Messina:

- a new annual legume for salt-land pastures

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SOUTH AUSTRALIAN RESEARCH & DEVELOPMENT INSTITUTE
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PREMIUM FOOD AND WINE FROM OUR CLEAN ENVIRONMENT

FUTURE FARM INDUSTRIES CRC

SOUTH AUSTRALIA

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Messina (*Melilotus siculus*)

A new legume species to agriculture

Unprecedented waterlogging and salinity tolerance

Teakle et al., 2011

Neptune messina was a direct release of an accession held by the APG

Why messina ?

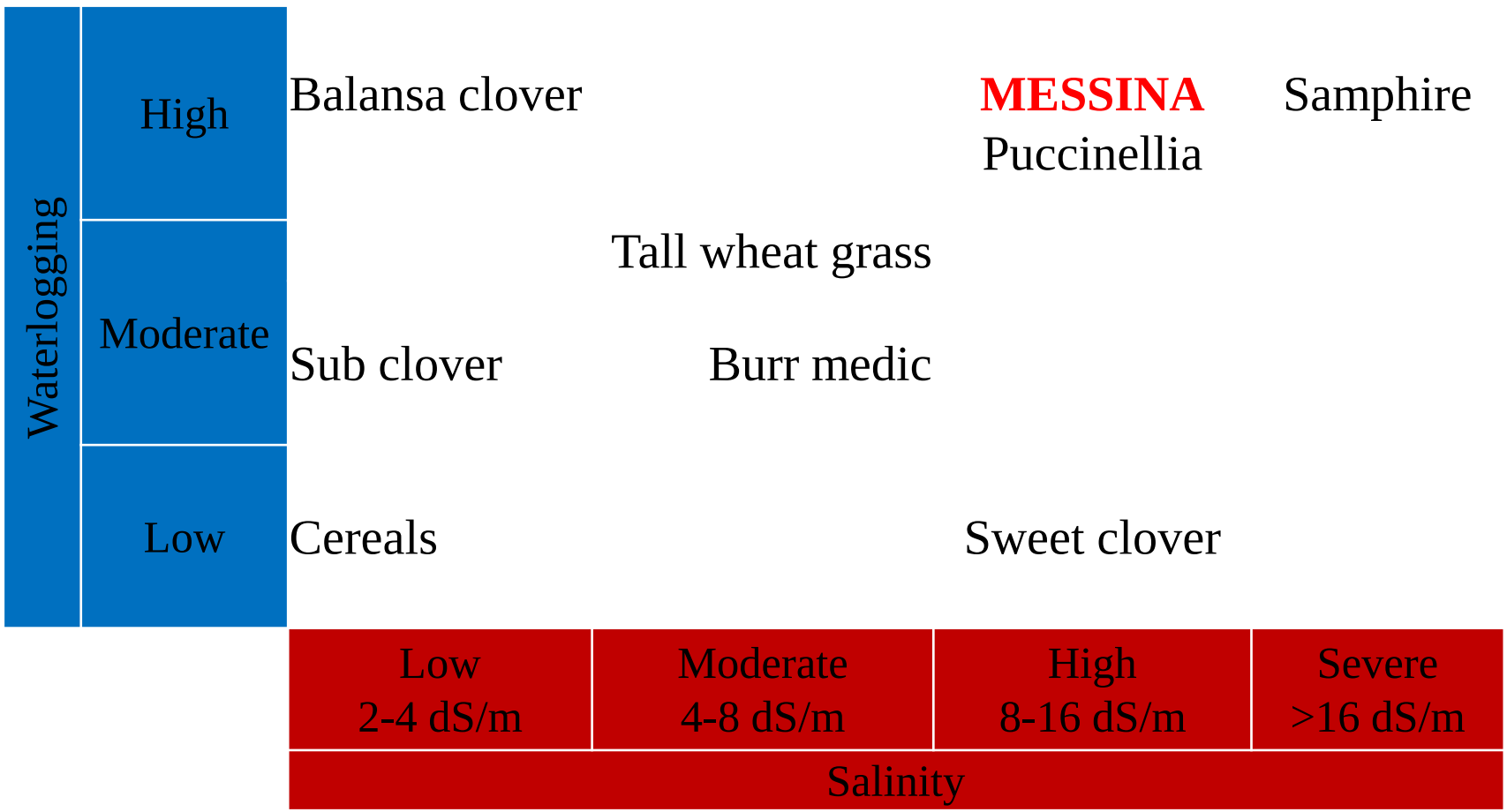
Combined stresses of salinity and waterlogging common to saline landscapes

Summer & autumn stress

+

Winter stress

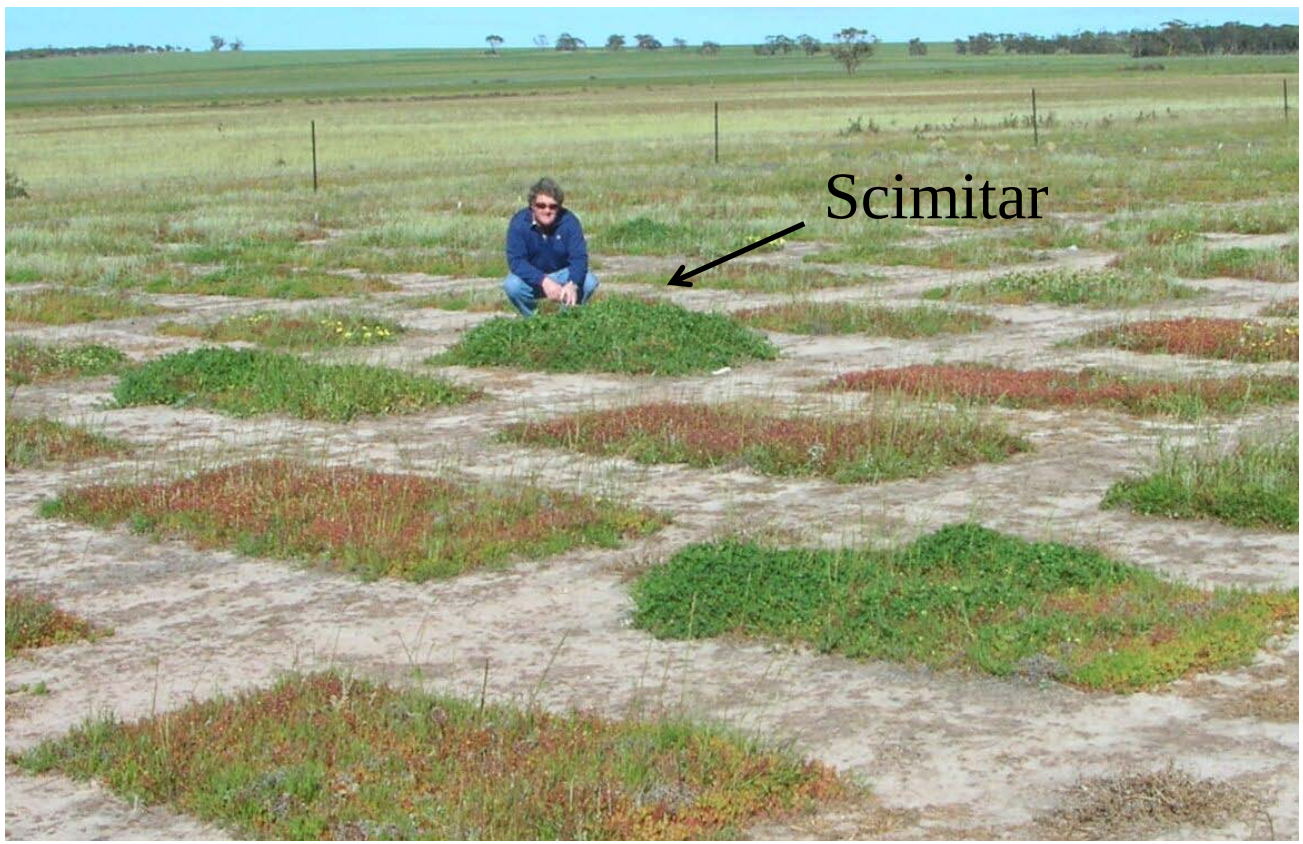
MESSINA in the landscape



Identification of salt tolerant legume

Grew a diverse range of current pastures species or potential species at saline sites

Scimitar burr medic is productive on saline well drained areas



Photos by Nichols et al.

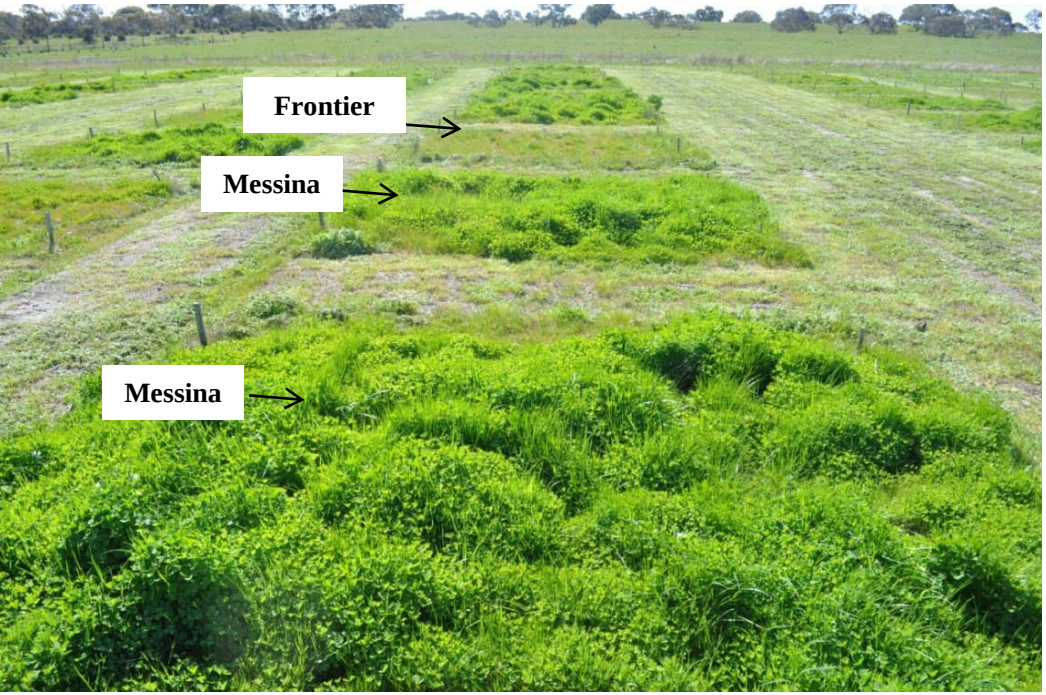
Identification of salt tolerant legume

Grew a diverse range of current pastures species or potential species at saline sites

Messina was the only species to perform on highly saline waterlogged sites

Photos by Nichols

Messina can thrive in the wet once established



Dry matter production

	MESSINA	Frontier balansa clover	Scimitar burr medic
South Australia	4.3 t/ha	0.4 t/ha	2.0 t/ha
Western Australia	7.6 t/ha	3.0 t/ha	0.4 t/ha

Seed production

	1st year seed kg/ha
Messina	1240
Frontier	300
Scimitar	490

12-39% hard seed levels in June, enabling good persistence

Poor nodulation interrupted messina development

Nodulation failure in regenerating messina plots

The rhizobia failed to persist through summer

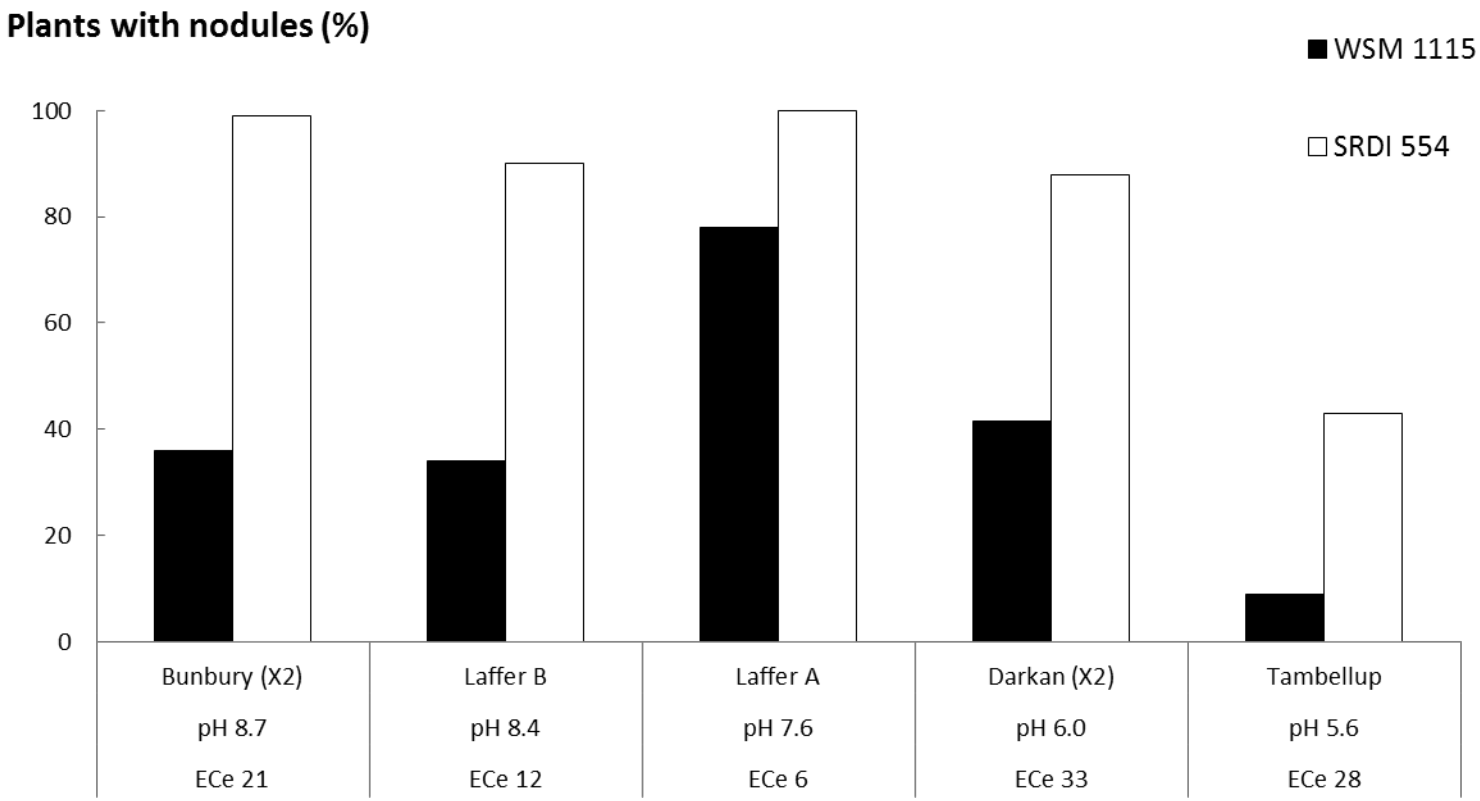
Year 2

Measuring rhizobial persistence and colonisation

WSM 1115

SRDI 554

SRDI 554 consistently improved nodulation (second year)



Impact of improved nodulation
Regenerating messina - 3rd year

MPN estimates of selected treatments

Number of rhizobia per g soil (n=4)

Treatment	January sampling	April sampling
No rhizobia	0	0
WSM 1115	107	0
SRDI 554	8355	3519

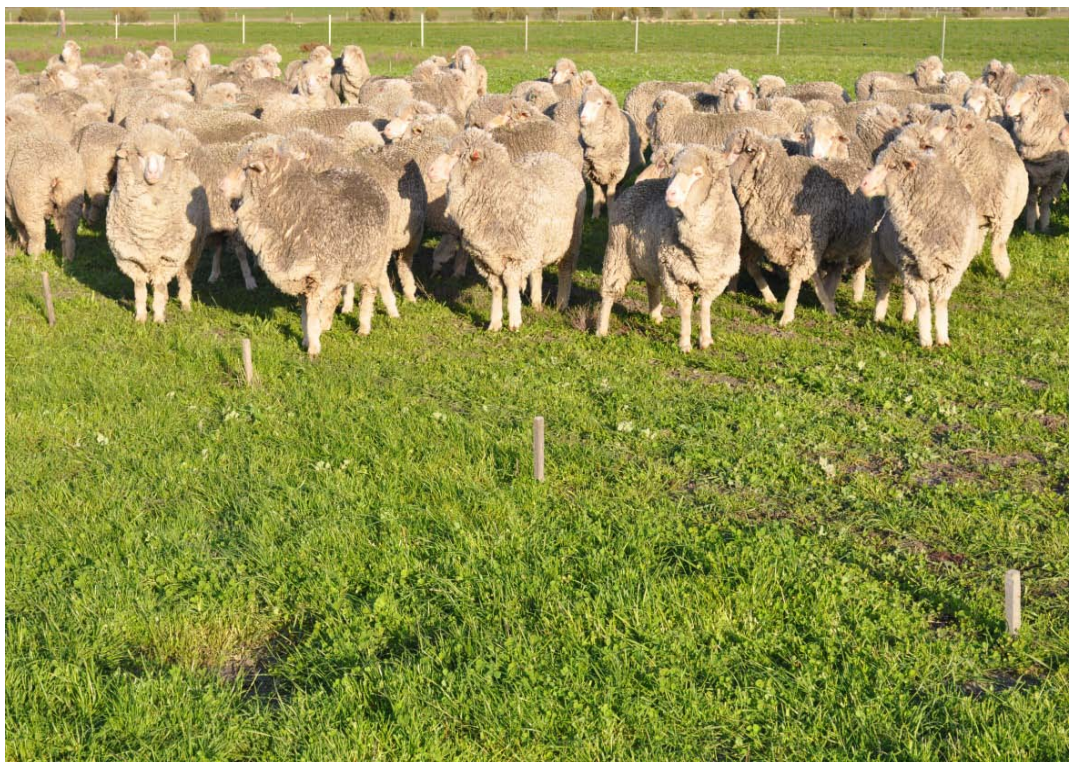
Grazing & livestock production

Appears palatable to sheep during vegetative stage

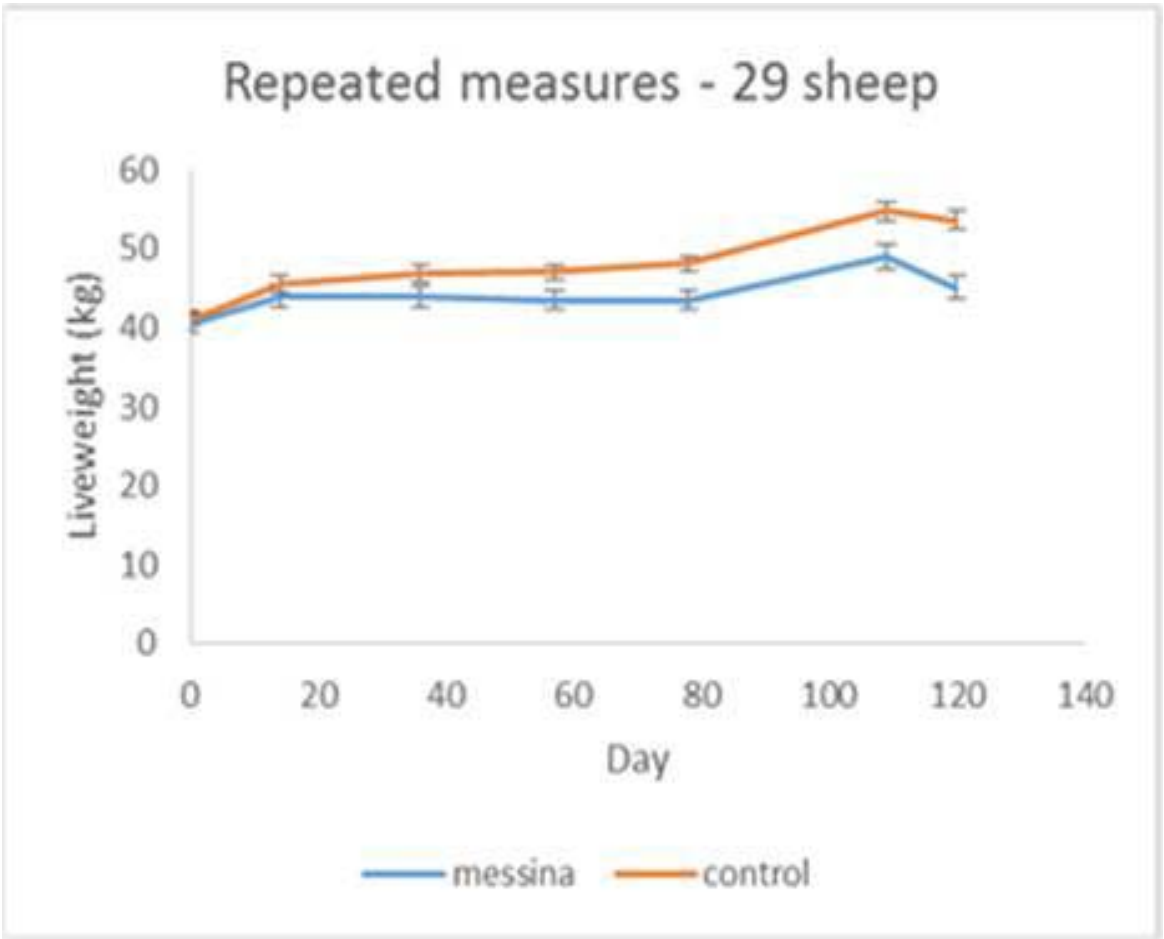
No animal health issues experienced

Nutritive value similar to that of other annual pasture legumes

Low coumarin levels



Livestock performance – ewe lambs 2016



Measures of animal health (6 measures), and meat quality (5 measures) all satisfactory

Knowledge gaps around pH and herbicide tolerance

Avoiding establishment failures critical to grower confidence

RIRDC project 009886 commenced 2015 to support commercial release in 2017.

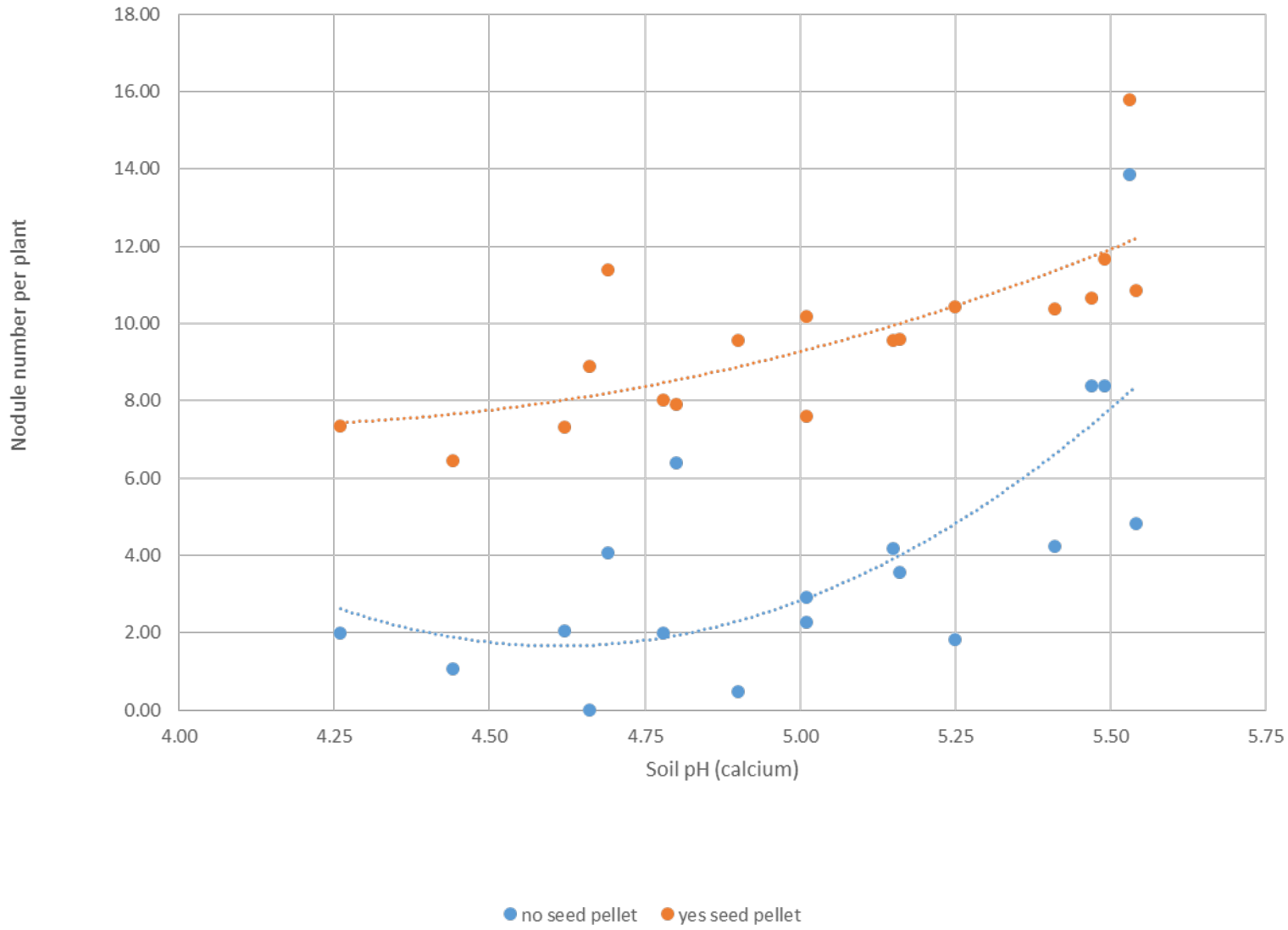
Aims:

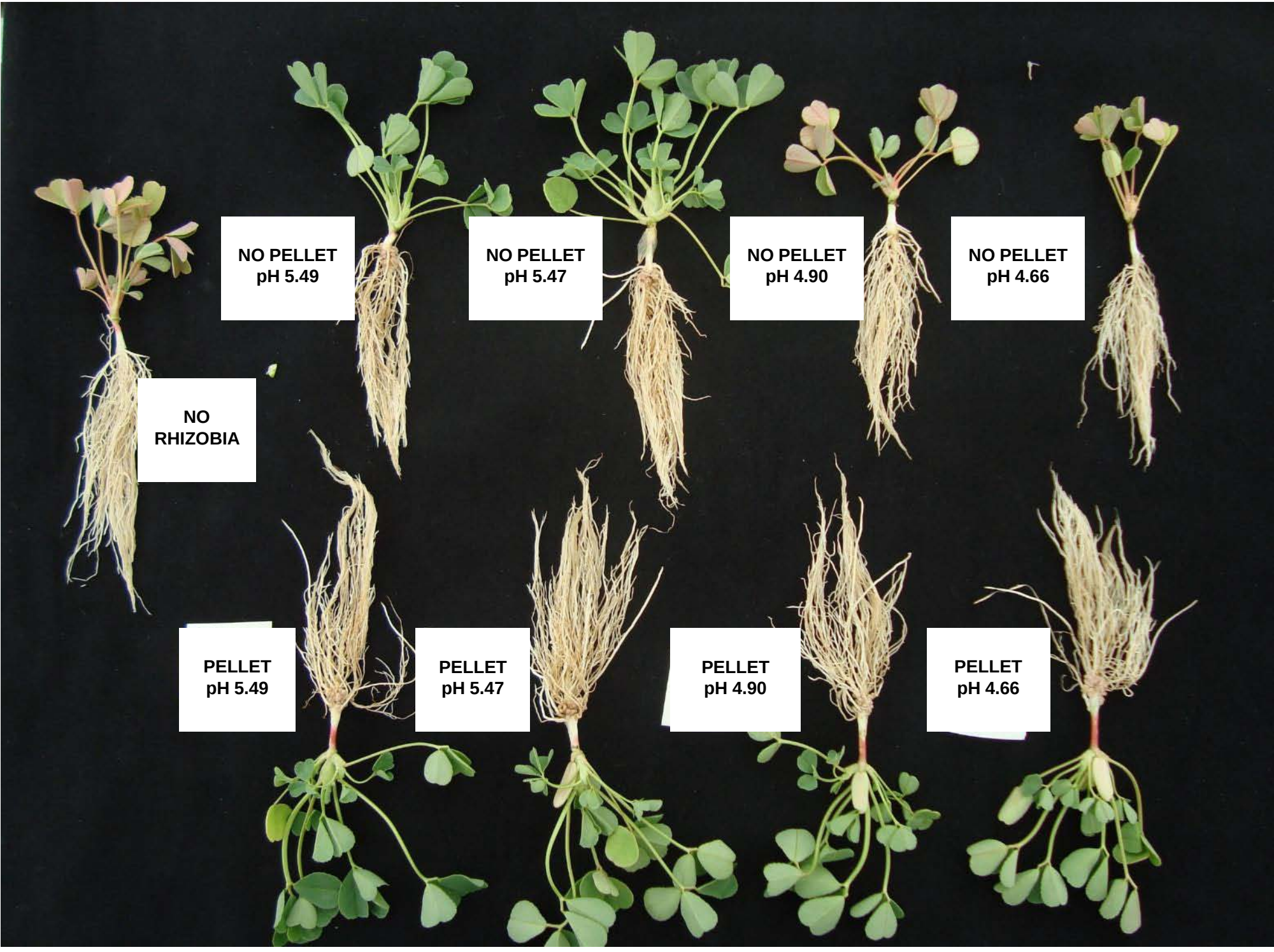
Define critical pH thresholds for establishment

Develop a basic knowledge of herbicide tolerance

pH thresholds and benefits of lime pelleting

Effect of pH & lime on messina nodulation




NO PELLET
pH 5.49
NO PELLET
pH 5.47
NO PELLET
pH 4.90
NO PELLET
pH 4.66
NO
RHIZOBIA
PELLET
pH 5.49
PELLET
pH 5.47
PELLET
pH 4.90
PELLET
pH 4.66

Neptune messina

An annual pasture legume for saline and waterlogging prone soils

Key features

- Higher combined tolerance to salinity and waterlogging than all other current pasture legumes
- Best suited to winter-wet saltland areas of southern Australia with ≥ 375 mm annual rainfall and soil pH(CaCl2) ≥ 5.5
- Recommended for grazing in combination with other pasture species
- Supplies nitrogen to N-deficient soils, provided it is inoculated with a specially developed salt-tolerant messina rhizobia.

Neptune three years after sowing on a saline valley floor at Woodanilling, WA.

Plant description and soil requirements

- Messina *(Melilotus siculus)* is native to the Mediterranean basin. It was identified in trials by DAFWA and SARDI as the only pasture legume tested able to persist on highly saline, waterlogged soils and Neptune was subsequently selected as the most productive and persistent messina variety.
- Neptune is an aerial-seeding annual legume that grows up to 0.8 m tall
- Neptune is adapted to winter waterlogged areas where summer-early autumn topsoil (0–10 cm) salinity levels are 8–30 dS/m ECe (moderate-high salinity).
- Neptune requires soil pH($CaCl_2$) ≥ 5.5 or pH(water) ≥ 6.0, which is important as messina nodulation is sensitive to soil acidity (liming may be required).
- Neptune is suited to a range of soil textures from sands to heavy clays.

Herbicide studies

Messina - Herbicide tolerance

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First qu

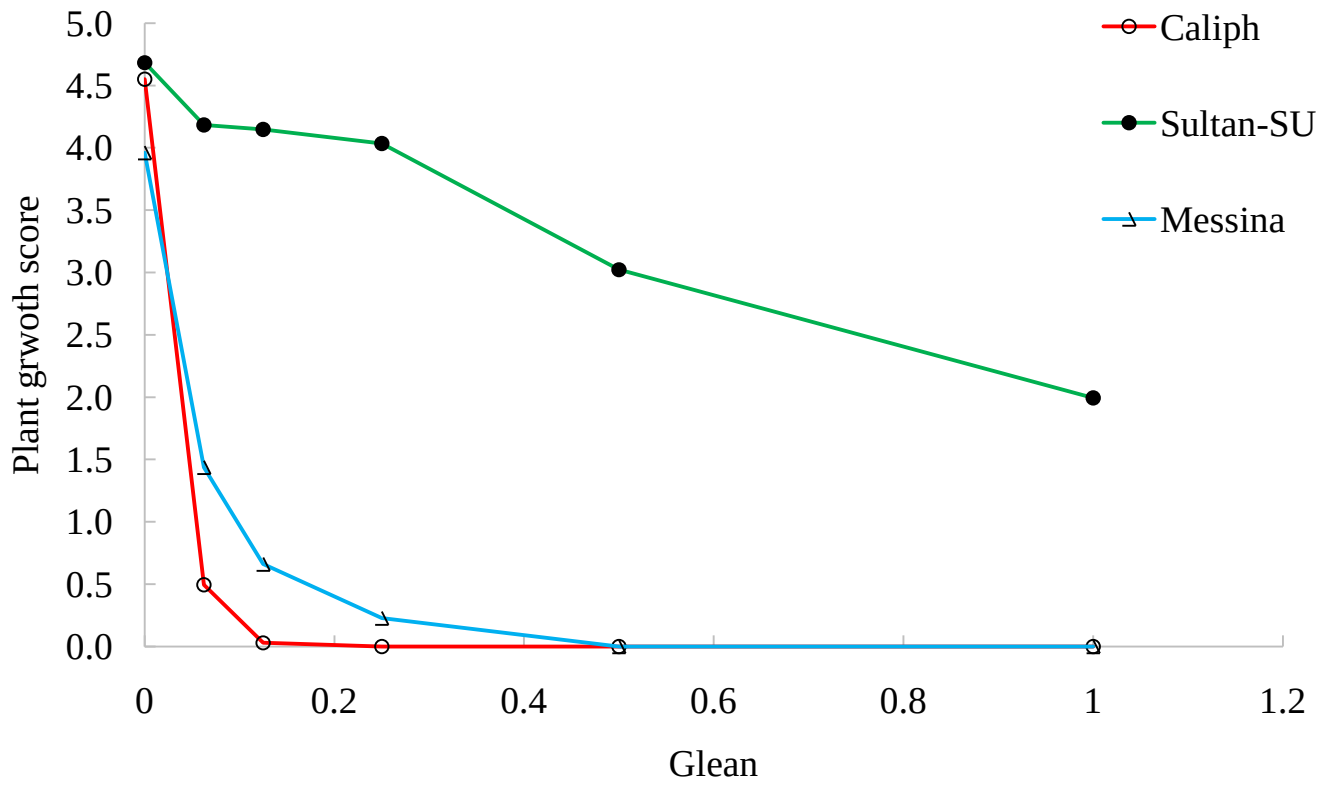
Have herbicide options from the following groups:
A, B, C, D, F and K

spécies

Active	Name	group	rate	Registered medic	clovers	lucerne	Result
Control							
nil	Nil						
Pre-sowing							
Trifluralin	Treflan	D	high	yes	yes	yes	damage
Pre-emergent							
S-Metolachlor	Dual gold	K	high	no	yes	no	safe
Imazethapyr	Spinnaker	B	mid	no	yes	yes	safe
pendimethalin	Stomp	D	high	no	no	yes	damage
Post-emergent							
Flumetsulam	Broadstrike	B	high	yes	yes	yes	safe
diflufenican	Brodal options	F	high	no	yes	yes	mid damage
Bromoxynil	Bromicide 200	C	low	yes	yes	yes	damage
2,4-D B	Buttress	I	low	yes	yes	yes	damage
Diuron	Diuron	C	low	no	no	yes	safe
Terbutryn	Igran	C	low	no	yes	no	safe
Bromoxynil + Difufencian	Jaguar	C & F	low	no	yes	yes	damage
propyzamide	Kerb	D	high	yes	yes	yes	safe
MCPA	MCPA	I	low	yes	yes	no	damage
Imazamox	Raptor	B	low	yes	yes	yes	damage
Simazine	Simazine	C	high	no	yes	yes	mid damage
Imazethapyr	Spinnaker	B	mid	no	yes	yes	safe
Grasses							
Haloxyfop-R	Verdict	A	high	yes	yes	yes	safe
Clethodim	select xtra	A	high	yes	yes	yes	safe
Butroxydim	Factor	A	high	yes	yes	yes	safe

Messina – Residual Herbicides

Seedgrowers need to keep clear of residual herbicides



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Neptune messina

Weed control

The paddock should be weed free prior to sowing. No chemicals are currently registered for use on messina and herbicide testing has been limited.

The grass selective herbicides Verdict, Select and Factor (Group A) used on other pasture legumes appear to be safe. Treflan applied pre-sowing at 1.4 L/ha and incorporated appears to be safe, although some damage has been measured at higher label rates. Post-emergent broadleaf weed control options used successfully in field trials include 25 g/ha of Broadstrike (plus label rate of uptake oil) and 50g/ha of Spinnaker at the 3-8 trifoliate leaf stages. Dual gold and Igran (at low label rate) have also been used safely on messina.

MCPA, Raptor and Simazine have caused significant damage to messina. Messina is very sensitive to the SU herbicide chlorsulfuron (Glean). Growers should avoid paddocks where SU herbicides have recently been used and strictly observe plant back periods on soils where residues persist.

Growers should observe cautions regarding the application of herbicides to waterlogged soils.

Pests and diseases

Messina should be monitored for redlegged earth mites and aphids during emergence and later in the season and controlled as required. Neptune has some susceptibility to powdery mildew.

Breeding and selection

Neptune messina was developed by DAFWA and SARDI as part of the Future Farm Industries Cooperative Research Centre. It is derived from accession SA40002, most likely collected from the wild in Israel.

Seed enquiries

Neptune messina is marketed under the Dyna-Gro Seed brand. For seed enquiries contact Seednet personnel.

Seednet

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Messina - Herbicide tolerance 2017

Trt #	Group	Active	Product		Rate	
1	nil					
2	B	Flumetsulam	Broadstrike	high	25	g/ha
3	F	diflufenican	Brodal options	low	100	ml/ha
4	F	diflufenican	Brodal options	mid	150	ml/ha
5	F	diflufenican	Brodal options	high	200	ml/ha
6	C	Bromoxynil	Bromicide 200	low	700	ml/ha
7	C	Terbutryn	Igran	low	550	ml/ha
8	C	Terbutryn	Igran	mid	625	ml/ha
9	C	Terbutryn	Igran	high	700	ml/ha
10	D	propyzamide	Kerb	high	1500	ml/ha
11	C	Simazine	Simazine	low	550	g/ha
12	C	Simazine	Simazine	mid	725	g/ha
13	B	Imazethapyr	Spinnaker	mid	100	g/ha
14	B	Imazethapyr	Spinnaker	high	140	g/ha
15	A	Butroxydim	Factor	high	180	g/ha
16	A	Haloxyfop-R	Verdict	high	100	ml/ha

Messina summary

Messina tolerates high levels of salinity (Summer ECe up to 30 dS/m)

Tolerates waterlogging once established

Must be inoculated with new strain of rhizobia (SRDI554)

Sensitive to pH_{Ca} below 5.5 – lime pellet seed at sowing

Recommended for use in mixed pastures

Tolerates low rate Treflan & grass selective herbicides

Broadstrike safe, but may be damaged by other broad leaf herbicides

Seed and inoculant available through Seednet