



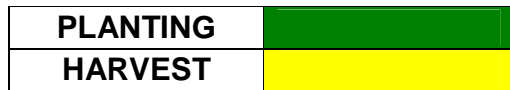
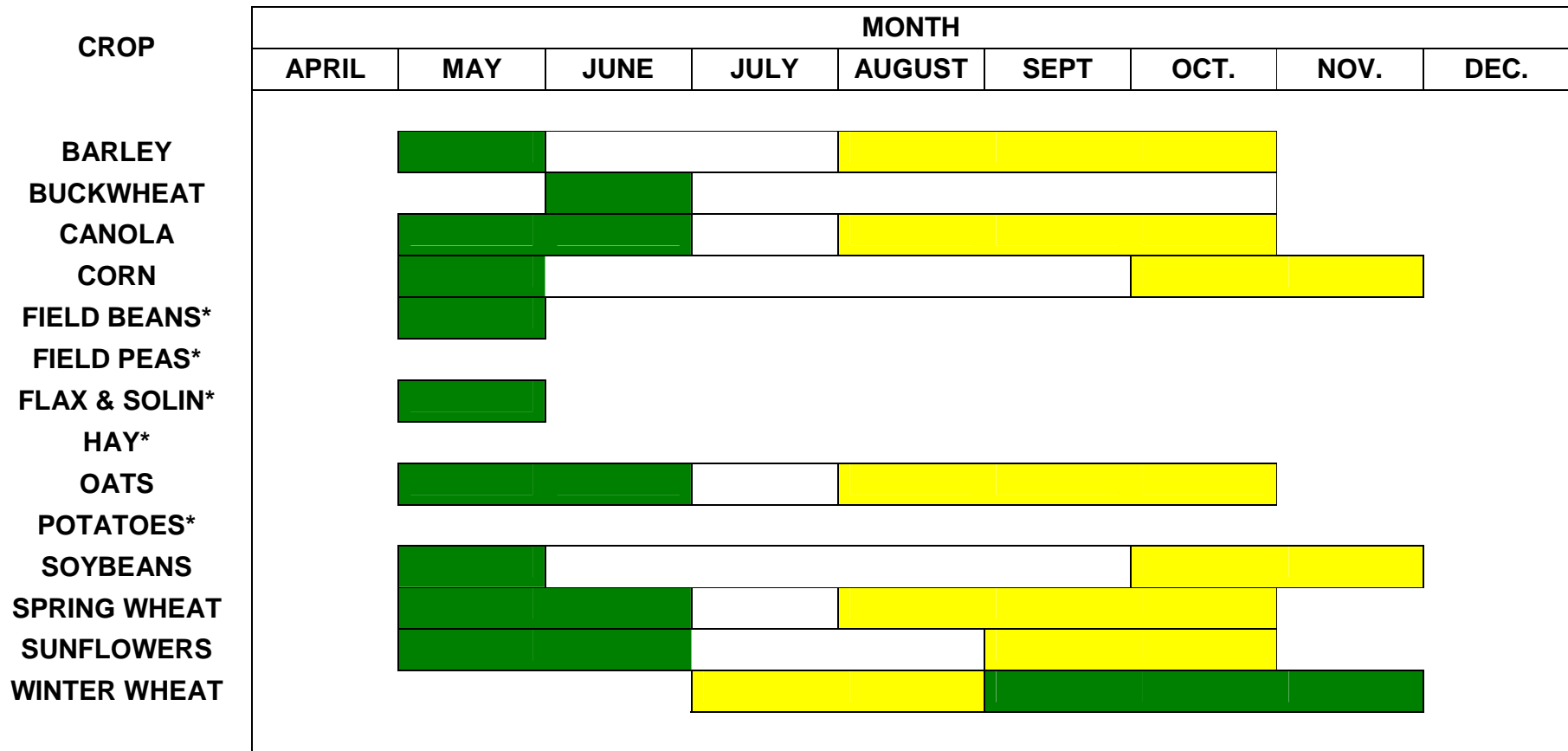
Crop Identification and BBCH Staging Manual:
SMAP-12 Field Campaign



Earth Observation Research Branch Team
Agriculture and Agri-Food Canada

Photos © Oklahoma State University, 2011

PLANTING & HARVESTING TIMELINES



(USDA, 2011)

* = timelines to be filled in

CROP PRODUCTION IN MANITOBA 2009-2010
 (*NOTE CANOLA, WHEAT, HAY, OATS, BARLEY, FLAXSEED, & FALLOW)

2009– 2010 SUMMARY OF MAJOR CROP PRODUCTION^P					
Crop	2009				2010 Area Seeded (000 ha)
	Seeded Area	Harvested Area	Yield Per Hectare	Production	
	(000 ha)	(000 ha)	(tonnes)	(000 tonnes)	
Wheat	1,228.1	1,220.0	3.3	3,999.7	1,284.8
Oats	242.8	196.3	3.4	663.2	283.3
Barley	283.3	248.9	3.8	958.0	271.1
Rye	32.4	32.4	3.1	99.1	18.2
Mixed Grains	6.1	2.0	1.6	3.2	-
Grain Corn	78.9	54.6	6.7	363.2	70.8
Canola	1,295.0	1,278.8	2.2	2,828.1	1,278.8
Flaxseed	121.4	117.4	1.6	193.0	103.2
Sunflower Seed	64.7	63.5	1.6	101.9	68.8
Soybeans	167.9	161.9	2.0	321.1	182.1
Canary Seed	6.1	6.1	1.2	7.4	-
Dry Beans	54.6	50.6	1.8	89.2	54.6
Dry Peas	34.4	34.4	2.9	100.0	48.6
Fodder Corn	36.4	32.4	37.8	1,224.7	16.2
All Tame Hay	987.4	894.4	3.7	3,356.6	-
Summerfallow	192.0	121.0

SOURCE: Statistics Canada, November Estimates for 2009 (subject to censal revision), Cat. 22-002-XPB, and March Seeding Intentions for 2010.

(STATISTICS CANADA, 2011)

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1. BARLEY

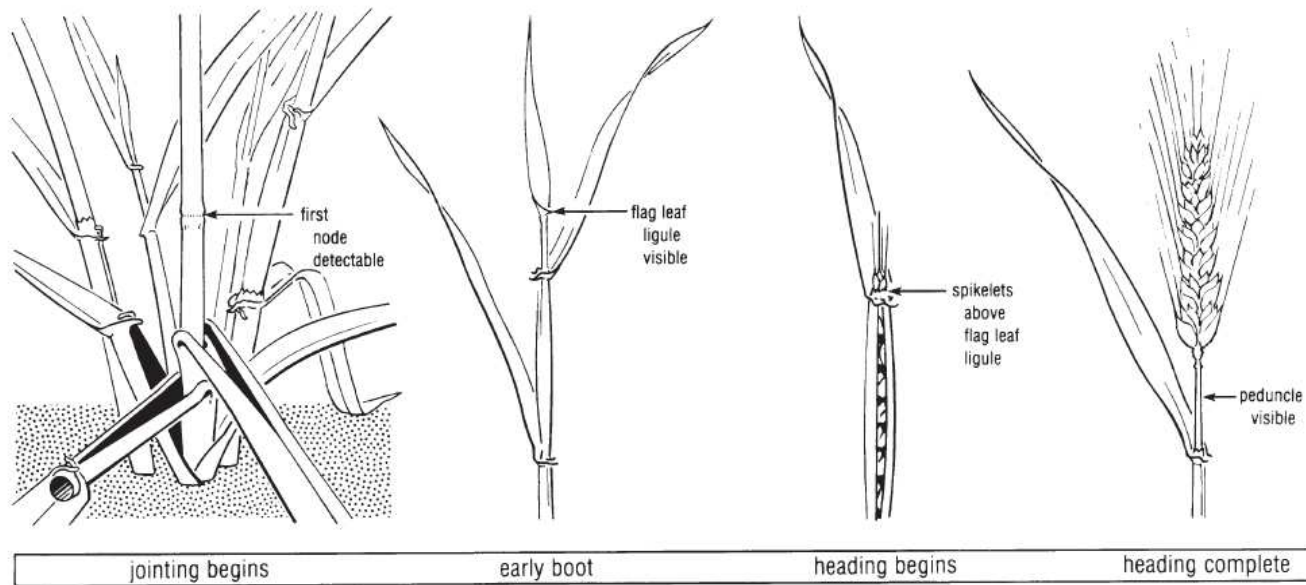
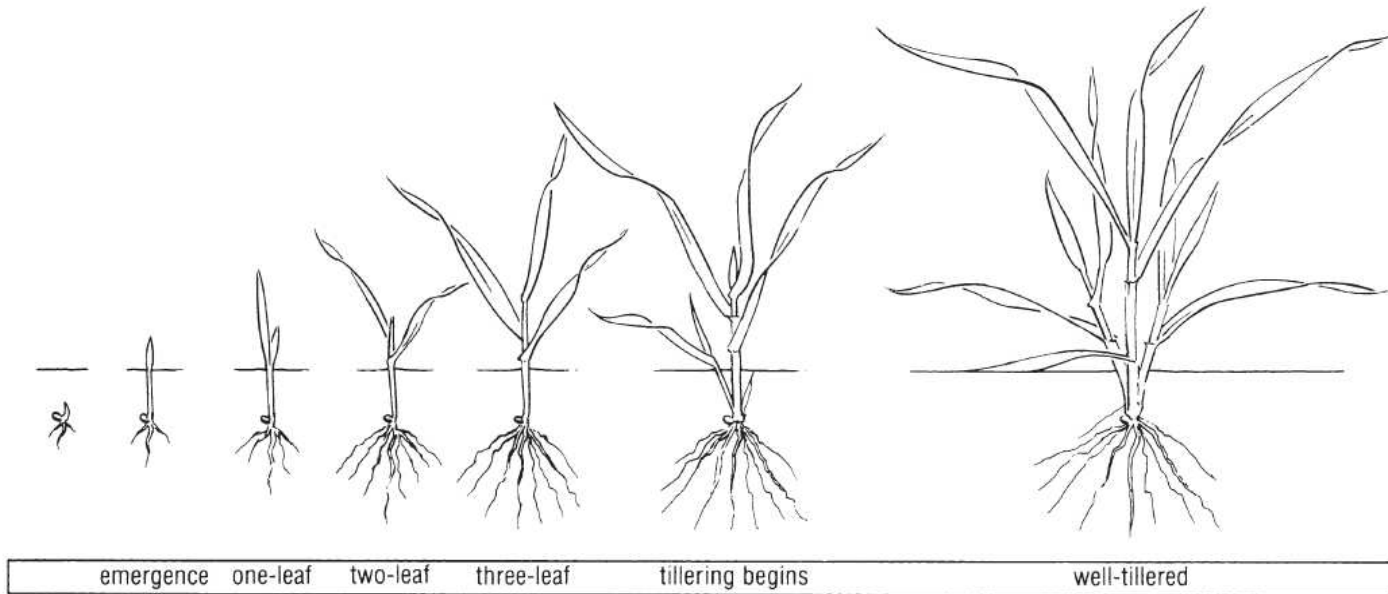
a) General

Tillage:	Seeding:	May 1 st to May	Plants:		Harvest:	August- October
			Density	22-25 plants/ft ²		
			Row Spacing			

b) BBCH GROWTH STAGES: CEREALS

0. Sprouting/Germination		5. Inflorescence emergence, heading		
00	Dry seed (caryopsis)			
01	Beginning of seed imbibition	51	Tip of inflorescence emerged from sheath, first spikelet just visible	
03	Seed imbibition complete	52-54	20% to 40% of inflorescence emerged	
05	Radicle emerged from caryopsis	55	Half inflorescence emerged	
06	Radicle elongated, root hairs/side roots visible	56-58	60% to 80% inflorescence emerged	
07	Coleoptile emerged from caryopsis	59	Inflorescence fully emerged	
09	Coleoptile penetrates soil	6. Flowering, Anthesis		
1. Leaf Development		61	First anthers visible	
10	First leaf through coleoptile	65	Full flowering: 50% of anthers mature	
11	First leaf unfolded	69	End of flowering: all spikelets flowered some dry anthers may remain	
12	2 leaves unfolded			
13	3 leaves unfolded			
1...	Stages continuous till ...	71	7: Development of fruit	
19	9 or more leaves unfolded	73	Watery ripe: first grains half final size	
2. Tillering			Early milk	
20	No tillers	75	Medium milk: grain content milky, Grains final size, still green	
21	First tiller detectable	77	Late milk	
22	2 tillers detectable	8. Ripening		
23	3 tillers detectable	83	Early dough	
2...	Stages continuous till	85	Soft dough: grain content soft but dry. Fingernail impression not held	
29	Max no. of tillers detectable		Hard dough: grain content solid Fingernail impression held	
3. Stem Elongation		87	Fully ripe: grain hard difficult to divide with thumbnail	
30	Pseudostem & tillers erect, first internode elongating, top of inflorescence at least 1 cm above tillering node	89	9. Senescence	
31	First node at least 1 cm above tillering node	92	Over-ripe: grain very hard, cannot be dented by thumbnail	
32	Node 2 at least 2 cm above node 1		Grains loosening in day-time	
33	Node 3 at least 2 cm above node 2		Plant dead & collapsing	
3...	Stages continuous till ...	93	Harvested product	
37	Flag leaf just visible, rolled (last leaf)	97		
39	Flag leaf unrolled, ligule just visible	99		
4. Booting				
41	Early boot: flag leaf sheath extending			
43	Mid boot: flag leaf sheath just visibly swollen			
45	Late boot: flag leaf sheath swollen			
47	Flag leaf sheath opening			
49	First awns visible (in awned forms only)			

c) BBCH GROWTH STAGES: ILLUSTRATIONS OF CEREALS
 (<http://ucanr.org/freepubs/docs/8165.pdf>)

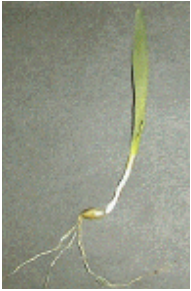


d) BBCH GROWTH STAGES: PHOTOS OF PLANTS

(U. Idaho...http://www.extension.uidaho.edu/scseidaho/growstage/Grstg_pgs/719.htm):

1. Leaf Development

11.



12.

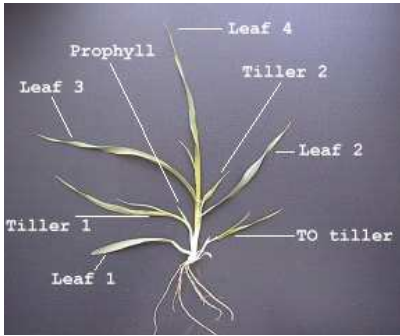


2. Tillering

21.

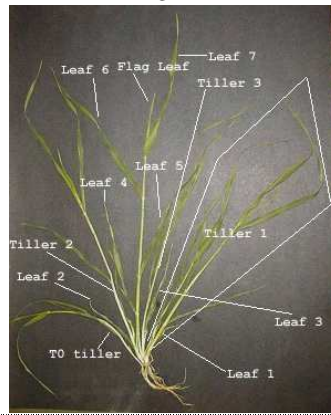


22.



3. Stem Elongation

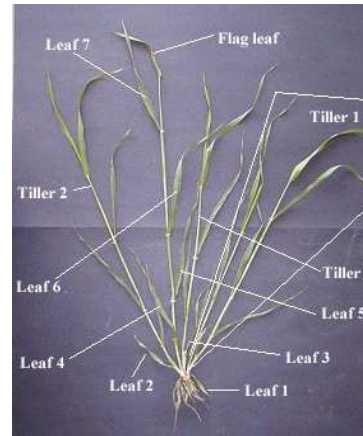
37.



Head



39.

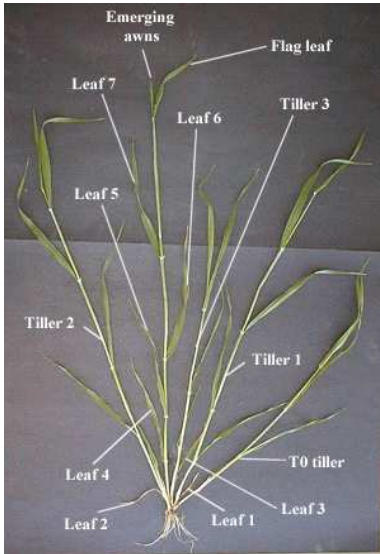


Head (mid Boot)



4. Booting

49.

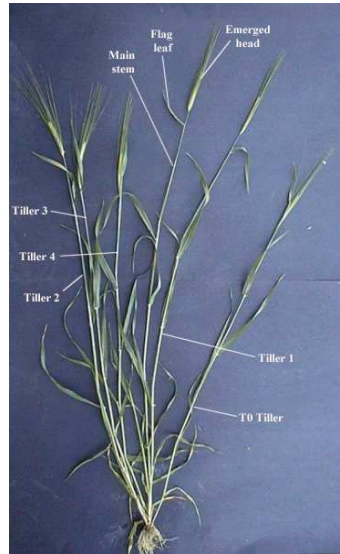


6. Flowering/Anthesis

65.



69.



8. Ripening

83.



9. Senescence

89.



92.



99.



e) BBCH GROWTH STAGES: PHOTOS OF FIELDS & OTHER
 (U. Idaho...http://www.extension.uidaho.edu/scseidaho/growstage/Grstg_pgs/719.htm)

1. Leaf Development
11.



2. Tillering
21.



29.



3. Stem Elongation
37.



4. Booting
49.



6. Flowering/Anthesis
65.



8. Ripening
83.



89.



9. Senescence
92.



Left to right, heading, & early to late flower



Anthers



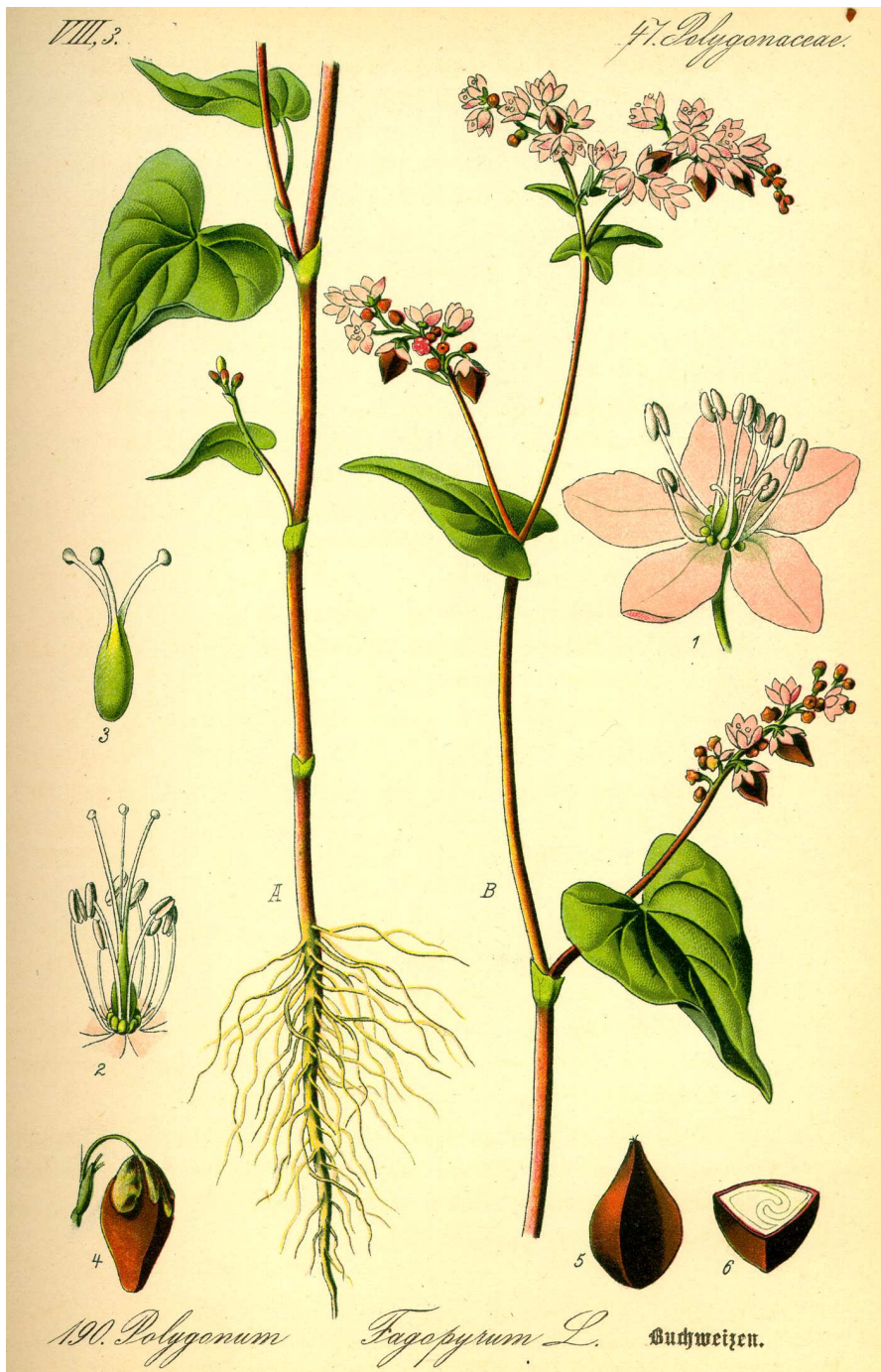
2. BUCKWHEAT

a) GENERAL

Tillage:		Seeding:	June 1 st -20 th	Plants:		Harvest:	
				Density	13-17 plants/ft ²		
				Row Spacing			
				Max Height	30-150 cm, ave. 45-75		
				Num. Stems	one		

b) BBCH GROWTH STAGES: N/A

c) ILLUSTRATIONS



d) GROWTH STAGES: PHOTOS OF FIELDS & OTHER
 (U. Cornell <http://www.hort.cornell.edu/bjorkman/lab/covercrops/buckgrowthphotos.php>)

Emergence (3-4 days)



Flower Buds Visible



Early Flowering (4-6 Weeks)



Peak Flowering



First Seeds Visible



Max Seed Fill



Seeds Maturing



Seeds Mature Leaves Shedding



Maturity (6 Weeks)



Flower



Withered Flower



3. CANOLA

a) GENERAL

Tillage:		Seeding:		Plants:		Harvest:	
				Density	7-11 plants/ft ²		
			N = May 5 th to May 31 st R = May 5 th to June 15 th	Row Spacing			August- October
				Max Height	N = 75-175 cm R = 50-125 cm		
				Branches	N = 4-6 R = 8-9		

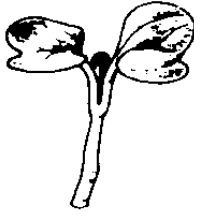
*(N = Napus Variety, R = Rapa Variety)

b) BBCH GROWTH STAGES: OILSEED RAPE

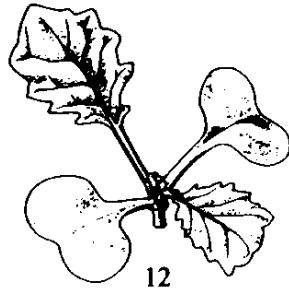
0. Germination			
00	Dry seed	59	First petals visible, flower buds still closed ("yellow bud")
01	Beginning of seed imbibition		6. Flowering
03	Seed imbibition complete	60	First flowers open
05	Radicle emerged from seed		
07	Hypocotyl with cotyledons emerged from seed	61	10% of flowers on main raceme open, main raceme elongating
08	Hypocotyl with cotyledons growing towards surface	62-64	20%, 30% to 40% of flowers on main raceme open
09	Cotyledons emerge through soil surface		
1. Leaf Development		65	Full flowering: 50% flowers on main raceme open, older petals falling
10	Cotyledons unfolded	67	Flowering declining: majority of petals fallen
11	First leaf unfolded	69	End of flowering
12	2 leaves unfolded		7. Development of Fruit
13	3 leaves unfolded	71-78	10%, 20%, 30%... to 80% pods final size
1...	Stages continuous till ...	79	Nearly all pods final size
19	9 or more leaves unfolded		8. Ripening
2. Formation of Side Shoots			Beginning of ripening: seed green, filling pod
20	No side shoots	81-88	
21	First side shoot detectable	89	Fully ripe: nearly all pods ripe, seeds dark & hard
22	2 side shoots detectable		9. Senescence
23	3 side shoots detectable	97	Plant dead & dry
2...	Stages continuous till ...	99	Harvested product
29	9 or more side shoots detectable		
3. Stem Elongation			
30	No internodes ("rosette")		
31	1 visibly extended internode		
32	2 visibly extended internodes		
33	3 visibly extended internodes		
3...	Stages continuous till ...		
39	9 or more visibly extended internodes		
5. Inflorescence Emergence			
50	Flower buds present, still enclosed by leaves		
51	Flower buds visible from above ("green bud") sheath, first spikelet just visible		
52	Flower buds free, level with the youngest leaves		
53	Flower buds raised above the youngest leaves		
55	Individual flower buds (main inflorescence) Visible, still closed		
57	Individual flower buds (secondary inflorescences) visible, still closed		

c) BBCH GROWTH STAGES: ILLUSTRATIONS

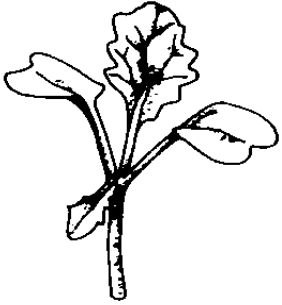
1. Leaf Development



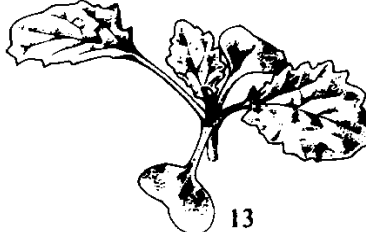
10



12



11



13

5. Inflorescence Emergence



18



51

3. Stem Elongation



32



51 (Detail)



53



55

6. Flowering



53 (Detail)



57



61

7. Development of Fruit



67



69



79

d) BBCH GROWTH STAGES: PHOTOS OF PLANTS

(Canola Council of Canada: http://www.canolacouncil.org/gallery/717/growth_stages.aspx?photo=10:

1. Leaf Development

10.



12.



17.



5. Inflorescence Emergence

51.



3. Stem Elongation

30.



6. Flowering

61.



67.



8. Ripening

85.



9. Senescence

99.



**e) BBCH GROWTH STAGES: PHOTOS OF FIELDS & OTHER
(AAFC, 2010)**

July 7, 15cm



July 26, >1m



August 5, > 1 m



August 8, 51-100 cm



August 19, 51-100 cm



August 24, 51-100 cm



August 29, 51-100 cm



Leaf



Leaf



Ripe Plants



Brassica napus



Brassica rapa



4. CORN

a) GENERAL

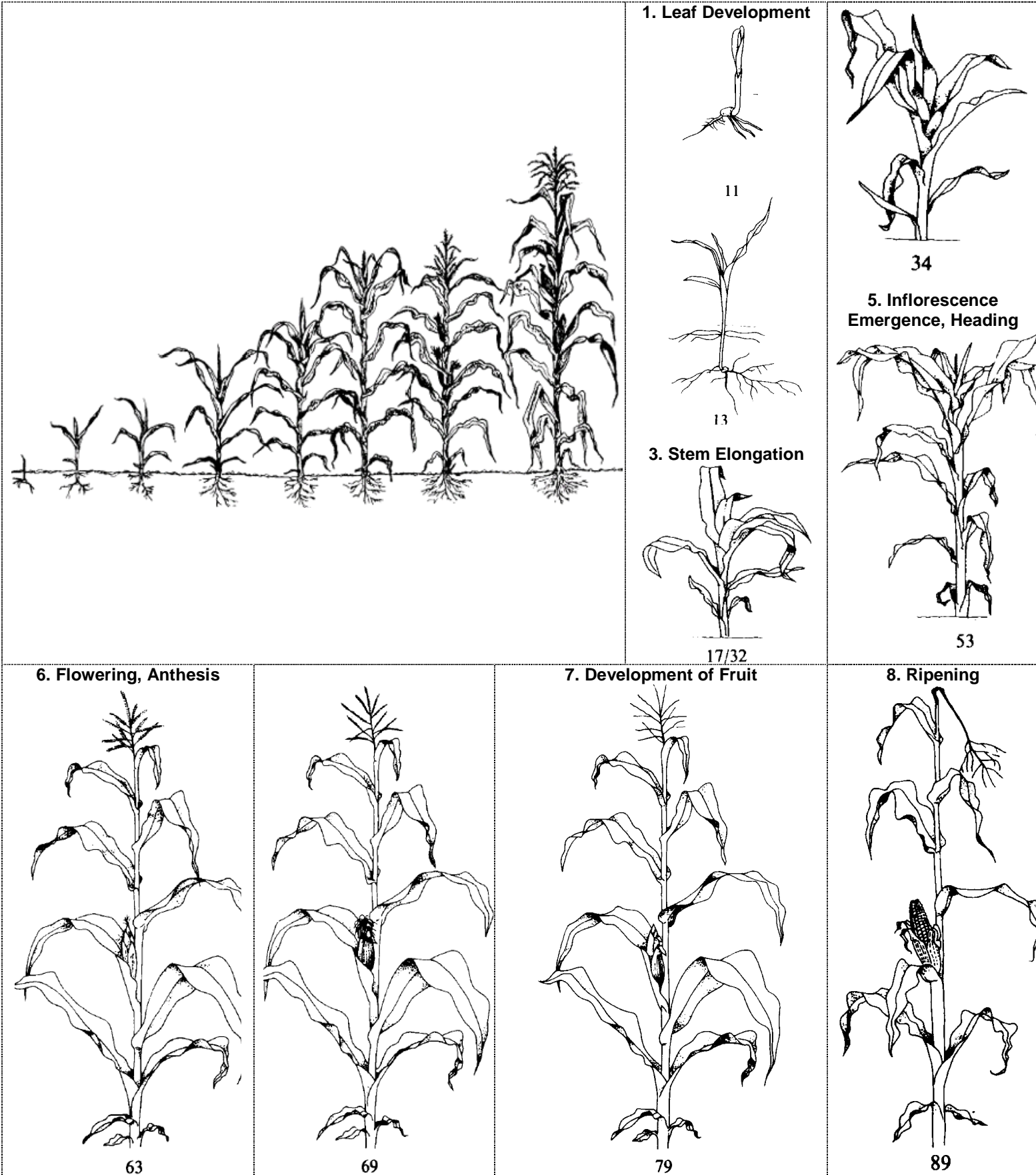
Tillage:		Seeding: May 1 st – 15 th	Plants:		Harvest: October-November
			Density		
			Row Spacing	30-36" (can be 20")	

b) BBCH GROWTH STAGES: MAIZE

0. Germination		67	Male: flowering completed Female: stigmata drying
00	Dry seed (caryopsis)		
01	Beginning of seed imbibition		End of flowering: stigmata completely dry
03	Seed imbibition complete		8. Ripening
05	Radicle emerged from caryopsis		
06	Radicle elongated, root hairs/side roots visible	83	Early dough: kernel content soft, 45% dry matter
07	Coleoptile emerged from caryopsis	85	Dough stage: kernels yellowish to yellow, 55% dry matter
09	Coleoptile penetrates soil		
1. Leaf Development^{1,2}			
10	First leaf through coleoptile	87	Physiological maturity: black dot/layer visible at base of kernels, 60% dry matter
11	First leaf unfolded		
12	2 leaves unfolded	89	Fully ripe: kernels hard & shiny, 65% dry matter
13	3 leaves unfolded		9. Senescence
1...	Stages continuous till ...	97	Plant dead & collapsing
19	9 or more leaves unfolded	99	Harvested product
3. Stem Elongation			
30	Beginning of stem elongation		
31	First node detectable		
32	2 nodes detectable		
33	3 nodes detectable		
3...	Stages continuous till...		
39	9 or more nodes detectable ¹		
5. Inflorescence emergence, heading			
51	Beginning of tassel emergence tassel detectable at top of stem		
53	Tip of tassel visible		
55	Middle of tassel emergence: middle of tassel begins to separate		
59	End of tassel emergence: tassel fully emerged & separated		
6. Flowering, Anthesis			
61	Male: stamens in middle of tassel visible Female: tip of ear emerging from leaf sheath		
63	Male: beginning of pollen shedding Female: tips of stigmata visible		
65	Male: upper & lower parts of tassel in flower Female: stigmata fully emerged		

¹ In maize, tassel emergence may occur earlier, in this case continue with principal growth stage 5

c) BBCH GROWTH STAGES: ILLUSTRATIONS



**d) BBCH GROWTH STAGES: PHOTOS OF FIELDS & OTHER
(AAFC, 2011)**

July 2, 31-50 cm



July 7, 50 cm



July, 26, > 1 m



Aug 5, > 1 m



Aug 8, >1 m



Aug 19, > 1 m



Aug 20, > 1 m



Aug 29, > 1 m



Emergence



Silks



Tassels



Leaf



5. FIELD BEANS

a) GENERAL

Tillage:	Fall or spring mouldboard or chisel ploughed	Seeding:	May 20 th – 27 th	Plants:		Harvest:	2 to 4 weeks
		Density	2.25 to 6 (per foot of row)				
		Row Spacing	Row = 22-36" Solid seeding = 5-8"				

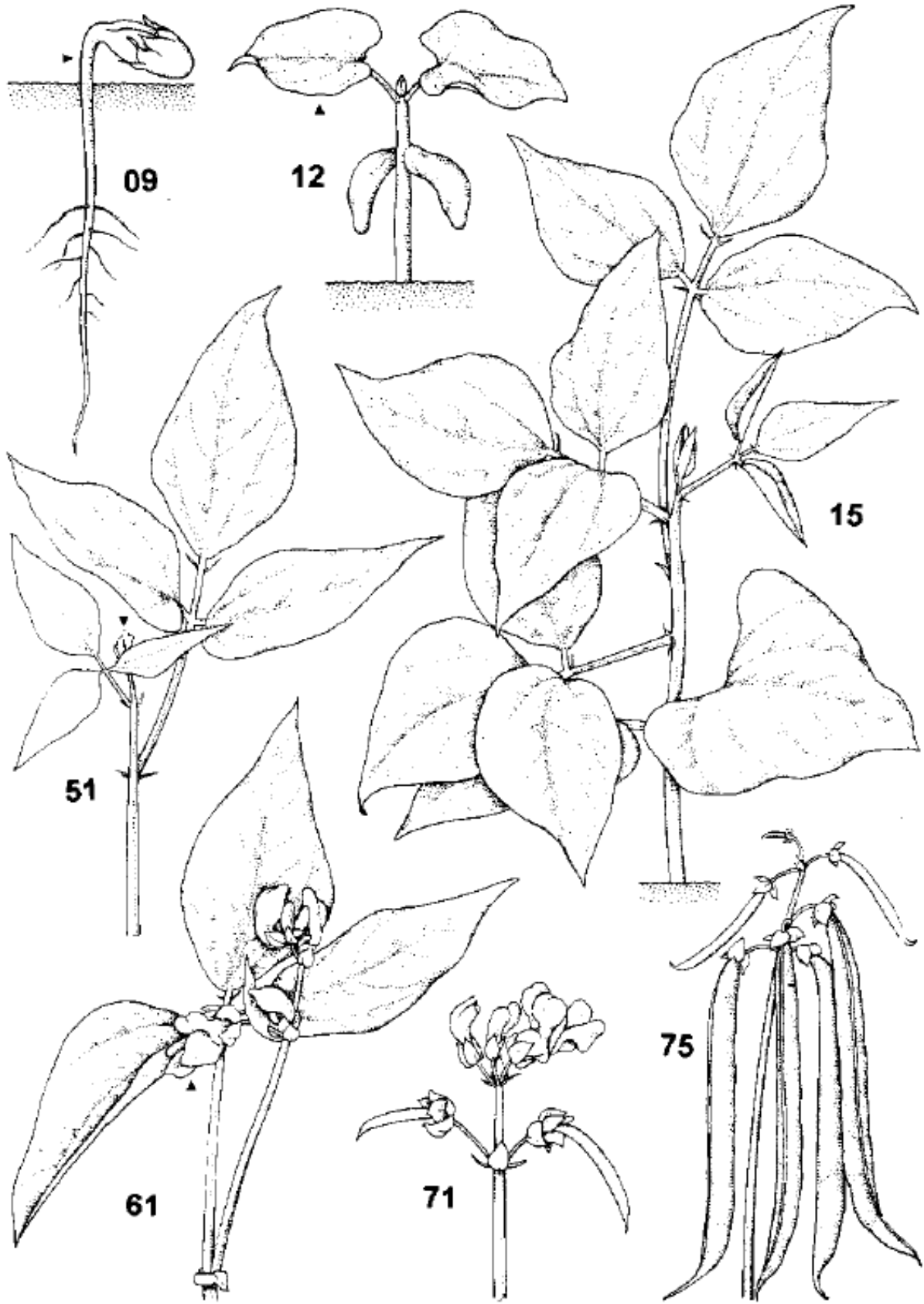
b) BBCH GROWTH STAGES: BEANS

0. Germination		72-74	20, 30 to 40% pods reached typical
00	Dry seed		
01	Beginning of seed imbibition	75	50% pods reached typical length beans beginning to fill out ¹
03	Seed imbibition complete	76	60% pods reached typical length ¹
05	Radicle emerged from seed		
07	Hypocotyl with cotyledons breaking through seed coat	77	70% pods reached typical length pods still break cleanly ¹
08	Hypocotyl reaches the soil surface; hypocotyl arch visible	78	80% pods reached typical length ¹
09	hypocotyl with cotyledons break through soil	79	Individual beans easily visible ¹
1. Leaf Development		8. Ripening of Fruit & Seed	
10	Cotyledons completely unfolded	81	10% of pods ripe (beans hard) ¹ Seeds beginning to mature ²
12	2 full leaves (first leaf pair unfolded)		
13	3rd true leaf (first trifoliolate leaf) unfolded	82-85	20 to 50%% of pods ripe (beans hard) ¹
1...	Stages continuous till . . .		Main period of ripening ²
19	9 or more leaves (2 full leaves, 7 or more trifoliolate) unfolded	86-88	60 to 80% of pods ripe (beans hard) ¹
		89	Fully ripe: pods ripe (beans hard) ¹
2. Formation of Side Shoots		9. Senescence	
21	First side shoot visible	97	Plants dead
22	2nd side shoot visible	99	Harvested product
26	3rd side shoot visible		
2...	Stages continuous till . . .		
29	9 or more side shoots visible		
5. Inflorescence Emergence			
51	First flower buds visible		
55	First flower buds enlarged		
59	First petals visible, flowers still closed		
6. Flowering			
60	First flowers open (sporadically within the population)		
61	Beginning of flowering: 10% of flowers open ¹ Beginning of flowering ²		
62-64	20%, 39 to 40% of flowers open ¹		
65	Full flowering: 50% of flowers open ¹ Main flowering period ²		
67	Flowering finishing: majority of petals fallen or dry ¹		
69	End of flowering: first pods visible ¹		
7. Development of Fruit			
71	10% of pods have reached typical length ¹ Beginning of pot development ²		

¹ For varieties with limited flowering period

² For varieties in which the flowering period is not limited

c) BBCH GROWTH STAGES: ILLUSTRATIONS



d) BBCH GROWTH STAGES: PHOTOS OF FIELDS & OTHER
 (Michigan State U. ...http://agbioresearch.msu.edu/saginawvalley/Pic_Tour/cropemerges.htm)

0. Emergence
 (5-7 days)



12.

1. Leaf Development
 12.



15.

12.



15.



5. Inflorescence Emergence
 59.



6. Flowering (mid July)
 60. (Canopies touch at flowering)



62.

(Flowers can be white to purple)



62.



7. Development of Fruit
 75.



6. FIELD PEAS

a) GENERAL

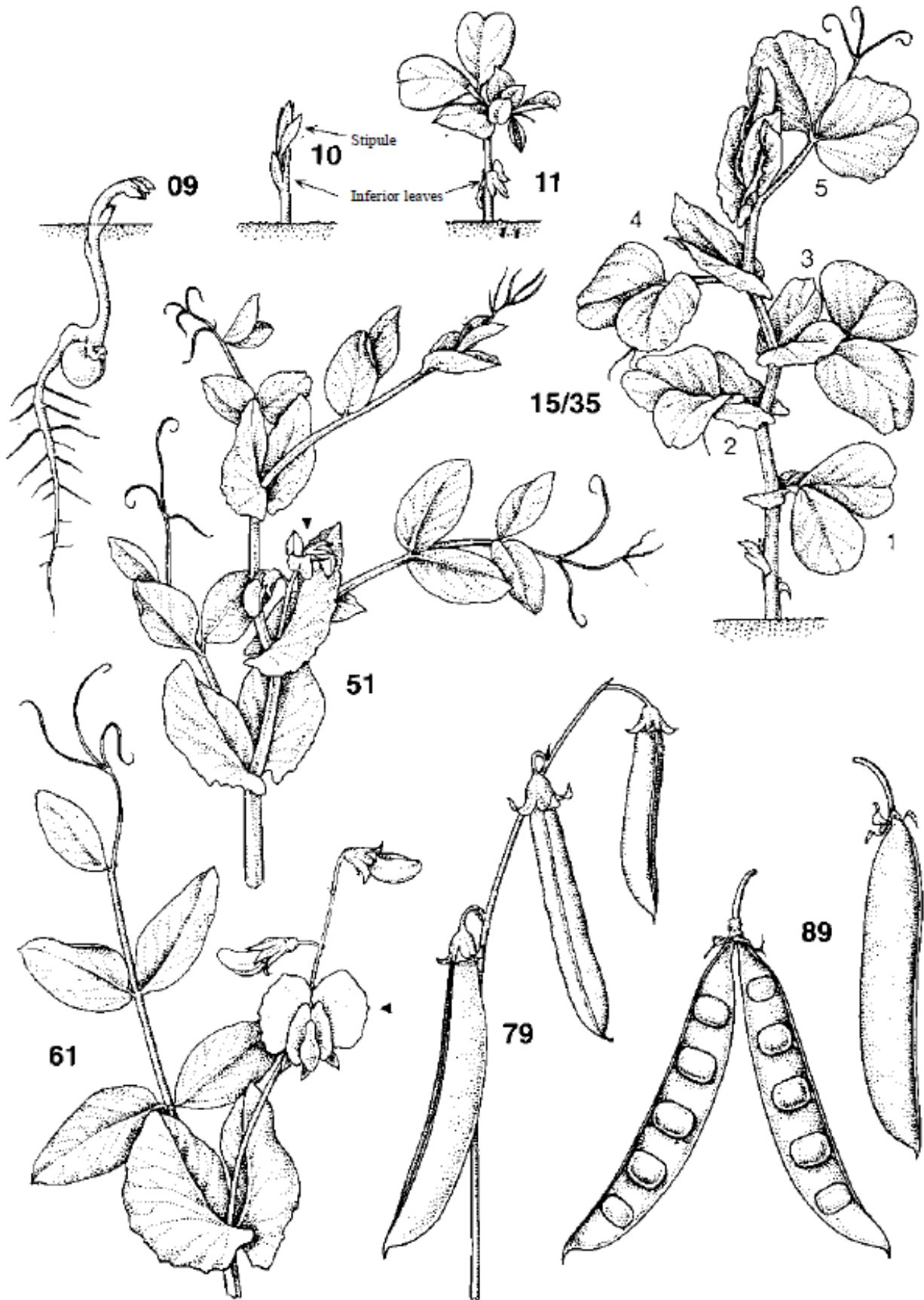
Tillage:		Seeding:		Plants:		Harvest:	
				Density	7-8 plants/ft ²		
				Row Spacing			

b) BBCH GROWTH STAGES: PEAS

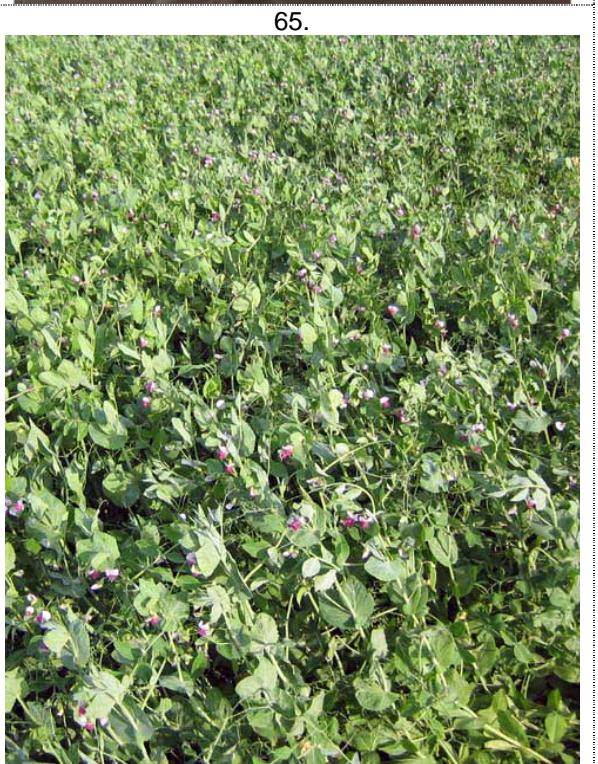
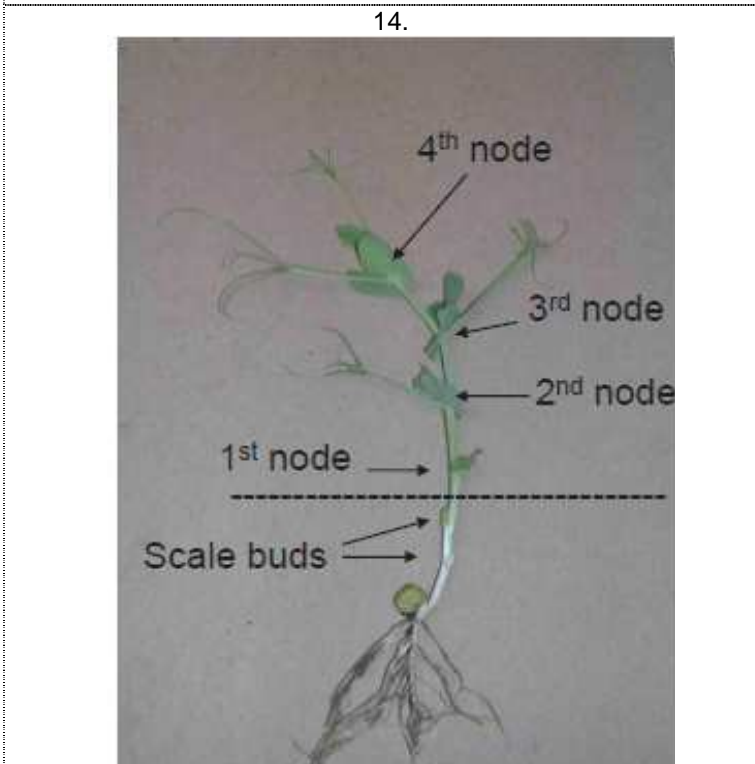
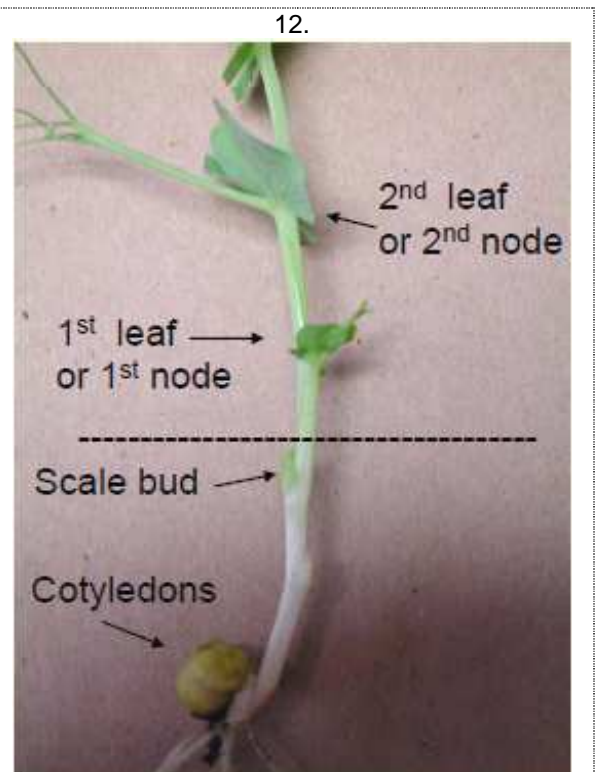
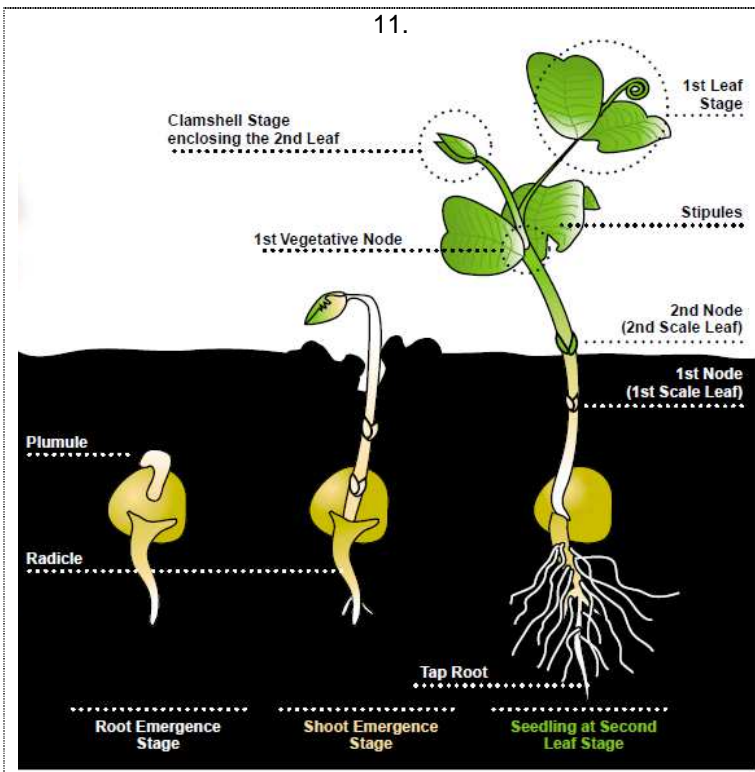
0. Germination		7. Development of fruit	
00	Dry seed		
01	Beginning of seed imbibition	71	10% of pods have reached typical length juice exudes if pressed
03	Seed imbibition complete		
05	Radicle emerged from seed	72-77	20 to 70% pods reached typical length; juice exudes if pressed
07	Shoot breaking through seed coat		
08	Shoot growing towards surface; hypocotyl arch	79	Pods have reached typical size (green ripe); peas fully formed
09	shoot breaks through soil surface		
1. Leaf Development		8. Ripening of fruit & seed	
10	Pair of scale leaves visible	81-88	10 to 80% of pods ripe, seeds final colour, dry & hard
11	First true leaf (with stipules) unfolded or first tendril developed	89	Fully ripe: all pods dry & brown. Seeds dry & hard (dry ripe)
12	2 leaves (with stipules) unfolded or 2 tendrils developed		
13	3 leaves (with stipules) unfolded or 3 tendrils developed	97	9. Senescence Plants dead & dry
1...	Stages continuous till . . .	99	Harvested product
19	9 or more leaves (with stipules) unfolded or 9+ tendrils		
3. Stem elongation (Main shoot)			
30	Beginning of stem elongation		
31	1 visibly extended internode ¹		
32	2 visibly extended internodes ¹		
33	3 visibly extended internodes ¹		
3...	Stages continuous till . . .		
39	9 or more visibly extended internodes ¹		
5. Inflorescence emergence			
51	First flower buds visible outside leaves		
55	First separated flower buds visible outside leaves but still closed		
6. Flowering			
60	First flowers open (sporadically within the population)		
61	Beginning of flowering: 10% of flowers open		
62-64	20 to 40% of flowers open		
65	Full flowering: 50% of flowers open		
67	Flowering declining		
69	End of flowering		

¹ The first internode extends from the scale leaf node to the first true leaf node

b) BBCH GROWTH STAGES: ILLUSTRATIONS



c) BBCH GROWTH STAGES: OTHER ILLUSTRATIONS & PHOTOS



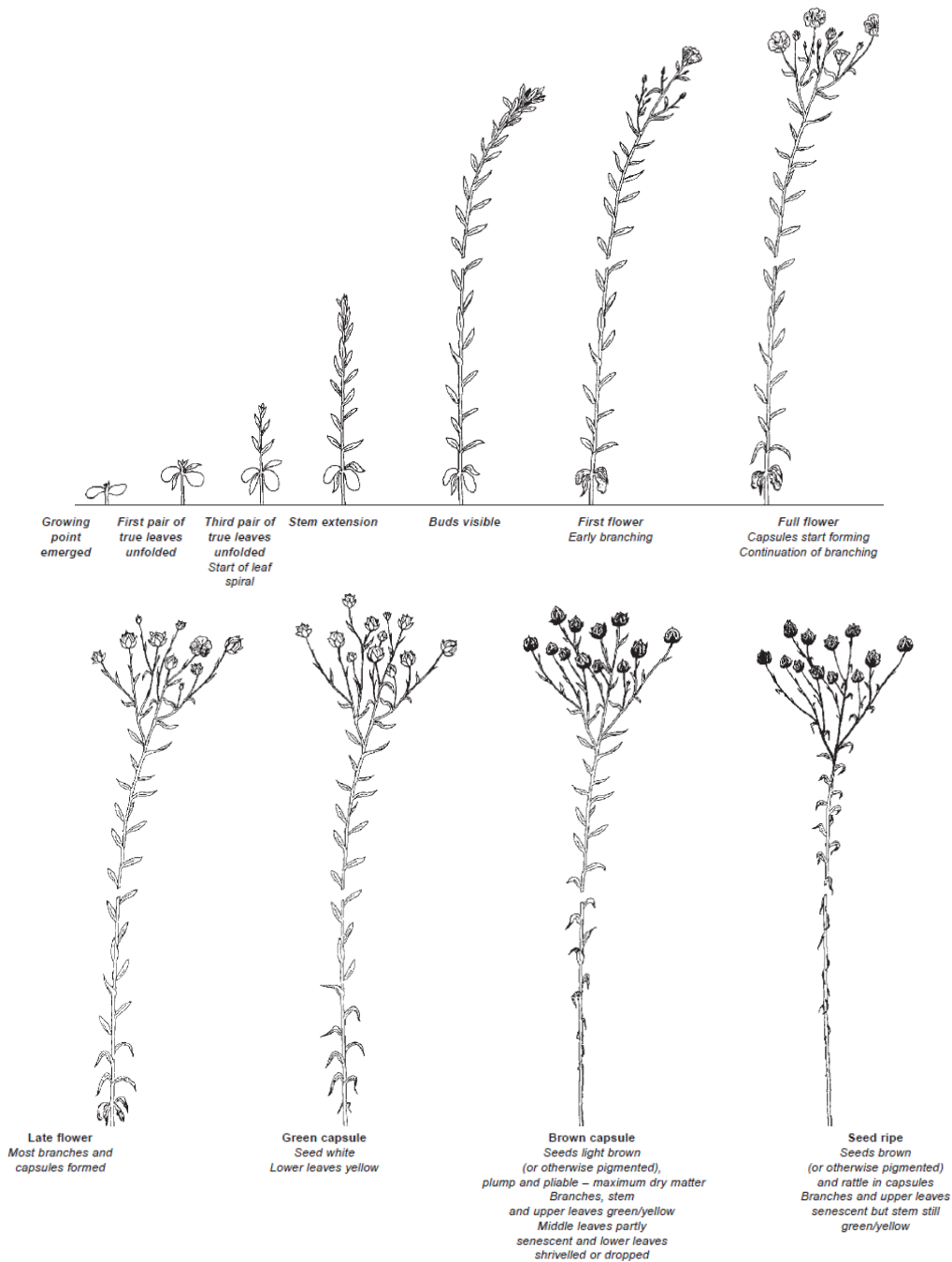
7. FLAX & SOLIN

a) GENERAL

Tillage:		Seeding:	May 10 th - 31 st	Plants:		Harvest:	
				Density	37-56 plants/ft ²		
				Row Spacing	15-20 cm sometimes 30 cm		
				Max. Height	40-91 cm		

b) BBCH GROWTH STAGES: SEE CANOLA FOR OILSEED RAPE

c) BBCH GROWTH STAGES: ILLUSTRATIONS



d) BBCH GROWTH STAGES: PHOTOS OF PLANTS

3. Stem Elongation



6. Flowering
65.



65,



Capsules



8. HAY

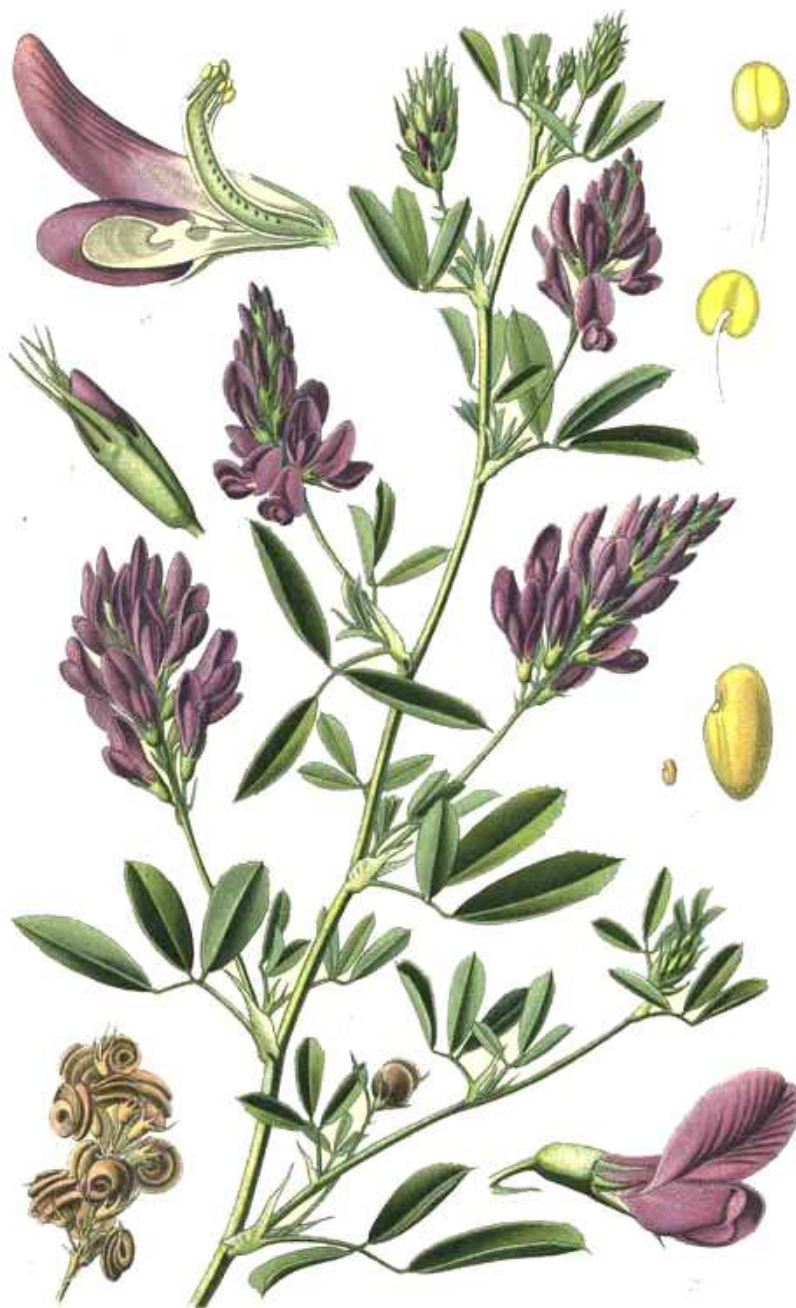
a) GENERAL

In most cases will have tame hay, which consists of timothy grass or alfalfa

Tillage:		Seeding:		Plants:		Harvest:	
				Density			
				Row Spacing			

b) BBCH GROWTH STAGES: LEGUME (SEE PEAS)

c) PLANT ILLUSTRATIONS (ALFALFA)



Pl. 75. Luzerne cultivée. *Medicago sativa* L.

d) BBCH GROWTH STAGES: PHOTOS OF PLANTS (ALFALFA)
(Cornell U. <http://nrcca.cals.cornell.edu/crop/CA2/CA020708.php>)

Stage 0: Early Vegetative



Stage 1: Mid-Vegetative



Stage 2: Late Vegetative



Stage 3: Early Bud



Stage 4: Late Bud



Stage 5: Early Flower



Stage 6: Late Flower



Stage 7: Early Seed Pod



Stage 8: Late Seed Pod



Stage 9: Ripe Seed Pod



e) **BBCH GROWTH STAGES: CEREALS (SEE BARLEY)**

f) **BBCH GROWTH STAGES: ILLUSTRATIONS (SEE BARLEY)**

g) **EXAMPLE TIMELINE AND PHOTOS OF FIELDS**
(AAFC, 2011)

June 9, 30 cm



July 26 (Harvested)



Aug 8, N/A



Aug 19, N/A



Aug 24, N/A



Aug 29, N/A



Cut hay



Bales



Wrapped Bales



9. OATS

a) GENERAL

Tillage:	Seeding:	May 1 st to June 10 th	Plants:		Harvest:	August to October
			Density	18-23 plants/ft ²		
			Row Spacing			

b) BBCH GROWTH STAGES: CEREALS (SEE BARLEY)

c) BBCH GROWTH STAGES: ILLUSTRATIONS (SEE BARLEY)

d) PHOTOS OF FIELDS WITH EXAMPLE TIME LINE AND OTHER

June 23, 5 cm



July 2, 15 cm



July 12, 16-30 cm



July 26, 51-100 cm



Aug 5, 51-100cm



Aug 8, > 1m



Aug 24, 51-100cm



Aug 29, > 1m



Sept 9, 16-30cm



10. POTATOES

a) GENERAL

Tillage:	Seeding:	Plants:	Harvest:
		Density	
		Row Spacing	

b) BBCH GROWTH STAGES: POTATOES

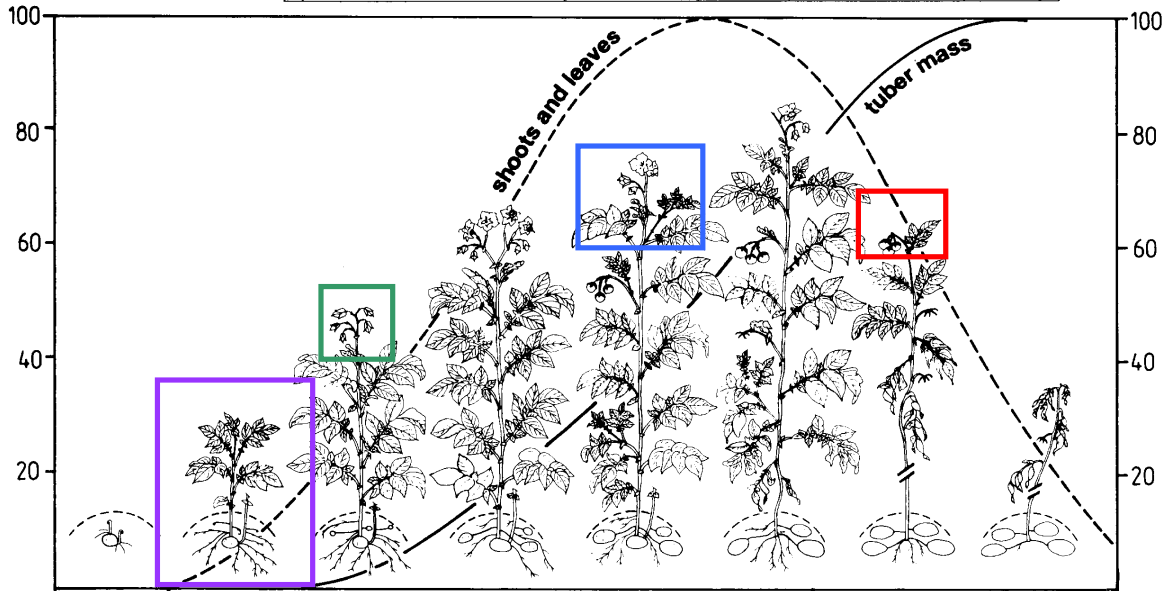
0. Sprouting/Germination		
00	000	Innate or enforced dormancy, tuber not sprouted
01	001	Beginning of sprouting: sprouts visible (< 1 mm)
02	002	Sprouts upright (< 2 mm), End of dormancy: sprouts 2–3 mm
03	003	End of dormancy: sprouts 2–3 mm
05	005	Beginning of root formation
07	007	Beginning of stem formation
08	008	Stems growing towards soil surface, formation of scale leaves in the axils of which stolons will develop later
09	009	Emergence: stems break through soil surface
1. Leaf Development		
		From tuber: first leaves begin to extend From seed: cotyledons completely unfolded
11-1...	101-10...	1st leaf of main stem unfolded (> 4 cm) to 2 nd , 3 rd ... until
19	109	9 or more leaves of main stem unfolded (> 4cm) (2digit); 9 leaves of main stem unfolded (> 4 cm) (3digit)
	110	10th leaf of main stem unfolded (> 4 cm)
	11...	Stages continuous till . . .
	119	19. leaf of main stem unfolded (> 4 cm)
	121	First leaf of 2nd order branch above first inflorescence unfolded (> 4 cm)
	122	2nd leaf of 2nd order branch above first inflorescence unfolded (> 4 cm)
	12...	Stages continuous till . . .
	1NX	Xth leaf of nth order branch above n-1th inflorescence unfolded (> 4 cm)
2. Formation of basal side shoots below & above soil surface (main stem)		
21	201	First basal side shoot visible (> 5 cm)
22	202	2nd basal side shoot visible (> 5 cm)
23	203	3rd basal side shoot visible (> 5 cm)
2...	20...	Stages continuous till...
29	209	9 or more basal side shoots visible (> 5 cm)
3. Main stem elongation (crop cover)		
31	301	Beginning of crop cover: 10% of plants meet between rows
32-38	302-308	20%, 30%, 40%... to 80% of plants meet between rows (i.e. 38 = 80%)
39	309	Crop cover complete: 90% of plants meet between rows
4. Tuber formation		
40	400	Tuber initiation: swelling of first stolon tips to twice the diameter of subtending stolon
41-47	401-407	10%, 20%, 30%... to 70% total final tuber mass reached (i.e. 47 = 70%)
48	408	Maximum of total tuber mass reached, tubers detach easily from stolons, skin set not yet complete (skin easily removable with thumb)
49	409	Skin set complete: (skin at apical end of tuber not removable with thumb) 95% of tubers in this stage
5: Inflorescence (cyme) emergence		
51	501	First individual buds (1–2 mm) of first inflorescence visible (main stem)
55	505	Buds of first inflorescence extended to 5 mm

59	509	First flower petals of first inflorescence visible
5: Inflorescence (cyme) emergence (continuation)		
521		Individual buds of 2 nd inflorescence visible
525		Buds of 2 nd inflorescence extended to 5 mm open (main stem)
529		First flower petals of 2 nd inflorescence visible above sepals
531		Individual buds of 3rd inflorescence visible(3rd order branch)
535		Buds of 3rd inflorescence extended to 5 mm
539		First flower petals of 3rd inflorescence visible above sepals
5N...		Nth inflorescence emerging
6. Flowering		
60	60	First open flowers in population
61	601	Beginning of flowering: 10% flowers in first inflorescence open (main stem)
62-64	602-604	20%, 30% to 40% of flowers in first inflorescence open
65	605	Full flowering: 50% of flowers in first inflorescence open
66-68	606-608	60%, 70% to 80% of flowers in the first inflorescence open
69	609	End of flowering in the first inflorescence
6. Flowering (continuation)		
621		Beginning of flowering: 10% flowers in 2 nd inflorescence open (2nd order branch)
625		Full flowering: 50% flowers in 2 nd inflorescence open
629		End of flowering in the 2 nd inflorescence
631		Beginning of flowering: 10% flowers in 3 rd inflorescence open (3rd order branch)
635		Full flowering: 50% flowers in 3 rd inflorescence open
639		End flowering in 3 rd inflorescence
6N...		Nth inflorescence flowering
6N9		End flowering
7. Development of fruit		
70	700	First berries visible
71	701	10% berries in first fructification full size (main stem)
72	702	20% berries in first fructification full size
73	703	30% berries in first fructification full size
7...	70...	Stages continuous till ...
	721	10% berries in 2nd fructification full size (second order branch)
	7N	Development of berries in nth fructification
	7N9	Nearly all berries in nth fructification full size (or shed)
8. Ripening of fruit & seed		
81	801	Berries in first fructification still green, seed light-coloured (main stem)
85	805	Berries in first fructification ochre-coloured or brownish
89	809	Berries in the first fructification shrivelled, seed dark
	821	Berries in 2 nd fructification still green, seed light-coloured (second order branch)
	8N	Ripening of fruit & seed in nth fructification
9. Senescence		
91	901	Beginning of leaf yellowing
93	903	Most leaves yellowish
95	905	50% leaves brownish
97	907	Leaves & stem dead, stems bleached & dry
99	909	Harvested product

c) BBCH GROWTH STAGES: ILLUSTRATIONS

The 2-digit decimal code

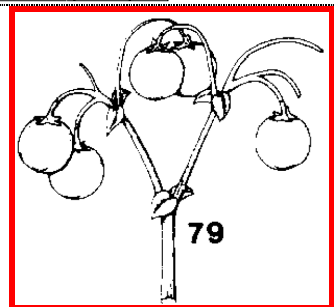
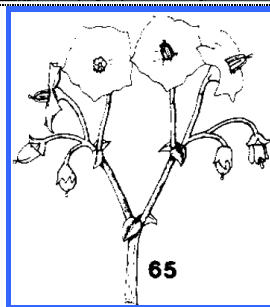
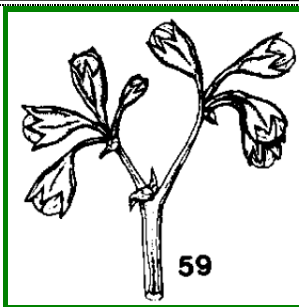
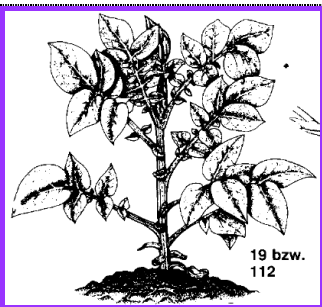
0 Sprouting			1 Leaf development			5 Inflorescence emergence			6 Flowering			7 Development of fruit			8 Ripening of fruit and seed			9 Senescence											
01	05	09	11	15	19	51	55	59	61	65	69	71	75	79	81	85	89	91	93	95	97								
Tuber formation																													
40												43			45			47			48			49			%		



0 Sprouting			1 Leaf development main stem			2nd order			3rd order			4th order																										
001	005	009	101	105	109	111	115	119	121	125	129	131	135	139	141	145	149																					
5 Inflorescence emergence main stem						2nd order			3rd order			4th order																										
501						505			509			521			525			529			531			535			539			541			545			549		

The 3-digit decimal code

6 Flowering main stem			2nd order			3rd order																							
601			605			609			621			625			629			631			635			639					
7 Development of fruit main stem						2nd order																							
701						705			709			721			725			729											
8 Ripening of fruit and seed main stem												9 Senescence																	
801												805			809			901			903			905			907		
4 Tuber formation																													
400						403			405			407			408			409											



d) BBCH GROWTH STAGES: PHOTOS OF FIELDS AND OTHER (AAFC, 2011)

July 7, 20 cm



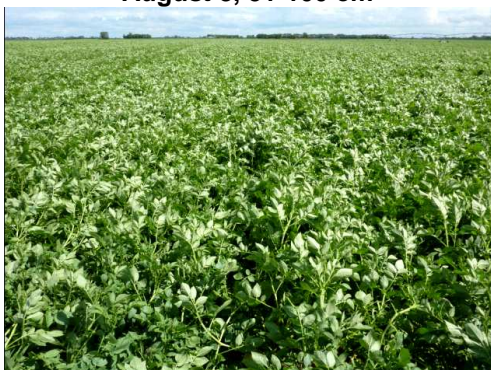
July 26, 31-50 cm



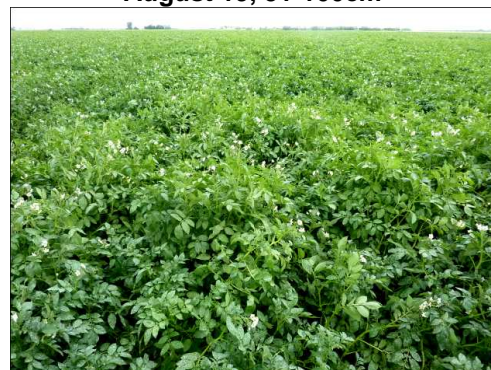
August 5, 51-100 cm



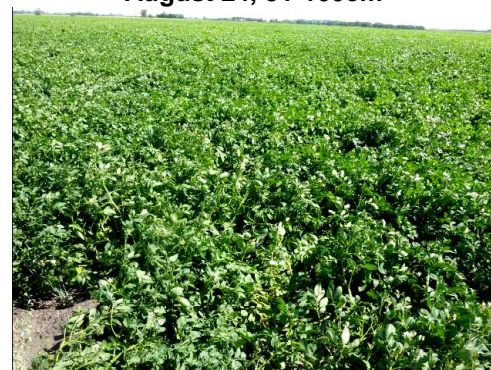
August 8, 51-100 cm



August 19, 51-100cm



August 24, 51-100cm



August 29, 51-100 cm



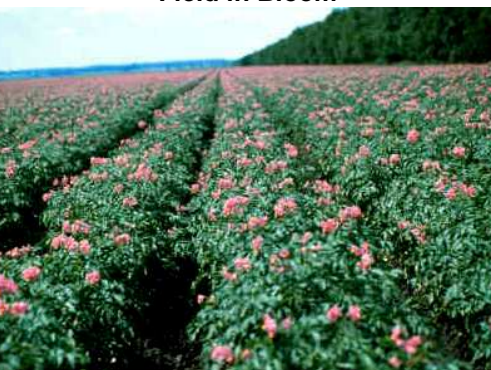
Planting (notice deep ruts)



Field



Field in Bloom



Leaf



11. SOYBEANS

a) GENERAL

Tillage:	Seeding:	May 15 th -25 th	Plants:		Harvest:	October- November
			Density	4 plants/ft ²		
			Row Spacing			

b) BBCH GROWTH STAGES: SOYBEANS

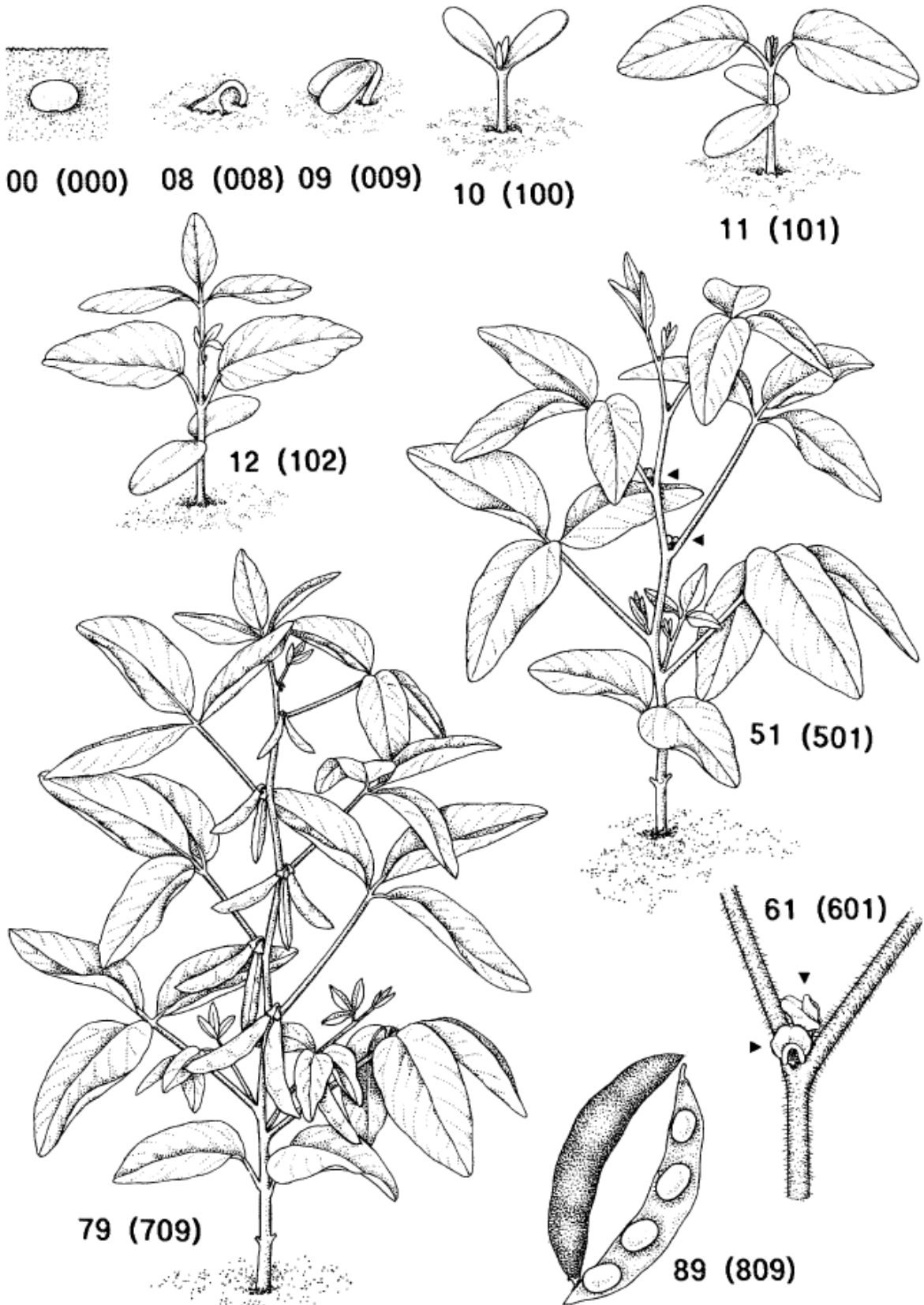
0. Sprouting/Germination			60	600	First flowers open (sporadically in pop.)
00	000	Dry seed			
01	001	Beginning seed imbibition	61	601	10% flowers open ² Beginning of flowering ³
03	003	Imbibition complete	62-64	602-604	20-40% flowers open ²
05	005	Radicle emerged from seed			Full flowering: 50% open ²
06	006	Radicle elongation; root hairs formed	65	605	Main period of flowering ³
07	007	Hypocotyl with cotyledons through seed	67	607	Flowering declining ²
08	008	Hypocotyl at surface; hypocotyl arch	69	609	End flowering: first pods visible (5 mm) ²
09	009	Hypocotyl with cotyledons above soil			
1. Leaf development (Main shoot)			70	700	7. Development of fruits & seeds
10	100	Cotyledons unfolded			First pod final length (15-20 mm)
11	101	First pair true leaves unfolded (unifoliate)	71	701	10% pods final length ² Beginning pod development ³
12	102	Trifoliolate on 2nd node unfolded	72	702	20% pods final length ²
13	103	Trifoliolate on 3rd node unfolded			30% pods final length ²
1...	10...	Stages continuous till . . .	73	703	Beginning of pod filling ³
19	109	9th node trifoliolate unfolded. No side	74	704	40% pods final length ²
	110...	10 th to nth node trifoliolate unfolded ¹			50% pods final length, continuation filling ²
	119	Trifoliolate leaf on 19th node unfolded ¹	75	705	Main period development, continuation filling ³
2. Formation of side shoots					
21	201	First side shoot visible			70% pods final length
22	202	2 nd side shoot of first order visible	77	707	Advanced filling ² & ³
23	203	3rd side shoot of first order visible			All pods final length. Seeds
2...	20...	Stages continuous till . . .	79	709	filling cavity of majority of pods ² & ³
29	209	9+ side shoots of first order visible (2			
		9th side shoot of first order visible (3	80	800	8. Ripening Fruits & Seeds
	210	10th side shoot of first order visible			First pod ripe, beans final colour, dry, hard ²
	221	First side shoot of 2nd order visible	81	801	10% pods ripe, beans final colour, dry, hard
	22...	Stages continuous till . . .	82-84	802-804	Beginning pod & seed ripening ³
	229	9th side shoot of 2nd order visible			20-40% pods ripe; beans final colour, dry, hard ²
	2N1	First side shoot of Nth order visible	85	805	50% pods ripe ; beans final colour, dry, hard ²
	2N9	9th side shoot of Nth order visible	86-88	806-808	Main period pod & seed ripening ³
					60-80% pods ripe; beans final colour, dry, hard ²
4. Development Main Shoot Harvestable Parts					
49	409	Harvestable vegetative plant parts final	89	809	Full maturity, all pods ripe, beans final colour, dry, hard (= Harvest maturity) ²
5. Inflorescence Emergence (Main Shoot)					
51	501	First flower buds visible			Majority pods ripe, beans final colour, dry, hard ³
55	505	First flower buds enlarged	91-96	901-906	9: Senescence
59	509	First petals visible; buds still closed	97	907	10-60% leaves discoloured or fallen
6. Flowering (Main shoot)			99	909	Above ground parts plants dead
					Harvested product (seeds)

¹ Side shoot development may occur earlier, in this case continue with the growth stage 2

² This definition refers to determinate varieties

³ This definition refers to indeterminate varieties

c) BBCH GROWTH STAGES: ILLUSTRATIONS



d) BBCH GROWTH STAGES: PHOTOS OF PLANTS
 (Iowa State U. http://extension.agron.iastate.edu/soybean/production_growthstages.html)

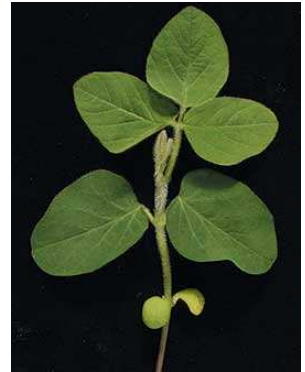
09



11



12



14



65



70



79



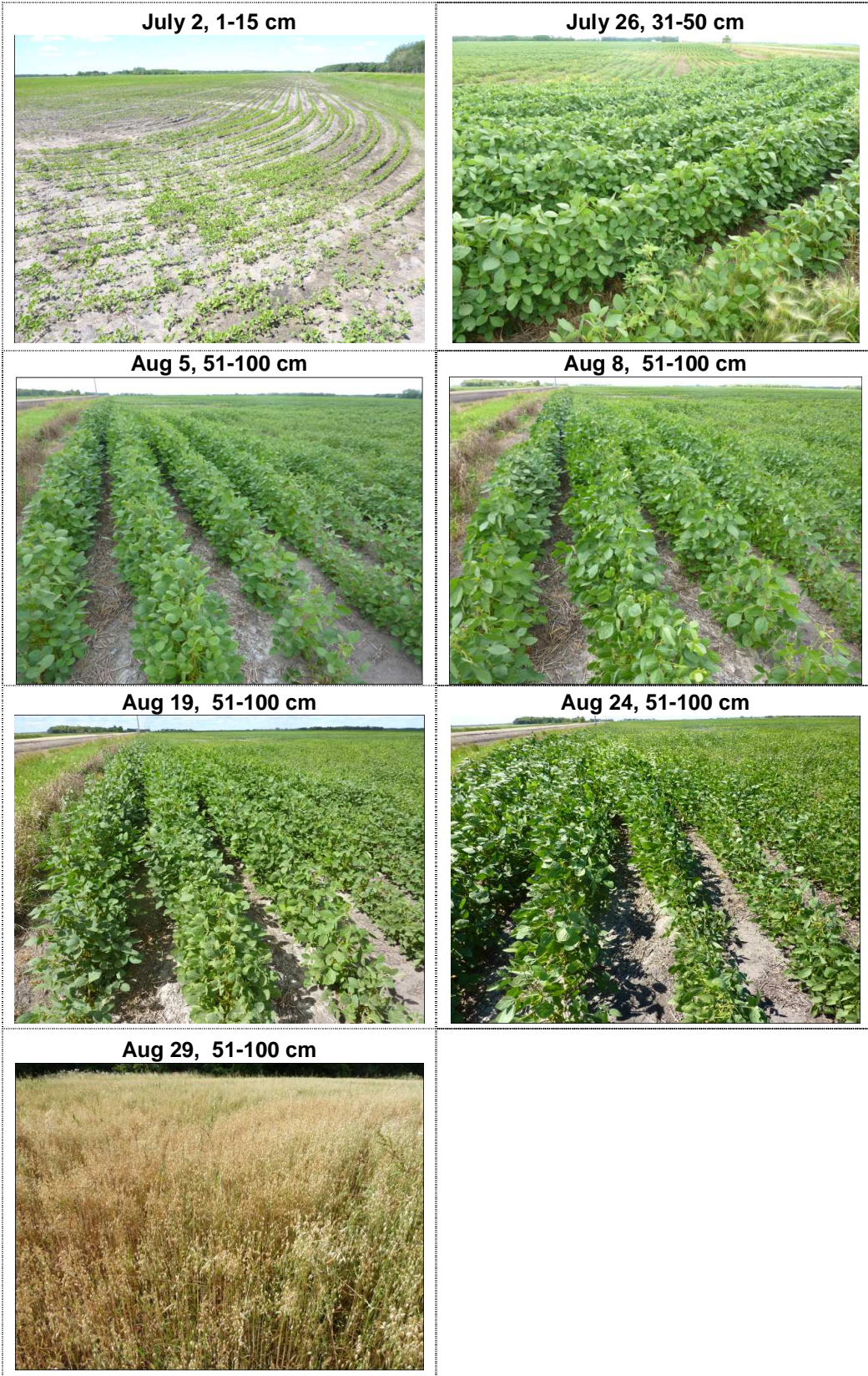
89



99



**e) FIELD PHOTOS WITH EXAMPLE TIMELINE
(AAFC, 2011)**



12. SUNFLOWERS

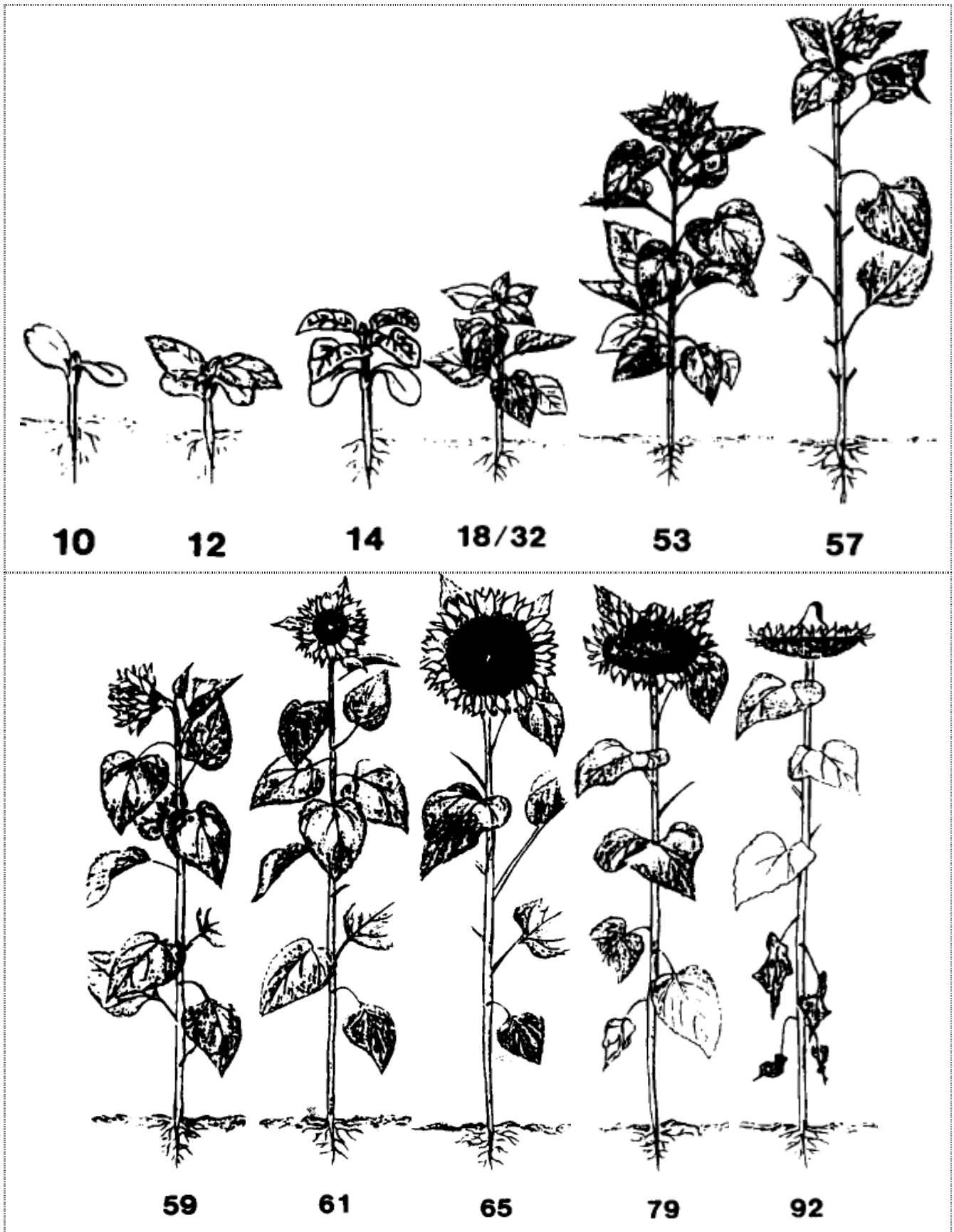
a) GENERAL

Tillage	Seeding:	May 1 st -June 1 st	Plants:		Harvest:	September-October
			Density	0.4-0.6 plants/ft ²		120 days
			Row Spacing	Row planting = 16-36"		
				Solid seeding = 10-12"		

b) BBCH GROWTH STAGES: SUNFLOWERS

0. Sprouting/Germination		7. Development of fruit	
00	Dry seed (achene)	71	Seeds on outer edge of the inflorescence are grey & final size
01	Beginning of seed imbibition		
03	Seed imbibition complete	73	Seeds on outer third of the inflorescence grey & final size
05	Radicle emerged from caryopsis		
06	Radicle elongated, root hairs developing	75	Seeds on middle third of the inflorescence are grey & have
07	Hypocotyl with cotyledons emerged from seed		
08	Hypocotyl with cotyledons growing towards soil surface	79	Seeds on inner third of the inflorescence are grey & have
09	cotyledons emerge through soil		
1. Leaf Development		8. Ripening	
10	Cotyledons completely unfolded	80	Seeds on outer third of anthocarp black & hard. Back of anthocarp still green
12	2 leaves (first pair) unfolded		
14-18	4 leaves (second pair) to 8 leaves unfolded	81	Seeds on outer third of anthocarp dark & hard. Back of anthocarp still green
19	9 or more leaves unfolded		
3. Stem Elongation		83	Dark of anthocarp yellowish-green, bracts still green. Seeds 50% dry matter
30	Beginning stem elongation		
31-33	1 to 3 visibly extended internode	85	Seeds on middle third of anthocarp dark & hard. Back of anthocarp yellow, bracts brown edged. Seeds 60% dry matter
3...	Stages continuous till . . .		
39	9 or more visibly extended internodes		
5. Inflorescence emergence		87	Physiological ripeness: back of the anthocarp yellow. Bracts marbled brown. Seeds 75-80% dry matter
51	Inflorescence just visible between youngest leaves		
53	Inflorescence separating from youngest leaves, bracts distinguishable from foliage leaves	89	Fully ripe: seeds on inner third of anthocarp dark & hard. Back of anthocarp brown. Bracts brown. Seeds 85% dry matter
55	Inflorescence separated from youngest foliage leaf		
57	Inflorescence clearly separated from foliage leaves		
59	Ray florets visible between the bracts; inflorescence still closed	9. Senescence	
		92	Over ripe, seeds over 90% dry matter
6. Flowering		97	Plant dead and dry
61	Beginning of flowering: ray florets extended, disc florets visible in outer third of inflorescence	99	Harvested product
63	Disc florets in outer third of inflorescence in bloom (stamens & stigma visible)		
65	Full flowering: disc florets in middle third of inflorescence in bloom (stamens & stigma visible)		
67	Flowering declining: disc florets in inner third of inflorescence in bloom (stamens & stigma visible)		
69	End of flowering: most disc florets have finished flowering, ray florets dry or fallen		

c) BBCH GROWTH STAGES: ILLUSTRATIONS



d) EXAMPLE TIMELINE & OTHER PHOTOS:

Emergence (10 days)



Leaves Forming (4 in 20 days)



Terminal bud (46 days)



Bud begins to Open (71 days)



Full Flowering (84 days)



Maturity (120 days)



(North Dakota, State University for all dates listed & photos)

13. SPRING WHEAT

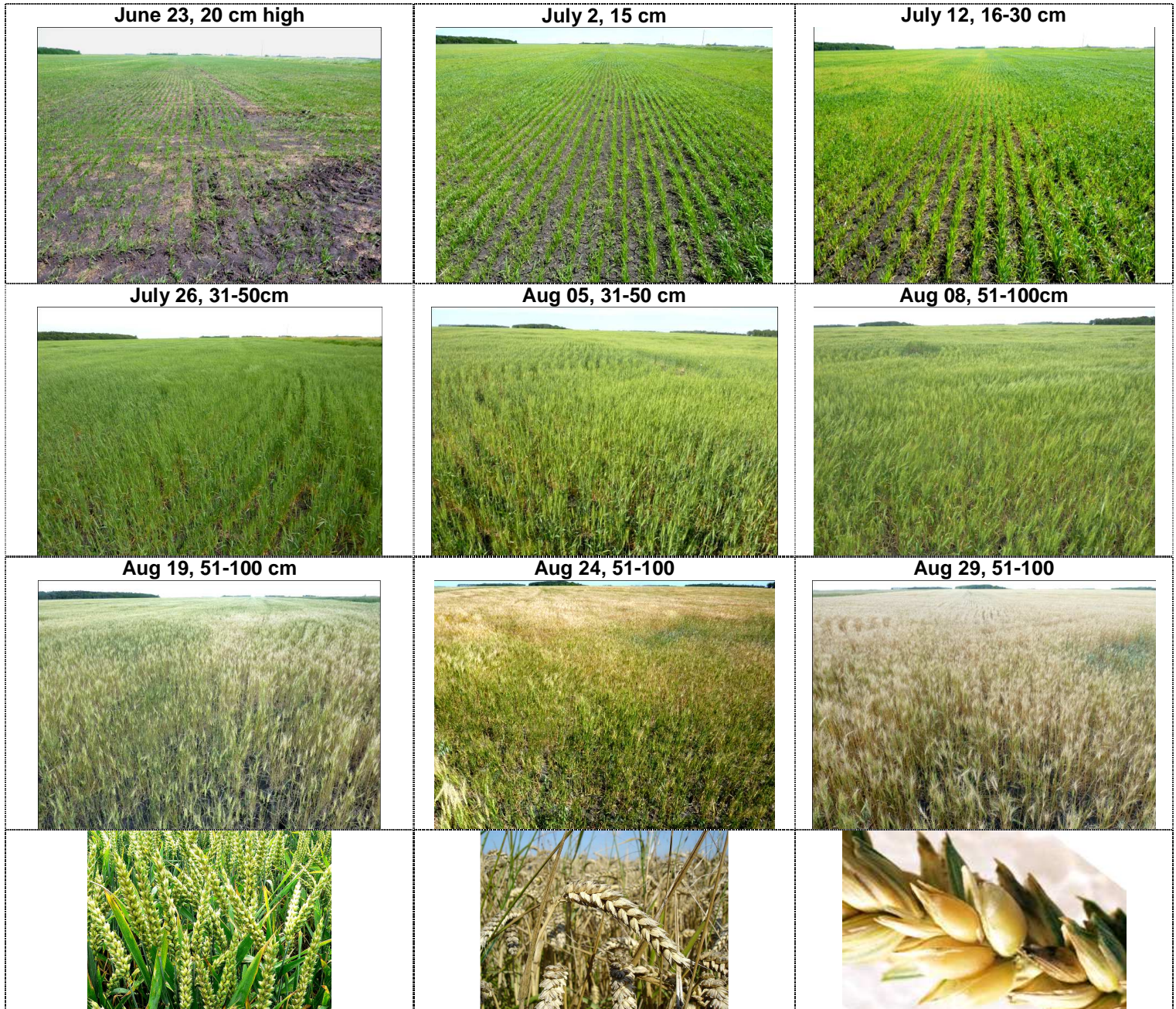
a) GENERAL

Tillage:		Seeding:	May 1 st -31 st	Plants:		Harvest:	August-October
				Density	23-28 plants/ft ²		
				Row Spacing			

b) BBCH GROWTH STAGES: CEREALS (SEE BARLEY)

c) BBCH GROWTH STAGES: ILLUSTRATIONS (SEE BARLEY)

d) EXAMPLE TIMELINE AND PHOTOS OF FIELDS (AAFC, 2011)



14. WINTER WHEAT

a) GENERAL

Tillage:	Seeding:	In the North = Sept. 1 st -15 th In the South = Sept. 1 st -21 st	Plants:	Harvest:	July-August
			Density		
			Row Spacing		

b) BBCH GROWTH STAGES: CEREALS (SEE BARLEY)

c) BBCH GROWTH STAGES: ILLUSTRATIONS (SEE BARLEY)

d) EXAMPLE TIMELINE AND PHOTOS OF FIELDS (AAFC, 2011)

June 9, 6 cm



June 21, 20 cm



July 26, 51-100 cm



Aug 5, 51-100 cm



Aug 8, 51-100 cm



Aug 19, 51-100 cm



Aug 24, 51-100cm



Aug 29, 16-30cm

