Reduced Tillage in Organic Agriculture and Winter Cover Crops Field Day, WSU Puyallup Research and Extension Center, 21 May 2012.

Project Directors: Doug Collins, Chris Benedict, Andrew Corbin, Craig Cogger, Andy Bary, Sandra Wayman, Liz Myhre. Farmer Cooperators: Colin Barricklow, Kirsop Farm; Steve Hallstrom, Let Us Farm; Erick Haakenson, Jubilee Farm.

Project Goal: A successful cover crop is essential to reduced tillage vegetable production. We are seeking cover crops that produce high biomass for weed suppression and also mature quickly to facilitate termination with organic methods. We would also like to increase soil fertility with leguminous cover crops in reduced tillage organic agriculture systems.

Experimental design: An experiment was designed to trial cover crops and organic termination methods (Crimp 5). Cover crops at WSU Puyallup were seeded on 23 September 2011. Target seeding rates were 100 lb/acre for grains and 60 lb/acre for vetches. Actual seeding rates (lb/acre) were: Aroostook rye, 123; common rye, 111; Strider, barley 108; Alba barley, 84; common vetch, 113; Lana vetch, 81; hairy vetch, 92; Purple Bounty vetch, 76; mix1 (Purple Bounty + Strider), 88; mix2 (Lana +Strider), 91. Mixes were 50/50 grain/vetch.

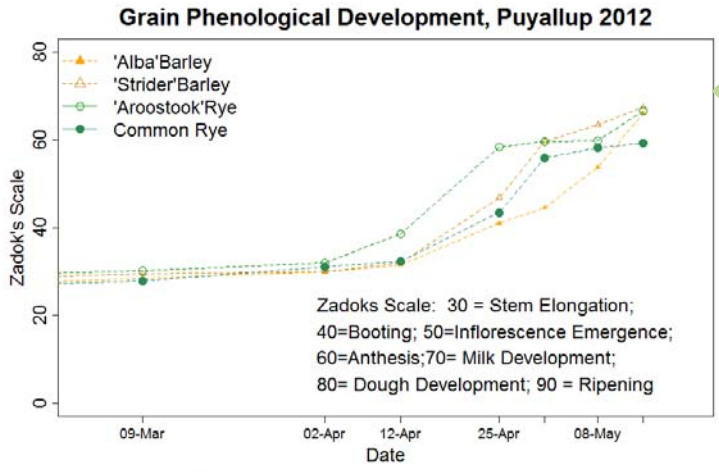
Each cover crop is terminated at two termination times with one of two termination methods

Vetches:

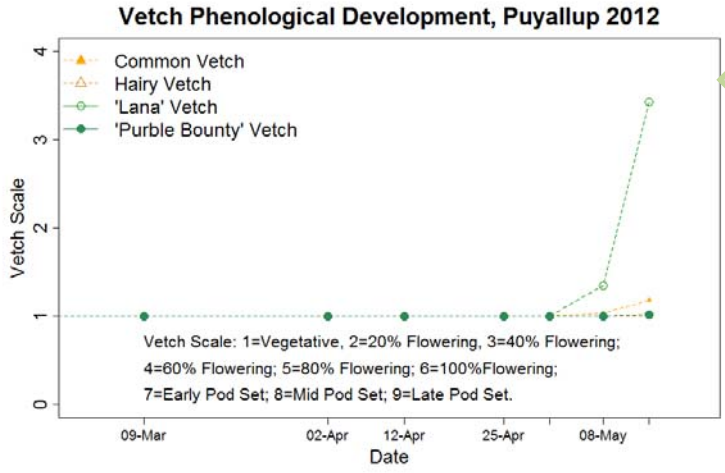
- Early = 60% Flowering
- Late = 100% Flowering
- Terminated with flail mower or roller/crimper + slicing

Grains:

- Early = late anthesis
- Late = early milk
- Terminated with flail mower or roller/crimper



'Aroostook' rye reached booting and inflorescense emergence more quickly than other grain varieties. However, barleys tend to start flowering (anthesis) before heads emerge or immediately after. 'Strider' barley passed 'Aroostook' rye in development in early May.



None of the vetch varieties flowered until early May. 'Lana' was the earliest to mature and once flowering started it progressed quickly to 100% flowering.

This research is supported by a grant from Western Sustainable Research and Education (SARE)

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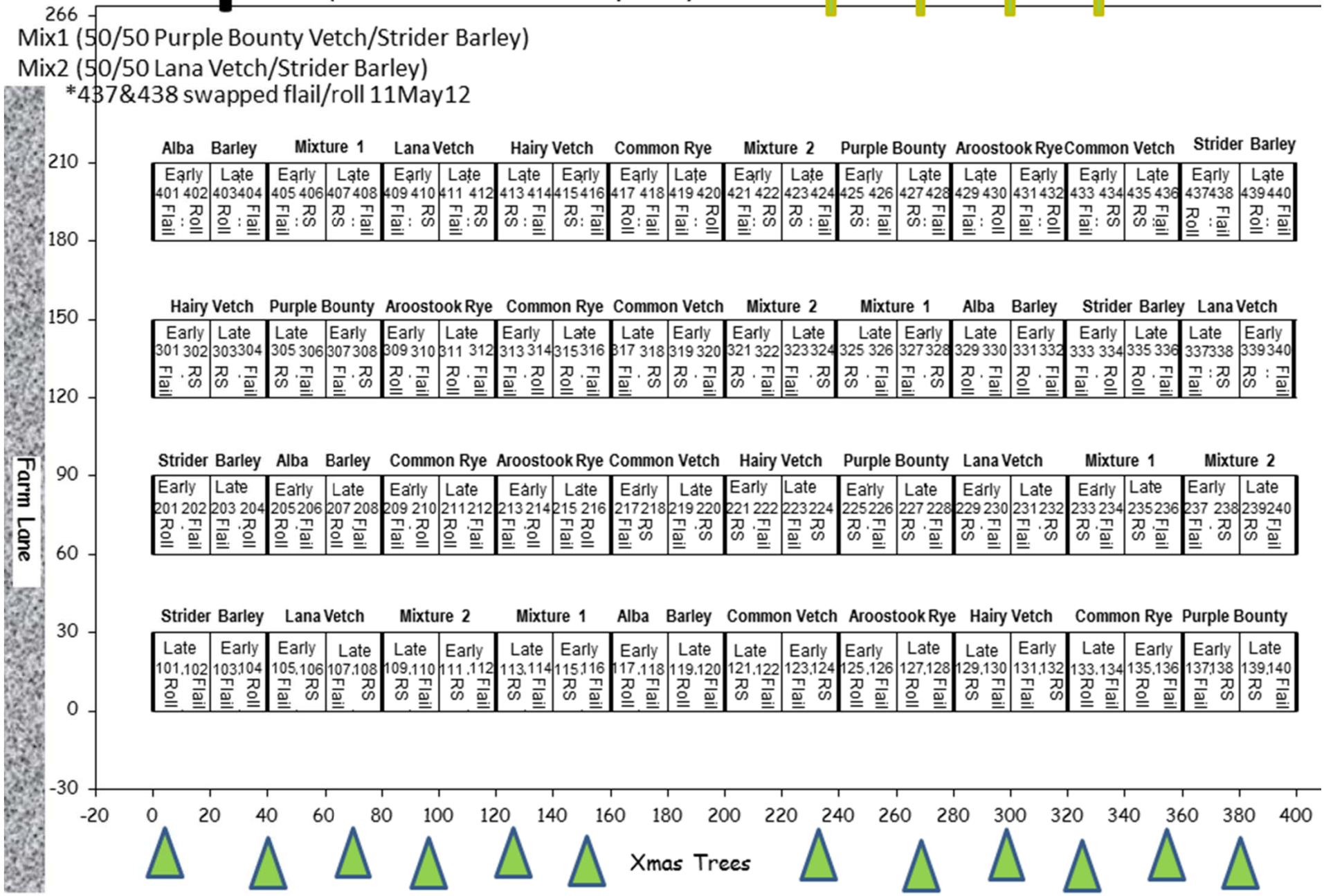
Crimp5 (Established late Sept11)

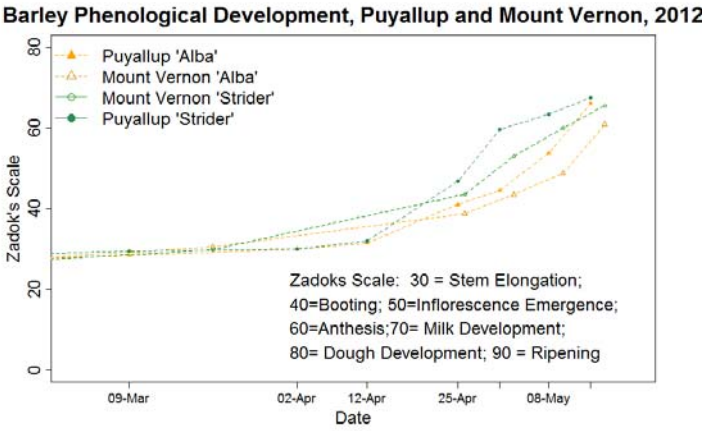
Poplars ^

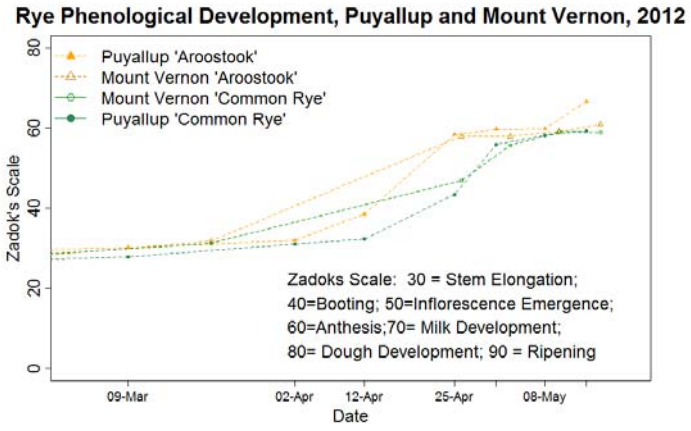
Mix1 (50/50 Purple Bounty Vetch/Strider Barley)

Mix2 (50/50 Lana Vetch/Strider Barley)

*437&438 swapped flail/roll 11May12





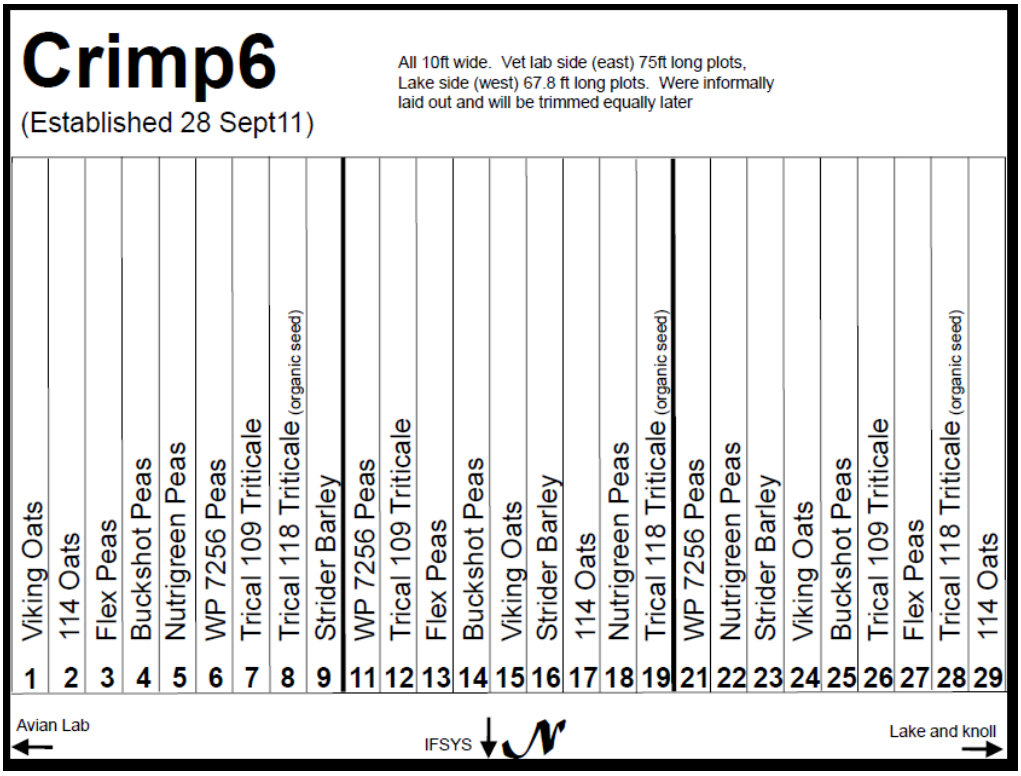


A similar variety trial is underway at Mount Vernon. Fields were seeded on 29 Sept, 2011. 'Alba' barley, 'Strider' barley, and 'Aroostook' rye matured more quickly at Puyallup. 'Strider' matured more quickly than 'Alba' at both sites and 'Aroostook' matured more quickly than common rye at both sites.

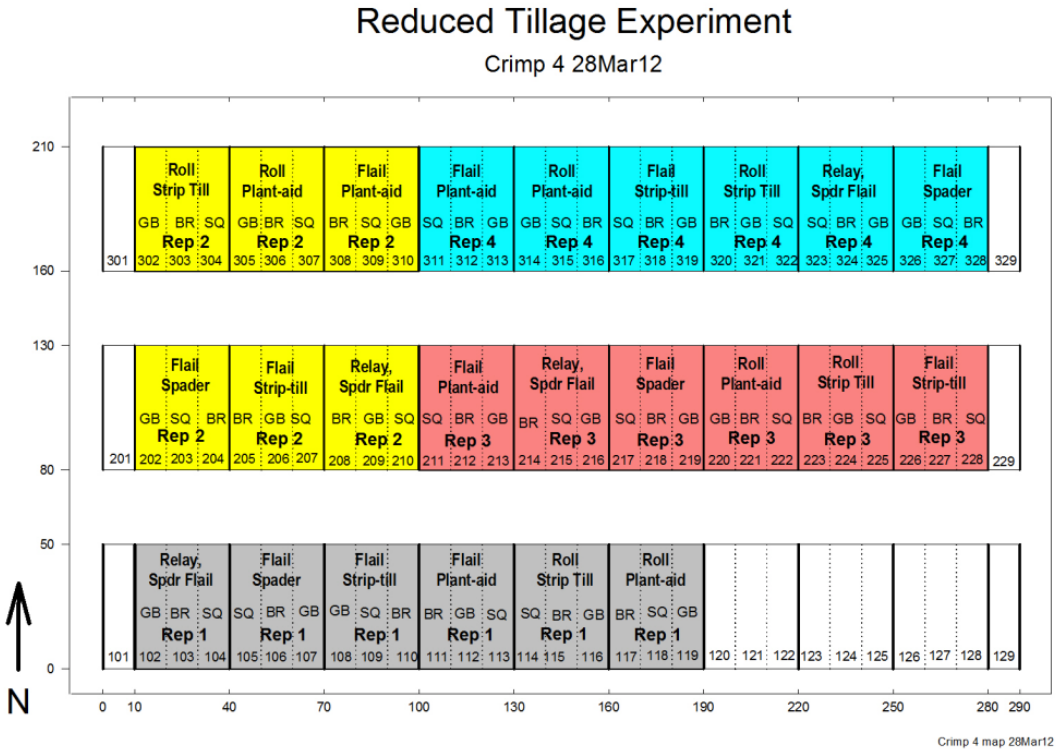
Cover Crop Biomass, 2012,2011,2010

Year	Location	Crop	Variety	Dry tons/ acre
2012	Puyallup	Barley	Strider	3.3
		Barley	Alba	3.6
		Rye	Aroostook	4.2
	Mt. Vernon	Barley	Strider	4.2
		Rye	Aroostook	6.9
		Rye	Common	7.6
	Let Us Farm	Barley	Strider	4.3
	Kirsop Farm	Barley	Strider	2.3
		Barley Clover Mix	Strider Crimson Total	0.9 1.6 2.5
2011	Puyallup	Vetch	Lana	2.5
		Barley	Strider	4.5
	Mt. Vernon	Vetch	Lana	3.1
		Barley	Strider	3.7
2010	Puyallup	Barley	Strider	3.1
		Barley	Kold	2.8
		Wheat	Stephens	3.2
		Wheat	Alpowa	2.3

'Strider' barley has been included in trials since 2010. It matures quickly and has consistently produced good biomass capable of suppressing weeds when flailed or rolled. 'Lana' vetch made a significant N contribution – estimated at 70 lb/acre plant available N – in 2011 reduced tillage systems. Two on-farm, Kirsop and Let Us Farm, are also being included in trials in 2012.



Crimp6: Supplementary Variety Trial. Eight additional varieties were trialed in 2012 to find good candidates for inclusion in another variety + termination method trial.



Reduced Tillage in Organic Agriculture, Systems Trial: This experiment will run for at least three years. Three cash crops will be rotated through each tillage treatment (squash, green beans, broccoli).

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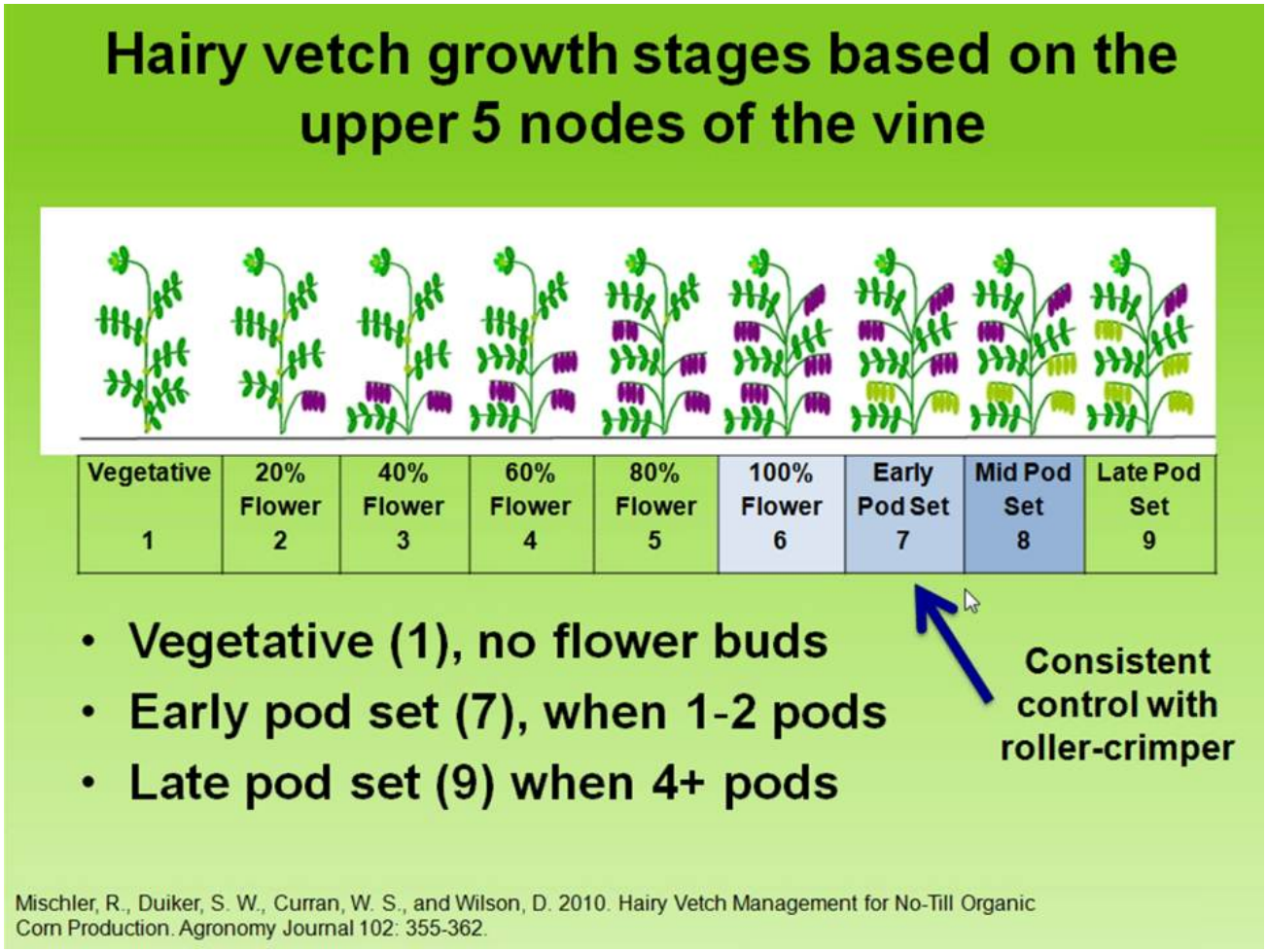
Cereal Grain Development Stages By Zadoks, Feekes And Haun

Zadoks Scale	Feekes Scale	Haun Scale	Description
			Germination
00			Dry seed
01			Start of imbibition
03			Imbibition complete
05			Radicle emerged from seed
07			Coleoptile emerged from seed
09		0.0	Leaf just at coleoptile tip
			Seedling growth
10	1		First leaf through coleoptile
11		1.+	First leaf unfolded
12		1.+	2 leaves unfolded
13		2.+	3 leaves unfolded
14		3.+	4 leaves unfolded
15		4.+	5 leaves unfolded
16		5.+	6 leaves unfolded
17		6.+	7 leaves unfolded
18		7.+	8 leaves unfolded
19			9 or more leaves unfolded
			Tillering
20			Main shoot only
21	2		Main shoot and 1 tiller
22			Main shoot and 2 tillers
23			Main shoot and 3 tillers
24			Main shoot and 4 tillers
25			Main shoot and 5 tillers
26	3		Main shoot and 6 tillers
27			Main shoot and 7 tillers
28			Main shoot and 8 tillers
29			Main shoot and 9 or more tillers
			Stem elongation
30	4-5		Pseudo stem erection
31	6		1st node detectable
32	7		2nd node detectable
33			3rd node detectable
34			4th node detectable
35			5th node detectable
36			6th node detectable
37	8		Flag leaf just visible
39	9		Flag leaf ligule/ collar just visible

Zadoks Scale	Feekes Scale	Haun Scale	Description
			Booting
40			—
41		8-9	Flag leaf sheath extending
45	10	9.2	Boots just swollen
47			Flag leaf sheath opening
49		10.1	First awns visible
			Inflorescence Emergence
50	10.1	10.2	First spikelet of inflorescence visible
53	10.2		1/4 of inflorescence emerged
55	10.3	10.5	1/2 of inflorescence emerged
57	10.4	10.7	3/4 of inflorescence emerged
59	10.5	11.0	Emergence of inflorescence completed
			Anthesis
60	10.51	11.4	Beginning of anthesis
65		11.5	Anthesis half-way
69		11.6	Anthesis complete
			Milk development
70			—
71	10.54	12.1	Kernel watery ripe
73		13.0	Early milk
75	11.1		Medium milk
77			Late milk
			Dough development
80			—
83		14.0	Early dough
85	11.2		Soft dough
87		15.0	Hard dough
			Ripening
90			—
91	11.3		Kernel hard (difficult to divide by thumbnail)
92	11.4	16.0	Kernel hard (can no longer be dented by thumbnail)
93			Kernel loosening in daytime
94			Overripe, straw dead and collapsing
95			Seed dormant
96			Viable seed giving 50% germination
97			Seed not dormant
98			Secondary dormancy induced
99			Secondary dormancy lost

**The Haun scale stages used in this example from boot through ripening are based on a seven-leaf plant.

Table 2. Cereal grain development stages by Zadoks, Feekes and Haun.



To evaluate vetch flowering, at least three stems per subplot are chosen at random and evaluated. Following the method of Mishler et al. (2010), the first five nodes below the apical meristem are counted. Nodes have to be at least 5 cm apart or the next sequential node is counted. Each node is recorded as a bud, flower, or pod to classify the growing stage. Flowers include “any purple color on the raceme.”