FINAL REPORT 2014

PROJECT CODE	: SO511

PROJECT TITLE	Assessment of new vetch species for low rainfall cropping areas

PROJECT DURATION

Project Start date	1 July 2011
Project End date	30 June 2014

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Project Code	
Project Type	

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PROJECT REPORT

Executive Summary

Four novel species of vetch *(Vicia articulata, V. palaestina, V. macrocarpa* and *V. orbicularis)* were investigated for their potential as legume break crops in low rainfall cropping areas of South Australia.

- *Vicia articulata:* As a species has a severe tendency to shatter prior to full maturity as well as low fodder yields in the target environment.
- *Vicia macrocarpa:* demonstrated a very prostrate plant type not suited to the target use as it never bulks up enough to provide adequate fodder or ground cover.
- *Vicia orbicularis.* This species never achieved yields equivalent to common vetch in any areas so was ultimately found unsuitable for further promotion.
- *Vicia palaestina:* Several factors limit this species' ability to become a viable option in low rainfall areas. It is an extremely slow establishing crop that does not grow well in cold conditions, making it a very poor competitor with weeds or other crops. Any competitor completely dominates the crop and severely affects yield and quality. It also showed susceptibility to Rhizoctonia.

There proved to be no advantage in cultivating these species as compared to common vetch. Common vetch consistently out yielded the lines tested and had more agronomic advantages in the targeted areas.

Project Objectives

The aims of this project were to:

- Continue the research commenced in the previous project (SO708R) to assess and select new vetch germplasm from: *Vicia articulata, V. palaestina, V. macrocarpa* and *V. orbicularis* for low rainfall cropping environments in South Australia.
- Focus on *V. palaestina* and *V. orbicularis* which showed the most potential for

development as viable legume options for South Australian low rainfall regions in the SAGIT Project S0708R.

- Trial these species in replicated trials in the target regions of South Australia (Upper Eyre Peninsula, Upper North and the SA Mallee) for assessment as potential new releases.
- Conduct quality testing for feed quality of both dry matter and grain, as well as hard seededness and evaluate disease resistance for advanced lines.
- Provide farmers with high yielding alternative vetch varieties that are well adapted to sandy-alkaline soils in low rainfall environments.
- Provide producers and users with agronomic packages for new germplasm.

Overall Performance

The main objectives of the project, trialing these four novel vetch species in replicated trials at multiple sites in low rainfall cropping areas of South Australia were achieved. Also disease, quality and agronomic testing were completed.

However the end goal of providing a new high yielding alternative vetch species/variety was not achieved as all lines/species trialed failed to outperform, or offer any significant agronomic advantage over, the standard common vetch variety (Morava) used as a control.

Staff and co-operators involved in this project:

Staff:
Principal Investigator; Stuart Nagel, Senior Research Officer (15%)
Research staff, Gregg Kirby, Senior Agricultural Officer (15%)

Co-operators:
Joop van Leur, NSW Department of Primary Industries (pathology)
Leigh Davis, Minnipa Agricultural Centre
Ken Smith, Charlick Research Farm
Gilmore Catford, Morchard
Grantly Pearce, Lameroo

Key Performance Indicators (KPI)

KPI	***Achieved (Y/N)***	***If not achieved, please state reason.***
1. Assessment of advanced material produced in project S0708R in replicated trials	Y	Trials were conducted in 2011 on all advanced material selected from the previous project (S0708R). This material was assessed in replicated trials at two sites in SA (Morchard and Charlick research farm). Only two sites were sown in 2011 due to the limitations of seed availability.

		From the results in 2011 combined with those from Project SO708R it was concluded that the line of *Vicia articulata (ATC 60358)* would be removed from future trials as this line and species are not meeting the targeted traits and requirements for further testing. Four sites were sown in 2012 focusing on low rainfall regions of SA with a fallback site at Charlick Research farm (Strathalbyn) to ensure seed production for ongoing trials. In 2013 the same four sites were sown. Once again all material was tested for hard seededness. The progress of this project and material being investigated was discussed in detail at the Upper North Farming Systems field day at Booleroo Centre in 2011 and Minnipa Field days in 2012 and 2013. Significant interest was shown by local growers and agronomists in both areas. Progress was also reported at all other field days attended/presented by the National Vetch Breeding Program (NVBP).
2. Fodder analysis of all advanced material for comparison against common and woolly pod vetch standards	Y	Fodder samples were taken from all lines in trial and were analyzed by Feedtest for fodder quality. The species trialed all showed excellent results for feed quality, being at the upper end of quality levels expected for legume hay. (see Table 1)
3. Multiple replicated trials in targeted regions of South Australia	Y	Trials were sown at four sites spread across the targeted regions of South Australia (SA) in 2012 and 2013, including sites in the SA mallee (Lameroo), upper north (Morchard), Upper Eyre Peninsula (Minnipa) and Strathalbyn (Charlick Research Farm). Yields at all sites except Charlick were disappointing; the soft finish at Charlick enabled good late season growth. Morava still out-yielded all lines in trial. Cutting early at Minnipa and Morchard, and again 1 month later failed to produce significant regrowth. Mixtures of the new species and common vetch were also trialed at Lameroo, Morchard

		and Charlick, with the common vetch completely out-competing the other species and choking them out after satisfactory emergence from all lines.
4. Disease screening (ascochyta and rust) of all advanced lines	Y	Disease screening (Rust) was conducted in conjunction with Joop van Leur (NSW DPI) (see Table 2), and susceptibility to Rizhoctonia was assessed at Minnipa, (Table 3).
5. Conduct agronomic trials of selected advanced material to determine optimum seeding rates and times, chemical compatibility, and weed management options	Y	Different seeding rates and chemical options were trialed during this project, as well as observations on the agronomic characteristics/potential of these species. *V. palaestina* proved to be a very poor competitor with weeds, and when planted in combination with any other crop it is completely out-competed and fails to develop. Rhizoctonia bare patch was observed at Minnipa in 2013 with *V. palaestina* and *V. orbicularis* proving to be very susceptible to this disease. All lines trialled in 2013 showed susceptibility to Simazine applied post sowing pre-emergence when significant rainfall was recorded post-emergence at Lameroo.
6. Multiply breeders seed of selected lines	N	No line/s were selected for release as a new variety, so no seed was multiplied
7. Provide farmers and agronomists with technical agronomic details/ packages for any new varieties	N	As no line was selected to be released, it was not appropriate to produce a technical/agronomic package for this material.
8. Release new variety	N	No line was selected as suitable for release
9. Produce a final report	Y	Completed

Technical Information

Table 1 shows the results from FEEDTEST fodder analysis, demonstrating the high quality of fodder produced by these species.

Table 1. Feedtest fodder/hay analysis results

SPECIES	LINE	CP %	DMD %	ME (MJ/kg DM)	NDF %
V. orbicularis	33118	14.8	71.7	10.7	30.8
V. palaestina	37292	20.9	76.5	11.5	29.2
V. palaestina	37293	21.1	76.4	11.5	29.6
V. palaestina	37331	20.5	73.9	11.1	33.2
V. palaestina	37332	21.3	75.1	11.3	31.5
V. palaestina	37355	22.5	78.1	11.8	28.6
V. palaestina	37361	20.8	76.7	11.6	30.6
V. articulata	60358	16.9	68.9	10.2	31.6
mean for vetch hay 2010/2011		19.1	64.2	9.4	48.2

CP- crude protein, **DMD**- dry matter digestibility, **ME**- metabolisable energy, **NDF**- neutral detergent fibre.

Tables 2 and 3 show results from disease screening of both rust (*Uromyces viciae-fabae)* and Rizochtonia bare patch. The results for rust were excellent showing the majority of lines as resistant with only two lines showing any sign of infection. The rizochtonia screening however showed very poor results with all lines showing susceptibility to infection, with three lines having extreme susceptibility resulting in complete plant deaths.

Table 2. Assessment of *V. palaestina* and *V. orbicularis* for rust infection 14 days after inoculation with vetch rust.

			Observation 14 days after inoculation		
Pot	*Line*	*Species*	*%leaf infected*	*%stem infected*	*Comments*
1	33118	*V. orbicularis*	0	0	resistant
2	37292	*V. palaestina*	0	0	resistant
3	37293	*V. palaestina*	0	0	resistant
4	37331	*V. palaestina*	0	0	resistant
5	37332	*V. palaestina*	1	1	tolerant
6	Blanchefleur	*V. sativa* rust susceptible control	50	10	susceptible
7	37355	*V. palaestina*	1	0	resistant
8	37361	*V. palaestina*	3	1	tolerant

Blanchefleur was used as susceptible control as Morava is resistant to rust

Table 3. Rhizoctonia bare patch assessment taken at Minnipa

Line	*Species*	*Disease score 1-5*	*Comments*
33118	*V. orbicularis*	4	susceptible
37292	*V. palaestina*	5	Very susceptible
37293	*V. palaestina*	4	susceptible
37331	*V. palaestina*	5	Very susceptible
37332	*V. palaestina*	4	susceptible
Morava	*V. sativa* control	1	tolerant
37355	*V. palaestina*	4	susceptible
37361	*V. palaestina*	5	Very susceptible

Disease Score 1=no damage/suppression , 5=plant s dead/ non existent

Tables 4 and 5 are summaries of the yield data derived from the replicated experiments, for complete data recorded during the project see Appendix A.

Table 4 is expressing the BLUPs (Best Linear Unbiased Predictions) of the mean of all the new species combined at each site compared to the BLUP for Morava. Showing that at no point did these species provide a better output than Morava (common vetch) even though Morava is not targeted at these environments, it is seen as a medium to high rainfall variety. Even at Charlick in 2011 when the best yields were recorded (over 6.0t/ha dry matter) the new species could not out-yield Morava and as the sites and seasons became tougher the difference grew in Morava's favor rather than the opposite.

Due to a lack of genetic variance in the initial analysis, the results for Morchard across all three years were not included in Table 4 but are presented in Table 5. After initially showing potential at Morchard in 2011, with yields similar to the common vetch controls, the subsequent seasons were less satisfactory.

All species, but particularly *V. palaestina* showed very poor early vigor, and at cold sites like Morchard this was particularly pronounced.

The conclusions reached were that of these four species, *Vicia articulata* and *V. macrocarpa* showed early on that they were unsuitable for the target environment. After showing initial promise *V. orbicularis* and *V. palaestina* also failed to perform in the targeted areas. Showing very poor initial vigor, a lack of competitiveness against weeds and other crops and poor regrowth after cutting or grazing. These attributes combined with low yields, susceptibility to Rizochtonia and a requirement for long mild springs to reach their full potential made them unsuitable for recommendation as a new cropping/grazing species in the low rainfall cropping areas of South Australia.

Table 4 BLUPS of the variety means for the new species combined compared to Morava, predicted values are t/ha dry matter

Site	Standard	predicted.value	standard.error
2011 Charlick	newspecies	6.1	0.76
2011 Charlick	Morava	7.5	1.28
2012 Lameroo	newspecies	2.8	0.20
2012 Lameroo	Morava	4.8	0.39
2012 Minnipa	newspecies	2.6	0.28
2012 Minnipa	Morava	4.1	0.43
2013 Lameroo	newspecies	2.7	0.17
2013 Lameroo	Morava	5.7	0.42
2013 Minnipa	newspecies	2.6	0.21
2013 Minnipa	Morava	4.8	0.41

Table 5. Morchard means t/ha dry matter for 3 years
(no genetic variance in analysis so BLUPs not produced)

Site	Line	2011	2012	2013
Morchard	33118	1.9	0.24	0.8
Morchard	37292	1.7	0.22	0.72
Morchard	37293	1.2	0.26	0.63
Morchard	37331	1.0	0.27	0.46
Morchard	37332	1.1	0.24	0.6
Morchard	37355	1.3	0.23	0.69
Morchard	37361	1.4	0.19	0.59
Morchard	60358	0.9	NS*	NS*
Morchard	Morava	1.8	0.83	1.8
Morchard	Rasina	2.2	NS*	NS*

(NS*- not sown)

Conclusions Reached &/or Discoveries Made

The four species investigated in this project have ultimately proved to be unsuited to the target environments. The conclusions reached on each of the species are:

- *Vicia articulata:* is not suited to the low rainfall cropping systems of southern Australia. As a species it has a severe tendency to shatter prior to full maturity as well as low yields in the target environment.

- *Vicia macrocarpa:* is a very prostrate plant type not suited to the target use as it never bulks up enough to provide adequate fodder or ground cover.

- *Vicia orbicularis:* initially showed promising results in the low rainfall site at Morchard in dry matter production but was very poor in seed production. While the quality of the hay produced from this species is slightly below the quality of the *V.*

palaestina, it is still in the upper range of quality averages for legume hay. This species never achieved yields equivalent to common vetch in any areas so was ultimately found unsuitable for further promotion.

- *Vicia palaestina:* The fodder quality of this species has been shown to be excellent, with all lines tested being at the upper end of the ranges expected for each trait in legume hay. Several of the lines tested showed excellent hay yields (dry matter) in medium rainfall sites when the season finished slowly. Results were far more variable when there was a dry finish.

  Several factors limit this species' ability to become a viable option in low rainfall areas. It is an extremely slow establishing crop that does not grow well in cold conditions, making it a very poor competitor with weeds or other crops. Any competitor completely dominates the crop and severely affects yield and quality. In 2013 it also showed susceptibility to Rhizoctonia at Minnipa. There proved to be no advantage in cultivating this species as compared to common vetch. Common vetch consistently out-yielded the lines tested and had more agronomic advantages in the targeted areas.

- In conclusion it has been found that none of this material is suitable for release as new varieties for the low rainfall cropping areas of South Australia. All species failed to outperform common vetch and did not demonstrate any agronomic advantages over other grazing/fodder legume species.

Intellectual Property

There was no intellectual property generated in this project and there is no potential for commercialisation of any varieties.

Application / Communication of Results

SUMMARY

- This project aimed to investigate the potential of four novel vetch species as legume grazing options for low rainfall cropping/mixed farming areas of South Australia.
- Two species were discarded early on, *Vicia articulate* and *Vicia macrocarpa,* due to a combination of traits which made them unsuitable for the purpose of this project.
- *Vicia orbicularis* and *Vicia palaestina* both showed promise as viable legume grazing/fodder options.
- However ultimately the undomesticated nature of the four species, indicated by slow initial vigour, poor competitiveness, prostrate growth habits, extended and late maturity, extreme shattering of pods and susceptibility to disease ultimately made them all unsuitable for release/use as legume grazing options in low rainfall cropping systems.

The species investigated in this project have ultimately proved to be unsuitable for inclusion in the cropping systems/rotations of low rainfall cropping areas off South Australia. Therefore there is no potential for any impact on this industry.

Extension Articles: (articles reproduced in Appendix A)

- Upper North Farming Systems trial compendium 2012
- Eyre Peninsular Farming Systems Summary 2012 and 2013

Progress and findings from this project were specifically reported at field days at Minnipa and Booleroo throughout the project. Staff from the national Vetch Breeding Program attend multiple field days across South Australia and interstate each year, at all of these, progress and findings from this project have been discussed.

Path to market is not relevant as there is no product or variety derived from the results of this project.

POSSIBLE FUTURE WORK

The findings from this project have prompted further work (Project S914) into the investigation of existing common vetch germplasm developed in the National Vetch Breeding Program (funded by the GRDC) targeted at marginal low rainfall cropping areas of South Australia. The material to be targeted in this project is unreleased material that may have a niche fit in specific areas rather than broad scale adaptability.

AUTHORISATION	
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Date:	26/8/14

Appendix A:

Table 1. Results from Charlick Research Farm (Strathalbyn), showing grain yield, green/ fresh cut and dry matter (hay) in t/ha

			2011			2013	
site	species	name	grain yield t/ha	t/ha/ green	t/ha/ dry	t/ha green	t/ha dry
Charlick	*V. orbicularis*	33118	0.8	16.9	4.8	10.0	4.4
Charlick	*V. palaestina*	37292	1.4	21	8.3	8.6	3.8
Charlick	*V. palaestina*	37293	1.5	17.1	5.1	14.6	6.4
Charlick	*V. palaestina*	37331	1.9	19.9	5.7	13.1	6.2
Charlick	*V. palaestina*	37332	1.2	21.3	6.3	15.9	6.9
Charlick	*V. palaestina*	37355	1.0	23.8	7.3	17.1	7.2
Charlick	*V. palaestina*	37361	1.9	22.2	7.1	16.6	7.1
Charlick	*Vicia articulata*	60358	0.7	14.9	4.1		
Charlick	*V. sativa*	Morava*	2.7		4.76*	19.6	7.6
Charlick	*V. villosa*	Capello*			8.05*		

*Results for Morava and Capello are taken from herbage trials sown at Charlick at the same time as the New Species trial.

Results for 2012 were discarded as trial was over-run by herbicide resistant rye grass and the species trialed could not compete and were smothered by the rye grass.

Table 2. Results for Morchard 2011-2013, in t/ha green/fresh cut and dry matter (hay)

			2011		**2012**		**2013**	
site	**species**	**name**	**t/ha/ green**	**t/ha/ dry**	**t/ha green**	**t/ha dry**	**t/ha green**	**t/ha dry**
Morchard	*V. orbicularis*	33118	5.7	1.9	0.42	0.23	1.7	0.8
Morchard	*V. palaestina*	37292	5.8	1.7	0.47	0.22	1.4	0.72
Morchard	*V. palaestina*	37293	3.8	1.2	0.48	0.26	1.14	0.63
Morchard	*V. palaestina*	37331	3.1	1	0.46	0.24	0.73	0.46
Morchard	*V. palaestina*	37332	3.8	1.1	0.44	0.24	1	0.6
Morchard	*V. palaestina*	37355	3.8	1.3	0.4	0.23	1.68	0.69
Morchard	*V. palaestina*	37361	4.6	1.4	0.34	0.19	1.14	0.59
Morchard	*Vicia articulata*	60358	2.7	0.9				
Morchard	*V. sativa*	Morava	6.1	1.8	1.5	0.77	4.32	2.17

Table 3. Results for Minnipa 2012-13, in t/ha green/fresh cut and dry matter (hay)

			2012		2013	
Site	**Species**	**line**	**t/ha green**	**t/ha dry**	**Cut 11/9 t/ha**	**Cut 10/10 t/ha**
Minnipa	*V. orbicularis*	33118	5.3	2.3	1.7	2.7
Minnipa	*V. palaestina*	37292	4.6	2.4	2.2	2.9
Minnipa	*V. palaestina*	37293	4.6	2.2	2.1	2.6
Minnipa	*V. palaestina*	37331	4.3	1.7	1.9	1.8
Minnipa	*V. palaestina*	37332	5.3	2.4	2.5	3
Minnipa	*V. palaestina*	37355	5.1	3.1	2.5	2.7
Minnipa	*V. palaestina*	37361	4.6	2.1	2.3	2.5
Minnipa	*V. sativa*	Morava	8.6	4	4.9	2.9 #

Morava cut 1 month after ideal time, reduced yield. There was no significant regrowth from the first cutting at the time of second cutting for all lines

Table 4. Results for Lameroo 2012-13, in t/ha green/fresh cut and dry matter (hay)

			2012		2013	
Site	Species	line	t/ha green	t/ha dry	t/ha green	t/ha dry
Lameroo	*V. orbicularis*	33118	4.5	3.3	6.4	2.9
Lameroo	*V. palaestina*	37292	4.1	2.6	7.2	3.3
Lameroo	*V. palaestina*	37293	4.7	2.7	4.8	2.2
Lameroo	*V. palaestina*	37331	3.9	2.7	5.8	2.6
Lameroo	*V. palaestina*	37332	3.9	2.4	4.6	2.1
Lameroo	*V. palaestina*	37355	3.8	2.7	5.9	2.7
Lameroo	*V. palaestina*	37361	4.9	3.3	6.3	2.9
Lameroo	*V. sativa*	Morava	6.7	4.8	12.5	5.6

Charlick prior to hay cuts Oct 2011 (the best growth achieved in all trials)

Morchard Trials in 2011 and 2012 for comparison.

Photos taken at similar times of the season.

2011 **2012**

Lameroo 2012. Common vetch on far left of top photo and 4th plot in (left to right) Bottom photos *V. palaestina* plots.

Minnipa 2013. Morava in foreground with patches of Rhizoctonia evident in *V. palaestina* with unaffected common vetch trial in background.

Article from Upper North Farming Systems trial compendium 2012

Assessment of new vetch species for low rainfall cropping areas in 2011

By Stuart Nagel, Rade Matic and Gregg Kirby, (National Vetch Breeding Program, SARDI)

In 2011 the National Vetch Breeding Program (NVBP) conducted a trial in conjunction with the UNFS at Morchard (Gilmore Catford's Property) looking at the adaptability of several new species of vetch to low rainfall cropping environments in South Australia.

- Included in the trial were 3 new vetch species *Vicia articulata, V. palaestina* and *V. orbicularis* as well as the 2 common vetch varieties Morava and Rasina (Rasina was not cut for hay as it was near to full maturity when the trial was cut).
- The trial was dry sown on the 10th of May and received good rain within 5 days.
- All lines were sown at an equivalent rate of 30kg/ha for common vetch which equals approximately 40plants/m^2.
- No fertilizer or innoculum were applied.
- The trial received a post sowing pre emergence spray of Diuron (680gm/ha) and Lorsban (140ml/ha) and an application of Select (350ml/ha) grass herbicide on August 15th.
- Between sowing and cutting for hay on October 4th the trial site received approximately 160mm of rainfall.

Background

The trialling of these three new vetch species, *Vicia articulata, V. palaestina* and *V. orbicularis,* was prompted by observations by the senior vetch breeder Rade Matic while on collecting trips in the Middle East. This was backed up by information from the International Centre for Agricultural research in Dry Areas (ICARDA), Syria; and the 2007 Forage Legumes Symposium at Novi Sad, Serbia. They reported that these three species and particularly *V. palaestina* (leaf dense vetch - LDV) are considered to be some of the best dry matter producers in very low rainfall areas, in Syria, Jordan, Egypt and Cyprus. These 3 species were tested for growth as a pasture, hay and grain in soils with pH –5.2-8.9 and rainfall of 120-230mm from seeding to harvesting. In the Middle East they can be sown to provide early grazing and turned into the soil to increase nitrogen for the following crop in the same year. *V. palaestina* and *V. obicular*is are slow in initial growth but cover the soil like a carpet and are the most tolerant species for heat and extended long dry periods. They also demonstrated superior grazing tolerance and regrowth compared to common vetch. It has also been reported that V. *articulata* (Bard vetch) and *V. orbicularis,* possess the same anti-nutritional components as faba bean (M. Tate pers. info) and could be good potential fodder sources both green and as grain.

Discussion

The trial at Morchard was sown early (May 10) to fit in around other sowing requirements. This was probably a little earlier than optimal but the season worked out ok. As stated there were minimal inputs due to these lines being predominantly aimed at a fodder or grazing end use.

Insecticide (Lorsban) was applied post sowing to prevent damage from RLEM and other insects in early post emergence. No damage was reported and no other applications were required throughout the year. Diuron was applied at the same time to provide initial weed control and proved effective, although some broadleaf weeds had to be removed by hand later in the season. If this crop was to be used for grazing or hay the grass herbicide application would probably not be required as the gasses and cereals would add to the fodder yields. But due to the nature of the trial we needed to keep the plots as clean as possible.

The trial showed promising results with minimum inputs, no fertilizer or inoculum and minimal insect or weed control. The best performing lines still nodulated well and produced similar fodder yields to Morava (see Table 1). The line of *V. orbicularis (*33118) again performed well in this area as did all lines of *V. palaestina* with line SA 37292 being particularly promising. The line of *V. articulata (ATC 60358)* was the worst performer at both sites and will be dropped from future trials.

The trial was repeated at Charlick Research Farm (Strathalbyn) and the results were exceptional (see Table 2), with several lines equalling the dry matter production of Capello (*V. villosa*) and all bar the *V. articulata* surpassing the production of Morava. Again SA 37292 was high yielding in fodder production as well as showing promising seed production.

The results from these two trials demonstrate the potential of these species. The target of the project is to produce a legume option for low rainfall cropping systems. To that end further trials will be conducted in 2012, including trials at Morchard, Upper Eyre Peninsular and in the South Australian Mallee. Toxin analysis of the grain indicates very similar levels of anti-nutritional components as common vetch and fodder analysis on the hay produced is currently being done.

The reason there is no grain yields from Morchard is that we desiccated the trial on the 11th of November and return to harvest the trial on the 15th only to find the trial had been eaten and trampled by the local pigeon population. They took the majority of seed and a lot of straw and knocked the rest of the seed to the ground. This was not ideal but we did have good results from Charlick research Farm.

This work is being supported by SAGIT, which has been investing in the development of this project since 2008 when we first imported the germplasm from ICARDA.

Conclusions

- *Vicia articulata* is not suited to the low rainfall cropping systems of southern Australia. As a species it has a severe tendency to shatter prior to full maturity as well as low yields in the target environment.
- *Vicia orbicularis* showed promising results in the low rainfall site at Morchard, but was very poor in seed production. Further investigation is required to ascertain if this species is suitable for further promotion.
- *Vicia palaestina* lines tested have shown excellent results in both the low and medium rainfall sites, with hay yields (dry matter) of several lines in excess of 7t/ha at Strathalbyn and over 1.4t/ha at Morchard.

Results

Table 1. Morchard New Species Trial 2011 Results

site	name	species	grain yield t/ha*	t/ha (green)	t/ha (dry)
Morchard	33118	*V. orbicularis*		5.7	1.9
Morchard	37292	*V. palaestina*		5.8	1.7
Morchard	37293	*V. palaestina*		3.8	1.2
Morchard	37331	*V. palaestina*		3.1	1.0
Morchard	37332	*V. palaestina*		3.8	1.1
Morchard	37355	*V. palaestina*		3.8	1.3
Morchard	37361	*V. palaestina*		4.6	1.4
Morchard	60358	*Vicia articulata*		2.7	0.9
Morchard	Morava	*V. sativa*		6.1	1.8

**No grain harvest*

This site received approximately 160mm of rainfall from sowing (10/5/2011) to cutting for hay (4/10/2011).

Table 2. Charlick New Species Trial 2011 Result

site	name	species	grain yield t/ha	t/ha (green)	t/ha (dry)
Charlick	33118	*V. orbicularis*	0.778	16.9	4.8
Charlick	37292	*V. palaestina*	1.419	21.0	8.3
Charlick	37293	*V. palaestina*	1.545	17.1	5.1
Charlick	37331	*V. palaestina*	1.875	19.9	5.7
Charlick	37332	*V. palaestina*	1.153	21.3	6.3
Charlick	37355	*V. palaestina*	1.009	23.8	7.3
Charlick	37361	*V. palaestina*	1.935	22.2	7.1
Charlick	60358	*Vicia articulata*	0.666	14.9	4.1
Charlick	Morava*	*V. sativa*			4.76*
Charlick	Capello*	*V. villosa*			8.05*

*Results for Morava and Capello are taken from herbage trials sown at Charlick at the same time as the New Species trial.

Articles produced for the Eyre Peninsular Farming Systems Summary 2012 and 2013

Vetch Breeding Trials at MAC, 2012
Stuart Nagel, Rade Matic and Gregg Kirby
SARDI, Waite.

- **Vetch is a versatile crop that can be used for grain, pasture, hay/silage or green/brown manure.**
- **Common vetches can be successfully grown in lower to mid rainfall areas of southern Australia where no other legume crops perform consistently**
- **Vetchoffer disease and weed breaks in rotation and also return significant amounts of nitrogen to the soil.**
- **Advanced breeding lines were trialled and compared to existing varieties at Minnipa this season.**
- **Several new vetch species that have shown potential in very low rainfall areas, were also trialled on Eyre Peninsula for the first time in 2012.**

Why do the trial?
In 2012 The National Vetch Breeding Program (NVBP) conducted two trials on Eyre Peninsula at Minnipa Agricultural Centre (MAC). A trial comparing grain production of advanced lines and existing varieties (S4 Trial) and another trial involving a range of new vetch species (New Species Trial) targeted at fodder production in low rainfall environments. The new species trial is investigating two new vetch species *Vicia palaestina* (leaf dense vetch – LDV), and *V. obicularis* (small erect vetch) which have shown potential in low rainfall environment, but have never been grown on Eyre Peninsula before.

How was it done?
The trials were sown on18 May 2012 with minimum inputs, no fertilizer or inoculum. Pre-emergent herbicides Diuron and Metribuzine were used on the S4 trial and only Diuron on the New Species trial, along with a pre- emergent insecticide on both trials.

The New Species trial was cut for hay on 11 October and the S4 trial was harvested for grain at maturity.

What happened?
The S4 trial emerged well and had strong early vigour, looking particularly good at the time of the Minnipa Field Day in September. The dry finish to the season limited grain yield potential, (Results Table 1) however the plants did produce good bulk early and with a little more rainfall in September would have produced better yields. Two lines trialled SA-34823 and SA-35103 are to be released as new varieties, these lines are better adapted to lower rainfall areas than current varieties, and have out yielded all current varieties in grain and hay production over the last 5 years (see Table 2). In 2013 we intend to conduct further S4 trials at Minnipa and are going to include a hay trial of advanced lines to demonstrate the yield potential of these lines in this environment.

Table 1. Grain Yield of Minnipa S4 Vetch, 2012.

Trial	Line	mean yield t/ha
S4 vetch	SA 34748	0.81
S4 vetch	SA 34822	1.03
S4 vetch	SA 34823**	0.91
S4 vetch	SA 34848	0.72
S4 vetch	SA 34883	0.99
S4 vetch	SA 34884	0.93
S4 vetch	SA 35019	0.77
S4 vetch	SA 35036	0.74
S4 vetch	SA35103**	0.84
S4 vetch	Blanchefleur	0.75
S4 vetch	Morava	0.48
S4 vetch	Rasina	0.68

** These lines are to be released as new varieties

Table 2. Grain yield and dry matter (t/ha) for two new and three existing vetch varieties, from a minimum of 4 sites/year in South Australia.

Variety	2008 mean		2009 mean		2010 mean		2011 mean		2012 mean		OAM*	OAM*
	Grain	Hay	Grain	Hay	Grain	Hay	Grain	Hay	Grain	Hay	Grain	Hay
34823	2.26	6.52	2.05	4.50	2.84	5.56	3.20	4.82	1.95	6.49	2.46	5.58
35103	2.06	6.62	1.84	4.25	2.77	5.31	2.90	4.20	1.68	6.27	2.25	5.33
BF#	1.91		1.65		2.70		2.10		1.46		1.96	
Morava	1.57	6.01	1.07	4.39	2.39	5.52	2.60	4.04	1.38	5.91	1.80	5.17
Rasina	1.83	6.06	1.65	3.83	2.42	5.21	2.90	3.94	1.50	5.67	2.06	4.94

*OAM is overall mean. # BF is Blanchefleur.

The New Species trial was somewhat disappointing as it showed poor early vigour and did not compete well with weeds, particularly wild turnips. The weed population compromised the results as they tended to crowd out the vetch (results in Table3). Again due to the lack of rainfall in September and October the anticipated late season growth that these lines are known for, did not eventuate. The fact that these new species could not out yield Morava in this environment was disappointing. This trial will be repeated again in 2013 to verify results before any recommendations can be made on the potential of these species.

Table3. Minnipa New Species Trial fodder yield (t/ha), 2012.

Trial	Species	line	Dry Matter green (t/ha)	Dry Matter dry (t/ha)
New Species	*V. orbicularis*	33118	5.2	2.3
New Species	*V. palaestina*	37292	4.6	2.4
New Species	*V. palaestina*	37293	4.5	2.2
New Species	*V. palaestina*	37331	4.2	1.7
New Species	*V. palaestina*	37332	5.2	2.4
New Species	*V. palaestina*	37355	5.0	3.1
New Species	*V. palaestina*	37361	4.6	2.1
New Species	*V. sativa*	Morava	8.5	4

What does this mean?

The common vetch lines to be released showed good results in comparison to existing varieties.

Fodder trials will be interesting, providing good information for those interested in green/brown manure as well as fodder.

The New Species trial was disappointing, but further work is required as they have performed well in other areas of the state.

Acknowledgements

The National Vetch Breeding Program would like to acknowledge the ongoing support and funding provided to the breeding program by the GRDC which has provided funding for research into vetch since 1992. As well as the support of SAGIT which has been actively funding research into new vetch species for low rainfall regions of southern Australia since 2008.

Location
Minnipa Ag Centre South 5??
Rainfall
Av. Annual: 325 mm
Av. GSR: 241 mm
2012 Total: 253 mm
2012 GSR: 185 mm
Yield
Potential: t/ha (vetch)
Actual: 2.46 -0.46 t/ha
Paddock History
2012: Canola and Legume trials
2011:
2010:
2009:
Soil
Red sandy loam
Plot size
12 m x1.25 m x 3 reps

2013 Vetch Breeding Trials at MAC

Stuart Nagel, Leigh Davis, Gregg Kirby and Rade Matic
SARDI, Waite.

- **Vetch is a versatile crop that can be used for grain, pasture/grazing, hay/silage or green/brown manure.**
- **It provides an opportunity to attack problem/resistant weeds in rotation while still providing other benefits like high quality grazing or hay**
- **Vetch offers oportunities for disease breaks in rotation and also returns significant amounts of nitrogen to the soil improving overall productivity.**
- **Advanced breeding lines were trialled and compared to existing varieties at Minnipa for fodder production.**
- **Several new vetch species were trialled on Eyre Peninsula in 2012 and 2013.**

Why do the trial?
In 2013 The National Vetch Breeding Program (NVBP) conducted two trials on Eyre Peninsula at Minnipa Agricultural Centre (MAC). A trial comparing hay production of advanced common vetch lines and existing varieties (S4 Trial) and another trial involving a range of new vetch species (New Species Trial) targeted at fodder production in low rainfall environments. The new species trial is investigating two new vetch species *Vicia palaestina* (leaf dense vetch - LDV), and *V. obicularis* (small erect vetch) which have shown potential in low rainfall environment, this trial has been funded by SAGIT.

How was it done?
Both trials were sown on18 May 2013 with 57kg/ha MAP fertilizer and no inoculum. Pre sowing 900ml/ha Roundup + 70ml/ha Nail + 900ml/ha Lorsban was applied and post sowing pre-emergent herbicides Simazine @ 680g/ha + Lexone @200g/ha were used on

the S4 trial and only Simazine @ 680g/ha on the New Species trial. During the season 300ml/ha Select + 150ml/ha Targa + 1L/100L Water Kwicken was used to control grasses.

The S4 trial was sown at 60plants/m2 which equates to approximately 45kg/ha. The New Species trial was sown at 50plants/m2.

The S4 trial was cut for hay on 11 September 2013. The New Species trial was cut twice, one replicate was cut on11 September 2013and the remaining 2 replicates on 10 October 2013.

What happened?
The S4 trial emerged well and had good early vigour, looking particularly good at the time of the Minnipa Field Day in September when it was cut for hay (Results Table 1). The timing of cutting was not ideal for all lines, Volga and 34748 had finished flowering and Morava was only at 50% flowering, but it gives an indication of yield potential.

It was an excellent season and yields were above expectations, but this does demonstrate the potential of vetch to produce significant amounts of fodder in good years.

Table 1. Hay Yield of Minnipa S4 Common Vetch, 2013.

Trial	Variety	yield t/ha
13 MAC S4 vetch	34748	6.26
13 MAC S4 vetch	35036	6.96
13 MAC S4 vetch	35072	6.30
13 MAC S4 vetch	37107	6.98
13 MAC S4 vetch	34462-1	6.65
13 MAC S4 vetch	35418-2	6.09
13 MAC S4 vetch	35614-1	6.39
13 MAC S4 vetch	35675-1	7.18
13 MAC S4 vetch	Morava	6.57
13 MAC S4 vetch	Rasina	6.58
13 MAC S4 vetch	Timok**	7.18
13 MAC S4 vetch	Volga**	6.18

** These lines are to be released as new varieties, previously trialled as Timok (35103) and Volga (34823), seed is not yet available for purchase.

In 2012 the New Species trial was disappointing and again in 2013 it showed poor early vigour and very little winter growth. The trial was cut at two different times (results in Table3) one replicate on11 September 2013 to assess regrowth potential and the remaining two on 10 October 2013 along with the regrowth from the first cut. Unfortunately regrowth was poor, averaging approximately 0.5t/ha. There were also significant patches of Rhizoctonia apparent in the trial affecting the new species but not the common vetch. The fact that these new species could not out yield Morava in this environment was disappointing, this combined with the poor early growth, lack of competitiveness and Rhizoctonia susceptibility has led to the conclusion that these species are not suited to this environment.

Table3. Minnipa New Species Trial dry matter yields (t/ha), 2012 and 2013.

Trial	Species	line	2012 Dry Matter (t/ha)	2013 Dry Matter(t/ha)
New Species	*V. orbicularis*	33118	2.3	2.7
New Species	*V. palaestina*	37292	2.4	2.9
New Species	*V. palaestina*	37293	2.2	2.6
New Species	*V. palaestina*	37331	1.7	1.8
New Species	*V. palaestina*	37332	2.4	3.0
New Species	*V. palaestina*	37355	3.1	2.7
New Species	*V. palaestina*	37361	2.1	2.5
New Species	*V. sativa*	Morava	4	4.8

What does this mean?
The common vetch performed very well in 2013, providing excellent yields of high quality fodder. It was a very good season and shows the potential of vetch in this area to provide either excellent hay and/or grazing or significant biomass for green/brown manure.

The New Species trial was disappointing, with yields below expectations and several negative traits mentioned above combining to make these species unsuitable for further investigation or release.

Acknowledgements

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Location
Minnipa Ag Centre South 5
Rainfall
Av. Annual: 325 mm
Av. GSR: 241 mm
2013 Total:
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Yield
Potential: t/ha (for common vetch)
Actual: 6.0-7.0 t/ha of hay/dry fodder

Paddock History
2013: Canola and Legume trials
2012:
2011:
Soil
Red sandy loam
Plot size
12 m x1.25 m x 3 reps