Nutrients removed by forage crops per hectare (Dr. Tarlok Singh Sahota CCA)

	N	P	K	S	Ca	Mg	Na	Cu	Zn	Fe	Mn	B	Yield
	.....(kg/ha).....							.....(g/ha).....					kg/ha
Silage corn													
Mean	74	9.0	64	5.2	30	26	1.0	43	193	880	120	82	7059
Max	89	12.6	82	6.6	54	60	1.8	59	315	1649	176	159	8892
Min	34	3.9	33	2.5	12	7	0.7	21	89	348	71	25	3556
Italian ryegrasses													
Mean	46	3.9	38	2.3	14	6.3	3.5	19	65	1929	167	58	1899
Max	67	5.4	47	3.5	20	9.7	7.1	24	95	4646	241	64	2366
Min	26	3.1	24	1.6	11	4.1	1.0	13	35	264	91	52	1697
Winter wheat for silage													
Mean	62	7.7	47	3.4	7	4.0	0.4	20	93	767	106	7	4037
Max	79	10.2	59	4.9	10	4.9	0.5	27	133	1138	156	10	4894
Min	44	5.0	37	2.2	5	2.9	0.4	14	64	533	77	4	3533
Barley for silage													
Mean	118	9.2	56	4.7	21	9.3	10.6	29	155	2822	127	11	4174
Max	126	10.4	61	5.5	28	11.1	12.7	41	205	4540	199	20	4468
Min	105	7.8	49	4.1	18	8.2	8.2	20	111	1406	81	5	3711
Alfalfa													
Mean	157	14.4	118	12.2	81	17.8	1.7	64	189	1951	246	146	5166
Max	279	31.5	219	20.1	150	30.9	14.0	151	369	12951	992	254	9528
Min	65	6.4	48	4.0	34	8.8	0.6	26	54	338	88	48	2525
Galega													
Mean	168	13.5	102	9.3	54	27.1	1.6	59	167	4680	178	136	4937
Max	262	19.8	140	14.5	93	38.5	3.6	89	452	21442	508	236	7243
Min	102	9.0	49	4.0	32	12.2	0.5	38	78	501	85	43	3733
Fenugreek at pod formation													
Mean	50	6.6	45	3.6	33	12.0	8.1	23	69	3154	79	55	1521
Max	54	7.2	50	3.9	41	13.8	9.7	26	90	5148	106	69	1588
Min	44	5.6	38	3.3	27	10.2	7.0	20	57	2028	62	45	1768
Fenugreek at pod maturation													
Mean	67	10.8	61	7.2	60	19.0	12.4	32	122	1586	99	74	2729
Max	78	11.2	63	7.7	76	23.4	13.4	33	135	1730	112	83	3115
Min	61	10.4	57	6.8	51	16.6	11.5	29	104	1424	92	67	3496
Brome grass													
Mean	83	11.2	107	6.2	23	8.9	0.9	40	125	4496	453	27	4609
Max	114	15.1	151	8.4	32	15.9	3.3	64	273	22795	1039	45	6045
Min	41	6.8	55	3.9	14	5.2	0.3	17	54	1201	195	11	2545
Timothy													
Mean	84	10.4	94	6.4	22	8.1	1.4	39	120	2490	234	31	4289
Max	115	13.7	126	8.4	46	12.7	16.3	162	196	8799	422	70	5613
Min	40	5.3	40	3.0	11	3.5	0.2	10	46	738	103	10	2183
Berseem clover													
Mean	104	9.5	60	6.5	45	14.2	21.6	36	118	4636	128	75	3152
Max	192	18.4	101	9.4	91	24.8	52.6	78	263	15999	259	139	4963
Min	67	5.4	35	4.6	16	9.8	9.4	24	68	1897	75	27	2059

Nutrients removed by forage crops per metric ton dry matter yield

	N	P	K	S	Ca	Mg	Na	Cu	Zn	Fe	Mn	B
	.....(kg/MT).....							.....(g/MT).....				
Silage corn												
Mean	10	1.3	9	0.7	4	3.4	0.2	6	27	119	17	13
Max	13	1.8	11	1.0	6	6.8	0.2	7	35	185	20	18
Min	10	1.1	7	0.6	3	2.0	0.1	5	21	94	12	4
Italian ryegrasses												
Mean	24	2.0	20	1.2	7	3.3	1.9	10	34	1011	87	34
Max	28	2.3	24	1.5	8	4.1	4.2	12	43	2656	113	38
Min	14	1.8	14	0.9	6	2.3	0.6	7	20	156	51	29
Winter wheat for silage												
Mean	15	1.9	12	0.8	2	1.0	0.1	5	23	190	26	2
Max	19	2.6	13	1.0	2	1.2	0.1	6	29	242	34	3
Min	12	1.4	10	0.6	1	0.8	0.1	4	17	148	21	1
Barley for silage												
Mean	28	2.2	13	1.1	5	2.2	2.5	7	37	676	30	3
Max	31	2.6	14	1.3	6	2.5	3.0	10	50	1042	45	5
Min	26	1.8	12	1.0	4	2.0	2.0	5	27	343	20	1
Alfalfa												
Mean	31	2.9	24	2.4	16	3.6	0.3	12	38	418	47	31
Max	38	6.2	36	3.9	24	5.7	2.7	31	84	3106	121	54
Min	21	1.9	14	1.2	9	2.2	0.1	6	19	70	19	13
Galega												
Mean	34	2.8	21	1.9	11	5.6	0.3	12	36	881	35	26
Max	38	3.6	26	2.3	13	8.6	0.6	14	121	3391	80	42
Min	27	2.2	12	1.1	7	3.1	0.1	9	17	134	19	11
Fenugreek at pod formation												
Mean	31	4.0	28	2.2	20	7.3	5.0	14	42	1991	49	34
Max	33	4.3	30	2.3	23	7.8	5.5	15	51	3385	70	39
Min	29	3.7	25	2.2	18	6.7	4.6	13	37	1147	39	29
Fenugreek at pod maturation												
Mean	22	3.5	20	2.3	19	6.1	4.0	10	40	516	32	24
Max	23	3.8	21	2.5	22	6.7	4.3	12	47	634	34	25
Min	20	3.2	18	2.2	17	5.4	3.5	9	33	457	30	23
Brome grass												
Mean	18	2.5	23	1.4	5	1.9	0.2	9	27	962	99	6
Max	26	3.4	27	1.7	7	3.0	0.7	12	45	4244	256	9
Min	15	1.9	21	1.2	4	1.6	0.1	7	18	276	57	3
Timothy												
Mean	20	2.4	22	1.5	5	1.9	0.3	9	28	602	56	7
Max	24	2.8	27	2.3	10	3.0	3.1	41	47	2347	133	14
Min	17	2.1	17	1.1	4	1.4	0.1	4	16	178	37	4
Berseem clover												
Mean	33	3.0	20	2.2	15	4.9	6.7	12	37	1323	40	27
Max	39	3.8	26	3.3	21	6.3	10.6	16	53	3224	52	59
Min	27	2.2	13	1.5	3	2.0	4.0	7	27	710	30	5

(Sahota, T. S., L. Luan and B. Tomeck. 2014. TBARS Annual Report 2014. Pages 17-21.)

Nutrients removed by grains per hectare

	N	P	K	S	Ca	Mg	Na	Cu	Zn	Fe	Mn	B	Yield
	.....(kg/ha).....							.....(g/ha).....					kg/ha
Barley													
Mean	93	16.6	25	4.8	3	6.8	1.8	38	170	361	58	5	4665
Max	127	26.3	37	5.8	5	11.4	2.5	71	386	805	87	10	5805
Min	48	13.8	21	3.5	2	4.5	1.0	18	104	139	29	3	3206
Oat													
Mean	85	16.1	21	5.0	4	5.8	1.1	34	153	349	132	4	4217
Max	116	20.9	28	6.3	6	7.3	1.6	62	214	539	189	5	5233
Min	55	10.9	14	3.7	2	4.4	0.6	22	97	200	106	3	3115
Soybean													
Mean	110	11.6	35	4.8	6	5.1	0.3	29	80	246	37	33	1785
Max	147	15.6	47	7.1	8	6.6	0.5	38	116	1269	57	47	2361
Min	77	7.9	25	3.6	4	4.1	0.1	22	54	120	26	19	1333
Wheat													
Mean	90	14.5	12	4.9	2	5.7	0.4	28	156	282	98	3	3239
Max	114	16.4	14	6.0	3	7.2	0.7	42	204	477	132	4	4007
Min	56	10.0	10	3.5	1	4.1	0.2	16	112	143	63	2	2043

Nutrients removed by grains per metric ton

	N	P	K	S	Ca	Mg	Na	Cu	Zn	Fe	Mn	B
	.....(kg/MT).....							.....(g/MT).....				
Barley												
Mean	20	3.6	5	1.0	1	1.5	0.4	8	37	76	12	1
Max	25	5.3	7	1.2	1	2.3	0.5	14	78	162	17	2
Min	15	2.8	4	0.9	0	1.2	0.3	5	22	38	8	1
Oat												
Mean	20	3.8	5	1.2	1	1.4	0.3	8	35	90	32	1
Max	24	4.0	6	1.4	1	1.5	0.3	13	44	173	39	1
Min	15	3.5	5	1.0	1	1.3	0.2	5	31	41	22	1
Soybean												
Mean	61	6.5	19	2.7	3	2.9	0.2	16	45	157	21	19
Max	70	7.5	21	3.0	6	3.1	0.4	19	49	952	39	23
Min	55	5.6	18	2.3	2	2.7	0.1	14	41	65	15	9
Wheat												
Mean	28	4.6	4	1.6	1	1.8	0.1	8	49	85	30	1
Max	32	4.9	5	1.7	1	2.0	0.2	12	57	133	33	1
Min	24	4.1	4	1.3	1	1.6	0.1	6	40	57	27	1

(Sahota, T. S., L. Luan and B. Tomeck. 2014. TBARS Annual Report 2014. Pages 17-21.)

Nutrients removed by straw per hectare

	N	P	K	S	Ca	Mg	Na	Cu	Zn	Fe	Mn	B	Yield
	.....(kg/ha).....							.....(g/ha).....					kg/ha
Barley													
Mean	52	3.9	57	2.3	20	7.5	19.8	20	66	319	55	13	3985
Max	96	10.4	71	3.6	32	11.4	38.7	36	104	661	109	24	4778
Min	19	2.0	26	1.6	13	3.8	2.8	14	24	172	33	8	3130
Oat													
Mean	55	3.6	88	2.2	15	5.5	24.7	27	56	492	44	11	5354
Max	74	7.0	111	3.2	20	7.1	49.4	40	70	839	71	16	7913
Min	47	1.3	62	1.3	7	4.1	0.8	11	26	196	21	7	3705
Soybean													
Mean	24	3.1	19	1.4	22	10.3	0.6	32	38	960	31	52	2408
Max	60	8.7	41	2.9	30	12.9	0.8	74	140	4717	83	68	3225
Min	7	0.8	7	0.6	17	8.2	0.4	7	15	219	2	42	1851
Wheat													
Mean	49	4.6	56	2.8	15	7.9	2.1	30	93	522	55	13	4549
Max	62	7.6	82	4.9	24	11.9	4.3	59	130	735	78	26	6460
Min	38	2.0	12	1.8	7	2.5	0.8	3	33	146	23	3	2522

Nutrients removed by straw per metric ton

	N	P	K	S	Ca	Mg	Na	Cu	Zn	Fe	Mn	B
	.....(kg/MT).....							.....(g/MT).....				
Barley												
Mean	13	1.0	14	0.6	5	1.9	4.8	5	17	80	14	3
Max	25	2.6	19	0.9	8	3.1	8.8	9	26	165	25	6
Min	5	0.5	8	0.4	3	1.2	0.9	4	6	49	9	2
Oat												
Mean	12	0.7	17	0.4	3	1.1	5.4	5	11	87	8	2
Max	20	1.3	21	0.6	4	1.2	9.2	7	15	109	13	2
Min	6	0.3	12	0.3	2	0.9	0.1	2	7	53	4	2
Soybean												
Mean	9	1.2	7	0.5	9	4.3	0.2	12	15	382	12	22
Max	19	2.7	13	1.1	11	4.9	0.3	30	57	1915	34	25
Min	4	0.4	4	0.3	8	3.7	0.2	4	8	114	1	18
Wheat												
Mean	13	1.0	11	0.6	3	1.7	0.5	6	21	111	12	2
Max	23	1.4	15	0.9	5	2.2	0.8	11	34	149	18	4
Min	6	0.8	5	0.4	3	1.0	0.2	1	13	58	9	1

(Sahota, T. S., L. Luan and B. Tomeck. 2014. TBARS Annual Report 2014. Pages 17-21.)

Total nutrients removal by whole crop (grain + straw) per hectare

	N	P	K	S	Ca	Mg	Na	Cu	Zn	Fe	Mn	B	Total
	.....(kg/ha).....							.....(g/ha).....					Biomass
Soybean													
Mean	134	14.7	53	6.1	28	15.4	0.8	61	118	1206	68	85	4193
Max	171	20.4	74	8.6	35	18.0	1.0	100	195	5985	135	110	5360
Min	102	11.2	41	4.7	23	12.8	0.6	33	93	357	30	67	3598
Barley													
Mean	145	20.5	83	7.1	23	14.3	21.5	58	235	679	113	18	8650
Max	211	29.2	100	8.4	35	21.2	40.4	90	464	1162	177	28	10202
Min	107	17.9	47	5.7	15	8.2	3.8	38	133	368	69	13	6336
Oat													
Mean	140	19.7	109	7.2	18	11.3	25.8	60	209	840	176	15	9571
Max	165	27.9	137	9.5	25	13.2	50.9	73	279	1378	247	19	11028
Min	110	14.1	80	6.1	10	8.8	1.4	40	143	397	137	11	7348
Wheat													
Mean	140	19.2	69	7.7	17	13.6	2.5	58	248	805	154	16	7788
Max	158	23.8	96	10.5	27	17.2	5.0	79	334	1046	210	30	10467
Min	114	12.0	22	5.2	8	6.6	1.0	19	145	289	86	5	4565

Note:
Barley, oat, wheat, soybean, silage corn, italian ryegrass, winter wheat for silage, barley for silage data werer from LTE-3 (2008-2013);
Alfalfa data were from alfalfa persistance and maximum yield (2006-2013);
Galega data were from two galega trials (2007-2013);
Fenugreek data were from the new galega trial in 2011;
Brome grass and timothy data were from N on grasses trial (2010-2013);
Berseem clover data were from galega trial (2012) and berseem trial (2010-2012).

(Sahota, T. S., L. Luan and B. Tomeck. 2014. TBARS Annual Report 2014. Pages 17-21.)