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F. Perold

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DEPARTMENT OF AGRICULTURE

The Reconstitution of Vineyards
in Lime Soils
on Suitable American Stocks

Perold
By Dr. A. I. PEROLD, Government Viticulturist.

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The Reconstitution of Vineyards in Lime Soils on Suitable American Stocks.

By Dr. A. I. PEROLD, Government Viticulturist.

GREAT difficulty is often already experienced in reconstituting vineyards on suitable American stocks in soils poor in lime, but in case of soils rich in lime the task to find the right American stock becomes all the more difficult.

As sometimes a considerable quantity of lime is found in the soils of the Montagu, Robertson, and Worcester Districts, and as the reconstitution of the vineyards in these districts has now begun, I found it desirable to gather samples of the different vineyard soils of these districts, and to find out how much lime they contain. This has meanwhile been done. Mr. A. J. Cloete, Supervisor Government Vine Plantations, and Mr. J. C. van Jaarsveld, Manager of the Viticultural Station at Paarl, helped me in collecting the samples, whilst the Assistant Viticulturist, Mr. W. Wagener, carried out the analyses in the laboratory under my supervision.

The lime was determined after Bernard's method.

TAKING OF SAMPLES.

A hole of 2 feet $\times$ 2 feet square was dug, its sides being kept vertical to a depth of 1 foot. After putting this loose soil on one side, even thin slices of soil all round the sides of the hole were cut down. This soil was then well mixed, and about 15 lb. thereof put in a small bag, to which a label was attached, indicating the particulars.

In one corner of the hole a smaller hole was made to a depth of 30 inches, i.e. to a total depth of 18 inches, measured from the bottom of the larger hole. Then in the same way as described above a sample was taken at the depth of 12-30 inches.

The numbers with "a" indicate the top samples, and those with "b" the lower.

PREPARATION OF THE SOIL.

The dry soils were pulverized and passed through a sieve of small meshes. The particles of soil that did not pass through the sieve were further pulverized, etc. Only some odd quartzitic pebbles were thrown away. This was done to enable one to determine the total contents of lime in the soil, as this is usually considerably greater than that in the fine soil.

In the following table the results obtained in the above manner are given.

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A.—MONTAGU DISTRICT, Nos. 1a-54a.

(a) The Village Montagu, Estates situated along Long Street.

No.	Owner.	Farm.	Locality	General Remarks.	% Lime (CaCO ₃).
1a	A. J. Rossouw.....	—	Behind the house.....	Old, ungrafted vineyard, in a deep, rich loam	Under 1
1b	"	—	"	"	"
2a	"	—	100 yards further.....	"	"
2b	"	—	"	"	"
3a	Dan. Joubert.....	—	In front of house.....	Subsoil reddish.....	"
3b	"	—	"	Deep, red, rich loam.....	" 4
3c	"	—	"	Deep, fairly loose loam.....	8-8
4a	W. J. van Zyl.....	—	Near by house, next to Widow Ros- souw	Grey till yellowish loam.....	under 1
4b	"	—	"	Fairly stiff after 12 inches depth....	"
5a	"	—	Near to Kingna River.....	Deep, even, grey loam.....	"
5b	"	—	"	"	"
6a	R. P. du Toit.....	—	In the middle of vineyard.....	Grey, deep loam.....	"
6b	"	—	"	Grey, deep, limy loam.....	2-2
6c	"	—	"	"	8-8
7a	"	—	From a braekish patch 15 ft. broad (30-48 in.)	Fine, alluvial, loose, deep soil; the vineyard grows very well here	under 1
7b	"	—	"	"	"
8a	D. S. du Toit.....	—	On the right hand, in front of house, from a patch infected with phyl- loxera	Grey, yellow soil.....	"
8b	"	—	"	"	"
9a	"	—	In the middle of vineyard.....	Subsoil decomposed lime, resting on a hard lime-layer	9-8
9b	"	—	"	Deep, stiff, sticky loam, greyish- reddish, cracks when dry	under 1
10a	G. Malherbe.....	—	"	"	3-6
10b	"	—	"	Sticky, greyish loam.....	under 1
			"	At a depth of 30 inches a compact, limestone layer	2-0

A.—MONTAGU DISTRICT—(continued).
(b) Kelsie (11a-19b).

No.	Owner.	Farm.	Locality.	General Remarks.	% Lime (CaCO ₃).
11a	F. J. van Zyl.....	Harmonie (onderste).....	In the middle of vineyard, on highest spot	Deep, loose, homogeneous, alluvial soil (rich)	under 1
11b	"	"	"	"	"
12a	Dan. Joubert.....	Bosrivier.....	Vineyard, behind cellar.....	Reddish, sticky loam.....	"
12b	"	"	"	Deep subsoil.....	"
13a	P. S. du Toit.....	Goede Moed.....	In the middle of vineyard, just in front of house	Deep, loose, dark, alluvial soil.....	"
13b	"	"	"	"	1.4
14a	"	"	Vineyard, nearer to river.....	Sand; somewhat sandier than No. 13	under 1
14b	"	"	"	"	2.6
15a	Wed. Joubert.....	Keurkloof.....	Vineyard, along the road on lower side of house	Grey-reddish, deep soil, containing some odd stones	under 1
15b	"	"	"	Subsoil: grey, loose, deep. alluvial soil	"
16a	J. J. du Plessis.....	Goede Moed.....	Vineyard, just below cellar.....	Grey, deep, alluvial soil.....	"
16b	"	"	"	"	1.6
17a	Mr. Ansell.....	Nieuweland.....	In the middle of vineyard.....	Dark, sandy, alluvial soil (deep)....	under 1
17b	"	"	"	"	1.3
18a	Paul Jordaan.....	Bordeaux.....	Near top of vineyard.....	Grey-brown rich river soil.....	1.0
18b	"	"	"	Subsoil deep and loose.....	under 1
19a	"	"	Near bottom of vineyard.....	Top soil partly lime-layer.....	4.0
19b	"	"	"	Subsoil peaty.....	under 1

A.—MONTAGU DISTRICT—(continued).
(c) Baden and Onder Baden (20a-33b) and remainder of Montagu District till 54b.

No.	Owner.	Farm.	Locality.	General Remarks.	% Lime (CaCO ₃).
20a	P. Jordaan (P. son).	Oud Huisland.....	Near homestead; patch of vines in which top parts of vines die off; no phylloxera was found	Deep, grey loam; cloddy.....	2.0
20b	"	"	"	"	"
21a	Alewijn Burger.....	Boontjesland.....	Lower part of vineyard.....	Deep subsoil.....	2.0
21b	"	"	"	Deep, loose, dark soil; roots very deep (only after a depth of 2 ft.)	under 1
22a	R. A. Knipe.....	Baden.....	Hill, with young, ungrafted vines....	Stony, red soil, limy.....	2.9
22b	"	"	"	Subsoil: gravelly, decomposed lime- stone; at the depth of 22 in., hard-pan	4.6
23a	"	"	Vineyard along the orange grove....	Deep, dark, sandy river-soil.....	under 1
23b	"	"	"	"	"
24a	Dirk C. Steijn.....	Baden (quite at top).....	In middle of vineyard, on lower side	Rich, stony river-soil.....	3.2
24b	"	"	"	"	under 1
25a	"	"	In front of the house in the vineyard, along the river, in a patch suffering from phylloxera	River-soil, more sandy in lower than in top layers, with river stones (sandstone)	"
25b	"	"	of the house	"	"
26a	Joubert Bros.....	Baden.....	In the middle of vineyard.....	Stony and limy soil.....	7.8
26b	"	"	"	No lime-layer underneath.....	under 1
27a	"	"	In lucerne-camp, along orange grove	Dark-grey, deep, fine, even soil....	"
27b	"	"	"	"	"
28a	"	"	Along the river.....	Sandy, deep river-soil, loose.....	"
28b	"	"	"	Underneath river stones.....	"
28a	P. le Roux.....	"	On hill along the river.....	Reddish-grey soil.....	"
28b	"	"	"	Underneath loose lime-stones.....	"
29b	"	"	Lucerne-land, above house, on a slope	Reddish, limy soil, with hardpan of 12-25 in. thick, consisting of hard limestone	"
30a	"	"	on lower side of road	"	"
30b	"	"	"	"	4.6

A.—MONTAGU DISTRICT—(continued).
(c) Baden and Onder Baden (20a-33b) and remainder of Montagu District till 54b—(continued).

No.	Owner.	Farm.	Locality.	General Remarks.	% Lime (CaCO ₃).
31a	A. Jordaan.....	Onder Baden.....	In the middle of vineyard, in front of house	Brown, peaty (turf) soil, very rich..	2·0
31b	"	"	"	"	under 1
32a	D. Burger.....	De Erf.....	In middle of vineyard, in front of house	Dark river-soil.....	"
32b	"	"	"	Subsoil more sandy than the above..	"
33a	"	"	In grafted young sultanas, near home- stead	Reddish, limy soil.....	"
33b	"	"	"	Loamy, red soil, with red stones from the hill	1·0
34a	M. M. Burger.....	Rietvlei No. 1.....	Lime hillock in lucerne-land on the upper side of house	Red, limy soil.....	5·6
34b	"	"	"	Deep, decomposed lime-soil.....	7·4
35a	"	"	On the other side of the river.....	River-soil.....	under 1
35b	"	"	"	Underneath loose river-soil.....	"
36a	Jacobus Kriel.....	"	On the right, on the upper side of the house	Grey-reddish, loamy hill-soil, with white quartzitic pebbles	"
36b	"	"	"	Subsoil a clayey pan.....	"
37a	"	"	On the lower side of orange grove...	Black, sandy river-soil, with river stones; a good vineyard soil	"
38a	David Burger.....	"	Along the river, in front of house....	Grey-reddish to yellow-blackish soil, at a depth of 9 in. already pretty stiff	1·0
38b	"	"	"	Subsoil red-yellowish, clayey, fairly stiff at 30 in. depth, not yet hard- pan	under 1
39a	"	"	Just in front of house, on the hill, at present under lucerne	Red-greyish, clayey, fairly stiff soil	"
39b	"	"	"	Subsoil red, stiff, at a depth of 30 in. practically a hard limepan	5·8

A.—MONTAGU DISTRICT—(continued).

(c) Baden and Onder Baden (20a-33b) and remainder of Montagu District till 54b—(continued).

No.	Owner.	Farm.	Locality.	General Remarks.	% Lime (CaCO ₃).
40a	J. D. Stemmet.....	Rietvlei No. 1	In the middle of vineyard.....	Dark, sandy, loose, deep, fertile river-soil; grapes ripen without irrigation	under 1
40b	"	"	"	"	"
41a	P. S. Fouche.....	"	At the foot of the kopjes, on the other side of the river	Greyish-reddish loamy soil, showing white efflorescence, but this is not salt; deep, loose	"
41b	"	"	"	"	"
42a	B. van Zijl.....	Rietrivier.....	In front of house, on left hand, along rivulet	Loose, deep, dark, peaty soil; at 30 in. depth river stones	"
42b	"	"	"	"	"
43a	Frans du Toit.....	Scheepers Rust.....	Lucerne-land, between quince hedges, in a wet, brackish hollow	Deep, peaty, dark soil; at a depth of 30 in. water	"
43b	"	"	"	"	"
44a	"	"	Lucerne-land as above, but in a "na-bankbult"	Reddish, stiff soil; soon a hard "na-bank"	"
44b	"	"	"	"	"
45a	"	"	Lucerne-land, in front of house, along the river	Deep, grey, sandy soil.....	"
45b	"	"	"	"	"
46a	D. Rossouw.....	Klipkuil.....	Vineyard on upper side of house on right hand	Subsoil dark and sandy.....	"
46b	"	"	"	Reddish, fine, loose loam.....	"
47a	Alewijn Burger.....	Talana.....	Just opposite the cellar, on the other side of the river	Subsoil fairly stiff.....	"
47b	"	"	"	Deep, loose, grey, even, alluvial soil	"
48a	Pieter Burger.....	Klipkuil.....	Vineyard in front of house, along the boundary of A. Burger	"	1.6
48b	"	"	"	Red, gravelly soil.....	8.4
	"	"	"	Subsoil red, decomposed shale; stiff and limy	11.4

A.—MONTAGU DISTRICT—(continued).
(c) Baden and Onder Baden (20a-33b) and remainder of Montagu District till 54b—(continued).

No.	Owner.	Farm.	Locality.	General Remarks.	% Lime (CaCO ₃).
49a	Joh. Conradie.....	Abrikooskloof.....	In the middle of vineyard, in front of house	Grey-reddish, deep soil, lime efflorescences white (gruis kalk)	2.0
49b	"	"	"	Subsoil contains lots of slate, stiff, difficult to get into soil	4.0
50a	Cornelis Rall.....	Rietvlei No. 1.....	Along left bank of Kingna River....	Greyish, dark, deep alluvial soil.....	under 1
50b	"	"	"	"	"
51a	J. Malherbe.....	Wit Hoogte.....	Along the river.....	Greyish-dark, deep, loose, moist, sandy river-soil	"
51b	"	"	"	"	"
52a	John Knipe.....	Knipe's Rest.....	"..... In the middle of vineyard, on lower side of cellar	Grey, deep, loose alluvial soil.....	4.4
52b	"	"	"	"	under 1
53a	Hermanus le Roux...	Nieuwe Drift.....	On the outside of vineyard, along the hillside	Grey, loamy, limy soil.....	2.4
53b	"	"	"	After 15 in. a whitish decomposed layer of limestone	16.0
54a	P. Hauptfleisch.....	"	In the middle of lowest vineyard, near bottom of vineyard	Grey, loamy, deep, loose soil, rich..	1.2
54b	"	"	"	"	under 1

B.—ROBERTSON DISTRICT.

No.	Owner.	Farm.	Locality.	General Remarks.	% Lime (CaCO ₃)
55a	J. S. de Wet.....	Excelsior, Zandvliet.....	Midway between house and river....	Light, sandy river-soil.....	under 1
55b	".....	".....	".....	".....	"
56a	".....	".....	" upper side of cellar.....	Grey loam, sticky, rich.....	"
56b	".....	".....	".....	Subsoil fairly stiff, dark, heavy; at a depth of 30 in. somewhat gravelly	"
57a	".....	".....	Lime-hillock on upper side of house, along the water-furrow	Red soil; from 12 in. deep a stiff lime-layer	"
57b	".....	".....	".....	".....	13.2
58a	Government Experimental Station	Near Robertson.....	On the right, on lower side of house, out of experimental vineyard	Grey-reddish, sandy soil, becomes hard lower down	3.2
58b	G. D. Burger.....	".....	".....	".....	7.0
59a	".....	De Hoop (top farm).....	Grafted vineyard, on the right, on the lower side of house	Reddish loamy soil.....	under 1
59b	".....	".....	".....	".....	"
60a	J. W. Bruwer (W.'s son)	De Hoop.....	Muscadel, near homestead.....	Grey, peaty, clayey soil.....	"
60b	".....	".....	".....	Subsoil more clayey than on top, deep; grafted vines die off in this soil, but no phylloxera was found	"
61a	Jan Burger.....	".....	Lucerne-land on upper side of road (hill-soil)	Reddish, limy (?) stiff soil; only went down as far as 1 ft.	"
62a	J. F. Botha.....	Roodchoogte.....	Grafted sultanas, near to house....	Reddish, stony soil; vines die, destroyed by eels	"
62b	".....	".....	".....	".....	"
63a	J. P. Marais.....	Wonderfontein, near village	Near to house, along fruit orchard..	Grey-reddish loam, deep, rich.....	2.4
63b	".....	".....	".....	Subsoil limy.....	6.0
64a	".....	".....	Brackish patch in sultanas, on lower side of quince-hedge	Clayey loam, stiff subsoil, red-yellowish, sticky; difficulty with sultanas on Metallica	under 1
64b	".....	".....	".....	".....	"

No.	Owner.	Farm.	Locality.	General Remarks.	% Lime (CaCO ₃)
65a	J. P. Marais	Wor derfontein, near village,	On lower side of labourer's house, out of Hanepoot on Jacques	Grey, peaty (turfy) loam.....	under 1.
65b	"	" "	" "	Subsoil stiff, dark, heavy loam; vine- yard poor	"
66a	D. J. le Roux.....	Uit Nood.....	Vineyard path near to house, in front of house	Reddish loam.....	2.0
66b	"	"	"	Subsoil red, limy, fairly stiff.....	2.8
67a	P. B. Malherbe.....	Vrolikheid.....	In the middle of vineyard.....	Grey-reddish deep loam.....	1.0
67b	"	"	"	"	2.6
68a	"	"	Experimental vineyard with American stocks	Reddish lime-soil, hard limestone layer, went as deep as 20 in.	under 1
68b	"	"	"	"	15.0
69a	W. J. Wessels.....	Thornvillla (near MacGregor)	Rye-land, on lower side of cellar....	Reddish, gravelly lime-soil.....	4.2
69b	"	" "	" "	Subsoil later hard lime-pan, went as far as 20 in.	11.2
70a	"	" "	Near river, in the lower vineyard....	Sandy, deep river-soil.....	under 1
70b	"	" "	" "	"	"
71a	G. Maynard.....	Ribbokskaal.....	In front of house, in young vineyard	Stiff, heavy loam, cakes easily, reddish, limy (?), karroo-like	"
71b	"	"	" "	" "	"
72a	G. J. Swart.....	MacGregor (village).....	Near to house.....	Somewhat stony, reddish soil.....	"
72b	"	"	" "	" "	"
73a	H. C. van Zijl.....	Goede Moed, Klaasvoogds- rivier	Behind and near to house.....	Tough, red potclay, rich soil.....	"
73b	"	"	"	"	"
74a	A. J. Noordling.....	"	In the middle of vineyard.....	Grey loam, deep, rich.....	"
74b	"	"	" "	"	"
75a	"	"	Near by water-furrow.....	Grey, limy (?) soil	"
75b	"	"	" "	"	"

B.—ROBERTSON DISTRICT—(continued).

No.	Owner.	Farm.	Locality.	General Remarks.	% Lime (CaCO ₃)
76a	J. F. Burger.....	Rietvlei, Klaasvoogdsrivier	On the right side of vineyard, on the lower side of house, near to edge of vineyard	Reddish-grey loam, limy (?)	under 1
76b	"	" ..	" ..	" ..	3.6
77a	"	" ..	Lucerne-land, near river.....	Grey-reddish, deep soil (loam).....	under 1
77b	"	" ..	" ..	" ..	"
78a	I. J. Malherbe.....	" ..	Along river.....	Red " doorngrond "	12.8
78b	"	" ..	" ..	Underneath clayey.....	26.4
79a	E. H. de Wet.....	Near village of Robertson	Lime-hillock along young, grafted Hanepoot	Reddish limestone-soil, the limestone fairly soft	14.4
80a	"	" ..	Brackish patch near to house.....	Dark, clayey, heavy loam; grafted vines die off here	under 1
80b	"	" ..	" ..	" ..	"

From the above results it is perfectly clear that the so-called lime soils in the Robertson and Montagu Districts hardly deserve this name. Here one frequently hears farmers talk about a limestone and a layer of limestone, where there is very little lime. This is, for instance, the case in 22b, 30b, 39b, 61a, 71a, and 71b. I left the general remarks in these cases just as they had been made on the spot, notwithstanding the low percentage of lime found by analysis. This should be noted. I wished hereby to illustrate all the more clearly the wrong opinion which is generally entertained about these soils. The so-called limestones are usually hard and of a reddish colour. They are simply more or less decomposed clay-slate (nabank). On weathering, this slate, which contains a fair amount of lime, gets a whitish till reddish coating of lime, which causes the false impression.

That the soil in certain cases and here in very restricted areas sometimes is very rich in lime, is proved by 48b, 53b, 57b, 68b, 69b, 78a, 78b, 79a, and 79b. These nine cases are, however, the only ones out of the 157 analyses where over 10 per cent. of lime was found.

From the analyses it will be clear that practically always much more lime was found at the greater depth than nearer the surface.

In any case (with a few rare exceptions) there is not sufficient lime in the soils to cause any serious difficulty in reconstituting the local vineyards on suitable American stocks. Practically all the alluvial soils along the rivers in these districts contain too little lime to cause the grafted vines to suffer from chlorosis. Thus nothing can be said on this score against the chance of success of *Riparia Gloire de Montpellier* in these soils.

According to the report recently brought out by the Government Commission on American Stocks, the difficulties in reconstituting the vineyards in these soils on suitable American stocks are not caused by too large an amount of lime in the soil, but are due to other causes. It will be advisable to read the report on this point.

In order to find out definitely which are the most suitable stocks for these parts, I have this year started seven experimental plantations of the best American vines in these districts. After about five years one will know more or less which stocks will be unsuitable. After some ten years one will, with a fair certainty, be able to say which stocks answer definitely. These American stocks will be grafted as soon as possible with the principal varieties of grapes grown in these districts, in order to find out which stock is the best for each variety of grape.

Without being able to affirm this definitely, I am nevertheless convinced that there are good reasons for thinking that *Aramon Rupestris* *Ganzen No. 1* will answer in nearly all soils of these districts. With *Jacquez* and *Metallica* one should here be *extremely cautious*, especially in the Karroo soils.

Riparia Gloire de Montpellier ought to thrive well in the deep alluvial soils along the rivers. It is in so far of particular importance, as it is a good stock for Hanepoot, which could not be said of *Aramon Rupestris*. At present it is not yet possible to say whether *Jacquez* will be sufficiently phylloxera-resistant in these alluvial soils. This will, however, fairly soon be shown by the experiments which are now going on.

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