimensions prescribed are not exceeded.

GROUPING

The importance of correct grouping of tobacco for sale is still not appreciated by all growers. Even if great attention has been paid to the grading aspects, the grower's grouping skill can either make or break a sale. Whilst good grouping normally results in better and more stable prices, bad or erratic grouping inevitably costs the grower money.