Chapter Four

DISCUSSION

4.1 - Comparison of the models

Design of the two deterministic dynamic computer models has been accomplished. These models considerably help to identify the optimal system and management of population structure for self-contained meat sheep crossbreeding enterprises, practically. The appropriateness of these models depends on specific conditions mostly with respect to the economical situations which shall be discussed later in this Chapter.

The DYNCSTBL.XLS model suggested a terminal-rotation crossing system and the DYNCVRBL.XLS model a combination rotational crossing including some sub-systems of rotational crossing, having no terminal crosses, both models running with same input data. Unlike the former model in which due to the stable and limited numbers of the ewes in the flocks, the surplus hogget ewes are crossed with the Border Leicester rams, there are no such additional hoggets for terminal crossings in the latter, due to accumulation of the hogget ewes in the flocks. In the meantime, the extra female lambs are sold in the system proposed by the DYNCSTBL.XLS model. The infinitesimal number of the ewes in flock number 3 in all of the crossbreeding Years is presented as zero.

However, as said earlier, in other circumstances using different input data, there is the possibility of suggesting different types of crossing by the models e.g., single crosses etc., while being managed as self-contained systems. Also, compared with the traditional rotational crossing systems, both of the present systems proposed by the models, make a moderate

use of complementarity and breed effects. This is fulfilled by means of either raising different numbers of the ewes and lambs in the flocks in different Years of crossing, to attain the optimal genetic make-up of the lambs i.e., generation preference, or through changing the type of the crossing system, in successive generations.

As mentioned in Chapter Two, for a proper comparison of two or more production systems, the standard cash flow discounting method is usually applied to the relevant systems for comparison. Therefore, the results in Table 9 are provided while applying the standard cash flow discounting method to both models, being discussed in the following.

The initial number of the ewes in the DYNCVRBL.XLS model was held constant and only this number for the other model changed until a cumulative discounted net profit, equivalent to that for the DYNCVRBL.XLS model, was gained in Year 8. This procedure has been illustrated in the following Table.

Table 9. The computer models and their attributes together with the results obtained from the worked examples - with cash flow discounting. For a proper comparison of the models, in an experiment, the initial number of the ewes in the DYNCSTBL.XLS model was adjusted to attain the same cumulative *discounted* net profit in the final year of the systems proposed by the models, as presented below. The other output data changed accordingly.

Name of the model	DYNCSTBL.XLS	DYNCVRBL.XLS
Strategy	Dynamic	Dynamic
Number of ewes in the flocks / Years	Stable	Variable
Total number of the ewes to start with	***916***	***500***
Cumulative discounted net profit	**767369**	**767672**
Cumulative number of the ewes	13921	16741
Cumulative number of the lambs sold	13833	14806
Avg. discounted net profit/ewe	55.12	45.85

Also, as can be seen in Figure 5, both of the systems recommended by the models, have statistically equal cumulative discounted net profit in the final Year of crossbreeding, but due to different initial numbers of the ewes, each model has a specific trend of profitability.

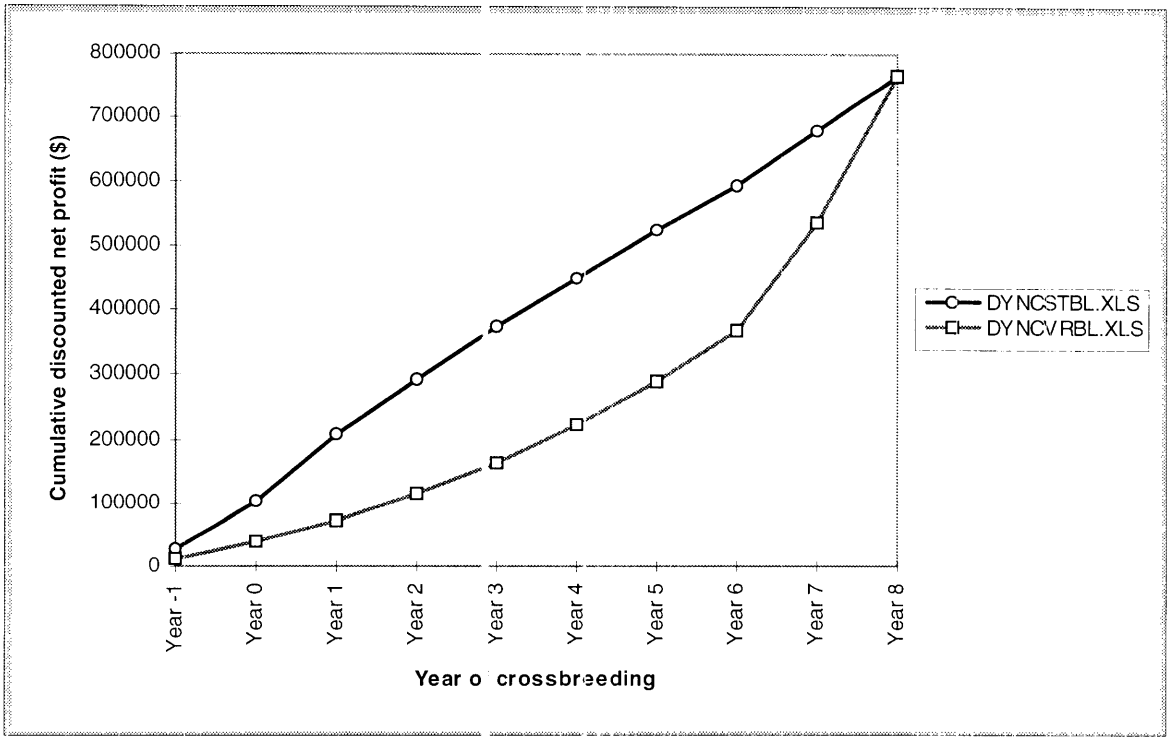

Figure 5, presenting trend of the annual cumulative discounted net profit for the systems recommended by the models having different initial numbers of the ewes, but equal cumulative profit in the final Year of crossbreeding.

It follows that, using the DYNCSTBL.XLS model resulted in 20.21% more average cumulative net profit per ewe compared with the DYNCVRBL.XLS model, owing to a 20.25% smaller cumulative number of the ewes, as can be seen in Table 9.

In other words, with equal cumulative net profit for both models, the crossing system proposed by the DYNCVRBL.XLS model, produced a larger number of the salable lambs, through retaining the crossbred female lambs in the flocks in order to propagate the ewes, for a higher level of lamb production at the later stages of crossing. This caused a reduction in the average cumulative discounted net profit gained per ewe, as costs of the ewes and hoggets are among the main economic components affecting the whole population structure.

Therefore, it must be concluded that the DYNCVRBL.XLS model would be more suitable where a lower amount of the initial investment and limited husbandry facilities are available to the breeder at the commencement of the crossing system while a particular amount of the cumulative profit is considered within the course of crossing using either of the models.

Similarly, if we are to compare the models from the standpoint of the overall profitability with same initial number of the ewes for both models, the DYNCVRBL.XLS model would be more desirable, provided no limitations in regard to provision of the relevant facilities and a wider range of investment at the later stages of crossing. The argument is that a higher number of the sheep may be raised, and thus, a larger amount of profit could be gained within the same period of crossbreeding, though there will be a smaller profit gained per ewe raised. However, using this model, a considerable amount of profit is gained with delay in the two final years of crossbreeding.

As from Year 1 onward the Merino rams are introduced, therefore in Year 1, a larger number (73%) of the hogget ewes (coming from Year -1), has been sent to flock 2 to maximize the utilization of breed effects. After this stage, numbers of the ewes in the flocks vary frequently highly unsteadily to different extents, while those of the DYNCSTBL.XLS are stable throughout the term of crossbreeding.

It should be noted that since all of the female lambs are retained in the flocks, therefore the optimal status has been to cross the ewe hoggets with the rams of both breeds in due course, considering all aspects and results of the crossing including maximum utilization of complementary, through generation preferences, as mentioned earlier, and in the literature review as well. This has caused a fluctuation in the number of the ewes in flocks 1 and 2 in the DYNCVRBL.XLS model, as illustrated below in Figure 6.

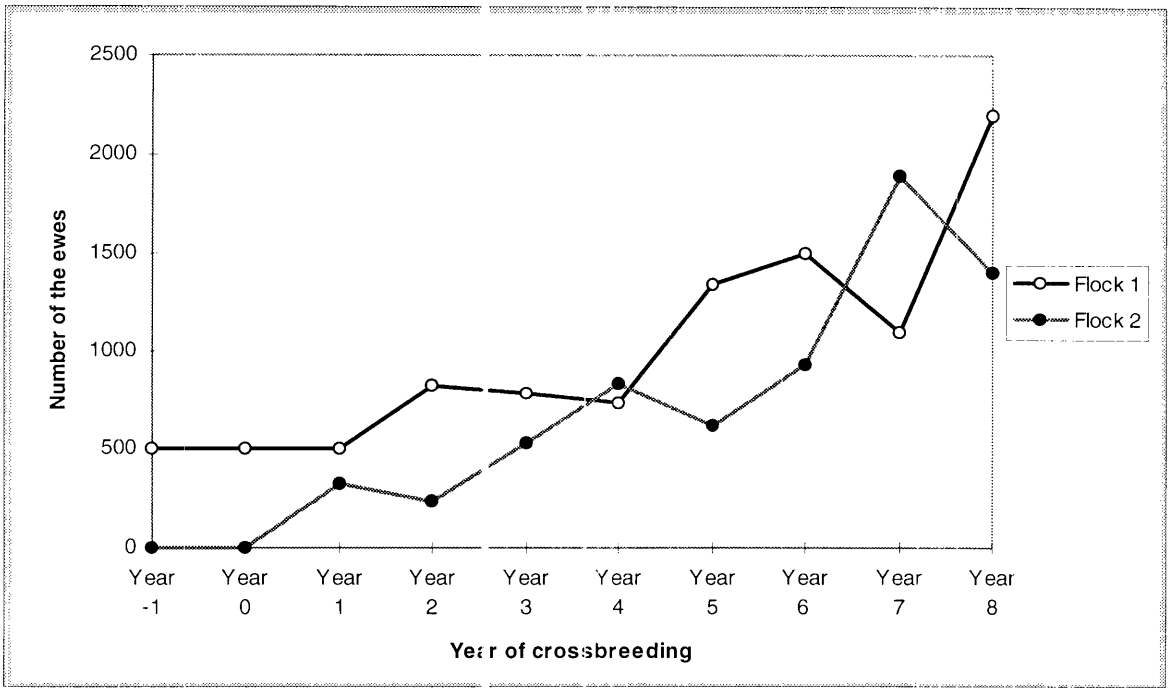

Figure 6, illustrating the variability of number of the ewes in the DYNCVRBL XLS model.

Figures 7-10, present details of the variations in the mean degree of heterozygosity of the ewes and also the variations in the proportion of the meatier sheep breed's genes i.e., the Border Leicester's genes in the salable lambs, for further consideration.

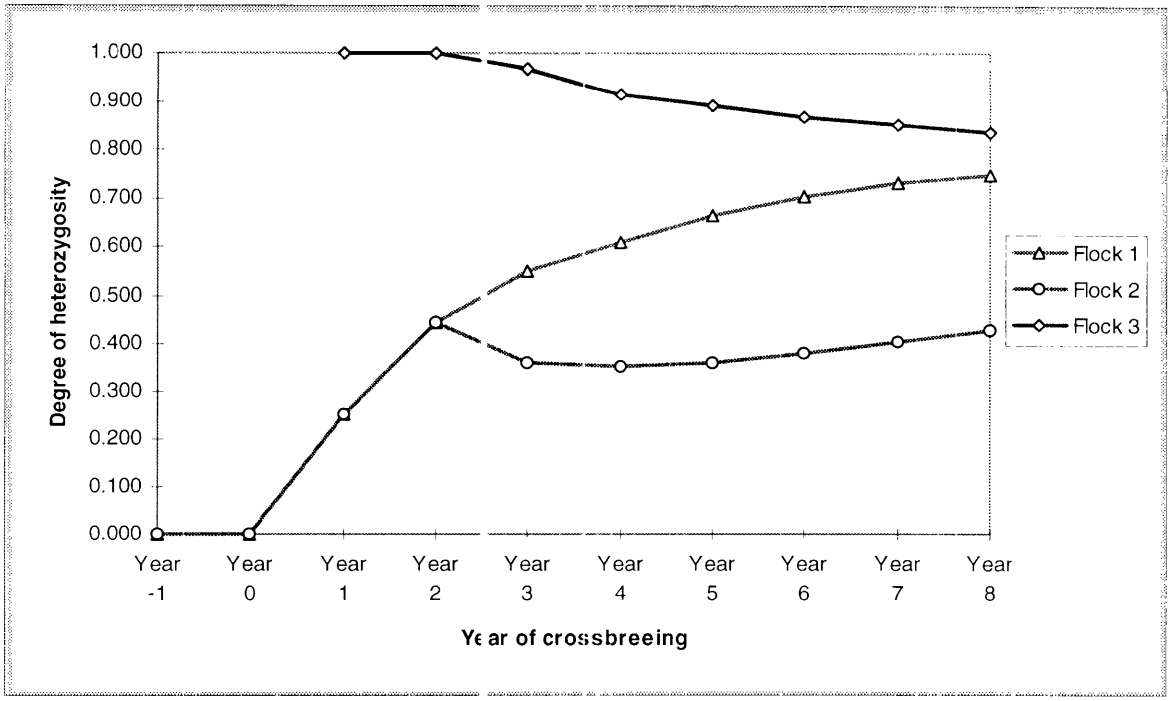

Figure 7. Mean degree of heterozygosity of the ewes in flocks 1-3, DYNCSTBL.XLS model (terminal-rotation crossing system), from Year -1 to Year 8.

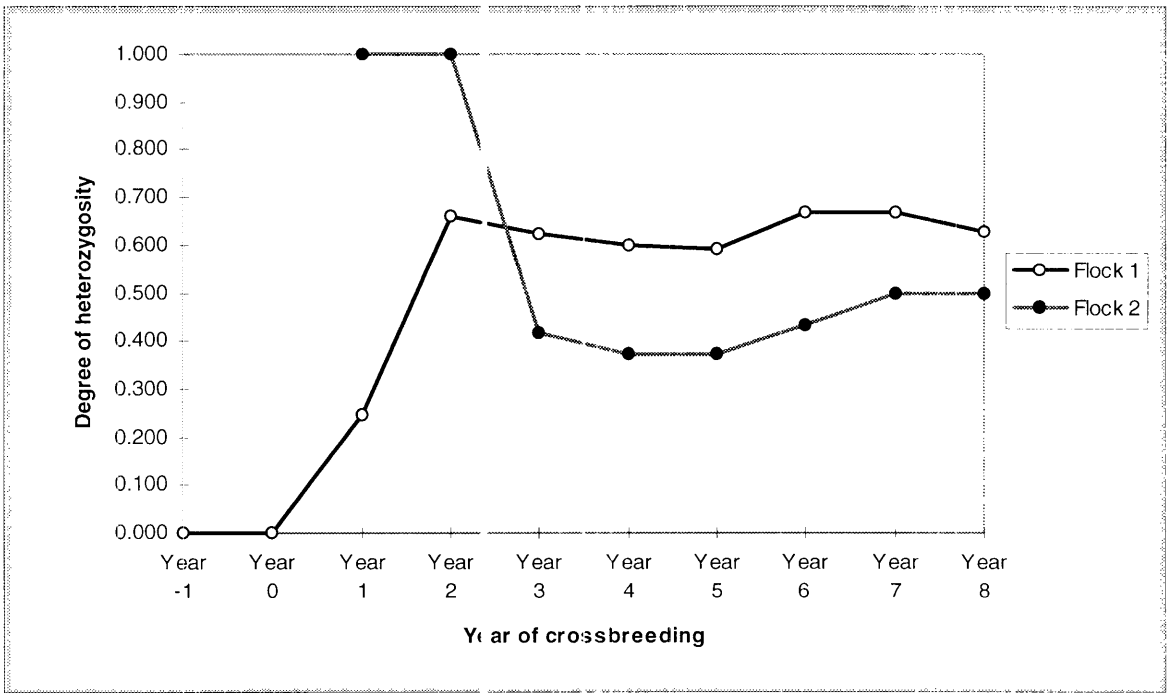

Figure 8. Mean degree of heterozygosity of the ewes in flocks 1-2, DYNCVRBL.XLS model (combination rotational crossing system), from Year -1 to Year 8.

In the DYNCSTBL.XLS model, there was a rapid, steady increase in the degree of heterozygosity of the ewes in flocks 1 and 2, up to Year 2 (this increment in the DYNCVRBL.XLS model was quite larger but just for flock 1). After this stage, flock 1 continued to have a slower increase in the degree of heterozygosity, while it conversely decreased in flock 2, almost symmetrically and to the same extent as for the other flock. This is because, from this Year onword, the Merino ewes are introduced so as the flocks are mated to two different types of the sire breeds.

Since there are only two flocks for the system suggested by the DYNCVRBL.XLS model, and flock 2 is established in year 1 therefore, in Year 1 and Year 2, all the ewes in this flock are 100% heterozygous as the required hogget ewes for Year 1 are predestined in Year -1, all of which being F_1's. In Year 2 no hogget ewes are entered into flock 2 from Year 0. Even if it had occurred, there would be no differences made, in terms of the changes in the degree of heterozygosity, as all the hogget ewes produced in Year 0 too are 100% heterozygous.

Advent of the Merino rams in Year 1, caused a decline in the degree of heterozygosity of the hogget ewes being entered into flock 2 in Year 3. Therefore, all the ewes in flock 2 are F_1's until Year 2, and afterwards a sharp decline occurs in the degree of heterozygosity of ewes in Year 3, due to the change-over in regard to the type of the mating sires in flock 1, Year 1.

Also, mean degree of heterozygosity in flocks 1 and 2, in the DYNCSTBL.XLS model varied with less fluctuations from one Year to another, compared with the other model, and flock 3 had a gradual decrease with respect to the degree of heterozygosity of the ewes.

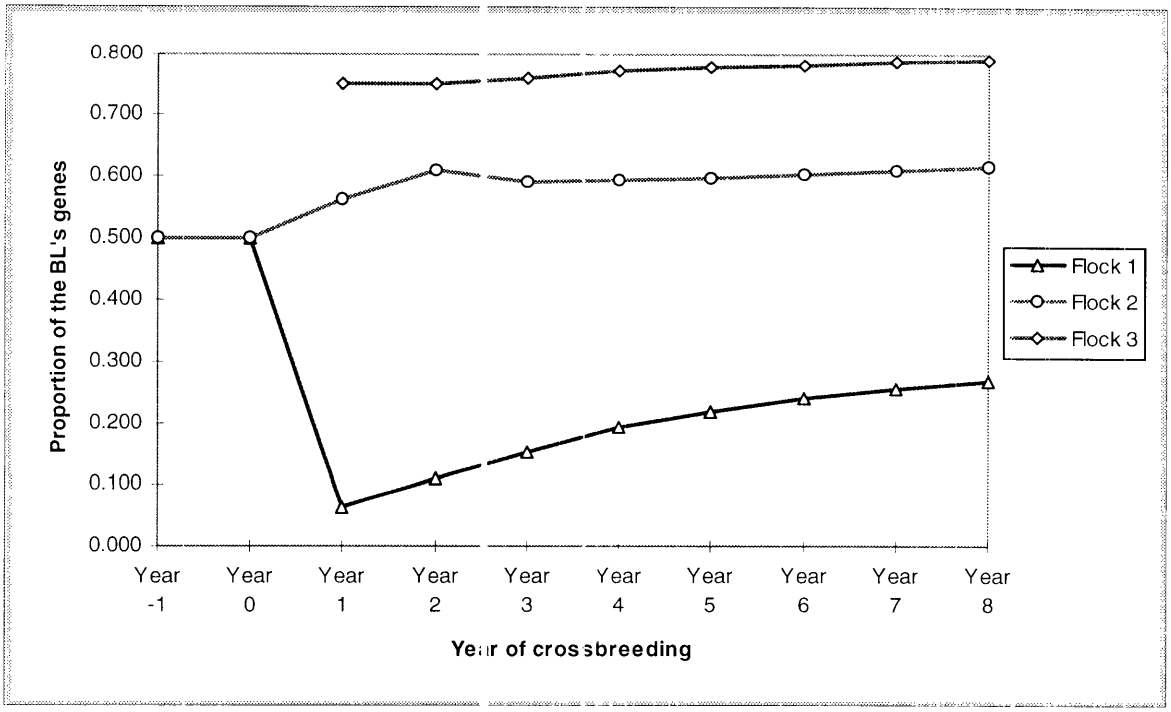

Figure 9. Proportion of the Border Leicester's (BL) genes contributing to the salable lambs of flocks 1-3, DYNCSTBL.XLS model, in different Years of crossbreeding.

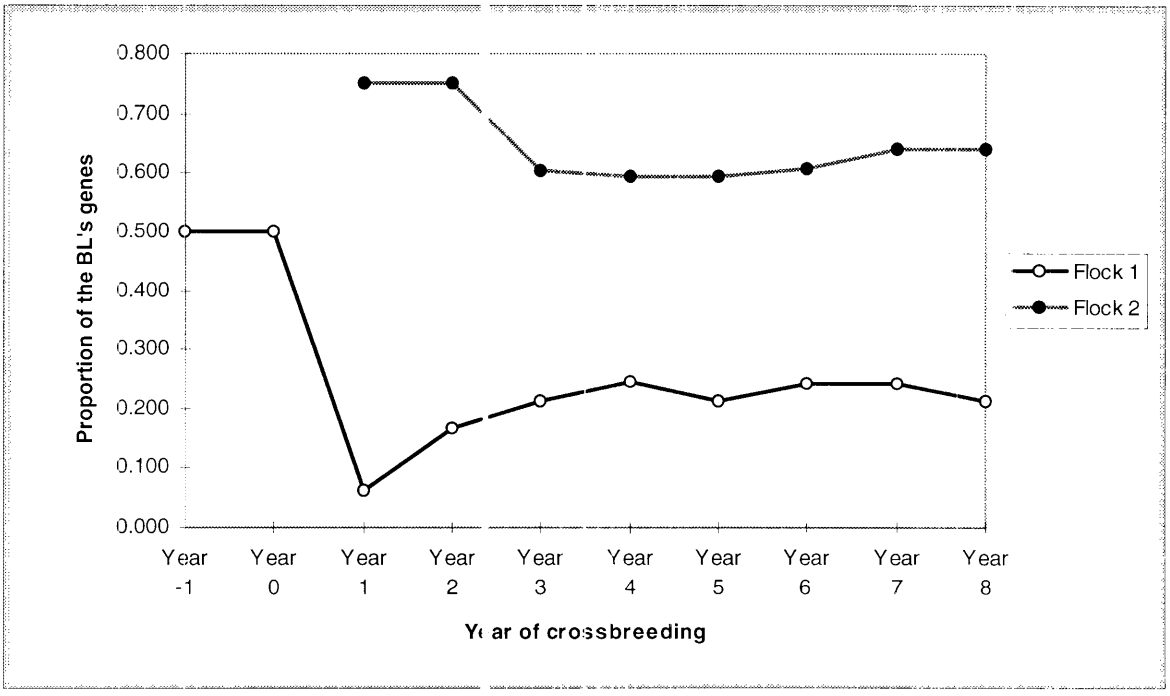

Figure 10. Proportion of the Border Leicester's (BL) genes contributing to the salable lambs of flocks 1-2, DYNCVRBL.XLS model, in different Years of crossbreeding.

Proportion of the Border Leicester's (BL) genes (50%) in flock 1 in the salable lambs in both models remained constant up to Year 0, then it slumped to around 5% in Year 1. After this stage, it started to rise rapidly untill Year 4, with little variations in the rest of the Years in the DYNCVRBL.XLS model. It had an initial gradual growth within the same time period and continued to increase mildly in the other model.

The large changes occurred in the proportion of the meatier breed, i.e., the BL's genes, in flock number 2 in both models, up to Year 3 and then it became almost plateau in the DYNCSTBL.XLS model. In the other model a negligible increase occurred in the proportion of the BL's genes, then it again leveled off in Year 8, after a little rise in the previous Year.

Meanwhile, flock 3 in the DYNCSTBL.XLS model had little changes in the proportion of the BL's genes. This flock consists of 39% of the total number of the ewes raised during the crossbreeding term.

Considering the year-by-year diagrams in the worked examples of the models, it can be seen that flock 1 is consisting of only 17% of the ewes, producing almost a proportionate number of the salable lambs within the course of the crossbreeding. Also, most of the lambs are produced in the other (two) flocks. Conversely, in the DYNCVRBL.XLS model, flock 1 comprises a notably larger number of the sheep for meat production. According to the above data flocks 1 and 2 of the DYNCSTBL.XLS model producing 83% of the lamb crop, have little variations in the proportion of the BL's genes, while these variations are larger in flock 1 of the DYNCVRBL.XLS model being responsible for most of the lamb production.

Moreover, proportion of the BL's genes in flocks 1 and 2 of the DYNCSTBL.XLS in which most of the meat crop is produced, is also higher. Therefore, the crossing system suggested by the DYNCSTBL.XLS model, helps produce more desirable meat, with less variations in its quality in subsequent Years of crossbreeding.

4.2 - Effect of the standard cash flow discounting on the flock structures and trend of the annual net profit

The method used in the derivation of the comparative economic parameters, i.e., the standard cash flow discounting method had no effect on the flock structures, when equal numbers of the ewes were used for the commencement of the systems in with- and in without cash flow discounting situations using same models at a time.

However, trend of the annual net profit changed, when cash flow discounting method was applied. As can be seen in Figures 11 and 12, shape of the curves, especially of that pertaining the DYNCSTBL.XLS model changed when the standard cash flow discounting method was applied.

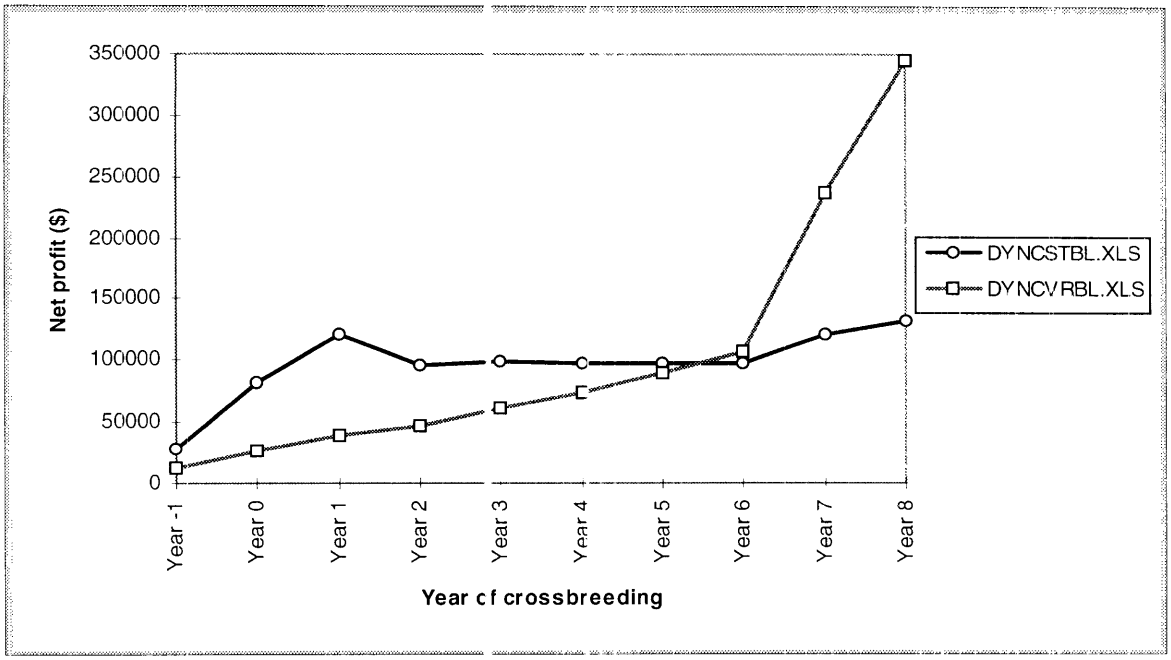

Figure 11. Trend of the annual net profit gained, for the systems proposed by the computer models DYNCSTBL.XLS and DYNCVRBL.XLS - without cash flow discounting and with equal initial number of the ewes in both models.

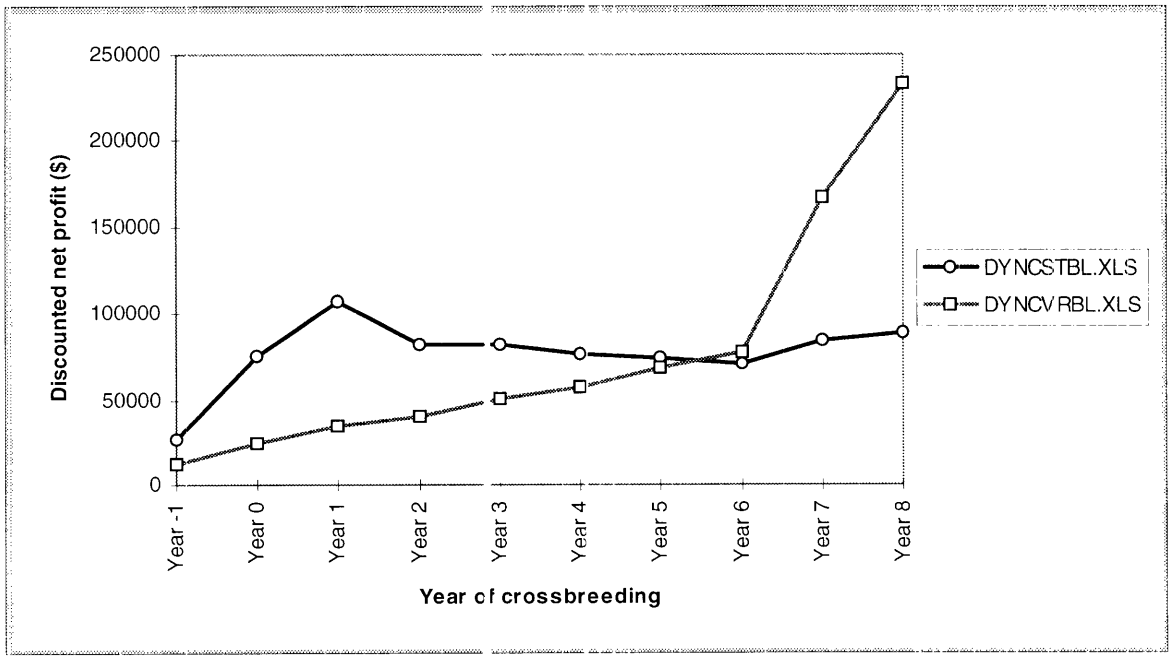

Figure 12. Trend of the annual *discounted* net profit gained, for the systems proposed by the computer models DYNCSTBL.XLS and DYNCVRBL.XLS - with cash flow discounting and with equal initial number of the ewes in both models.

But, when setting the proposed systems for equal cumulative net profits gained through different initial numbers of the ewes, in both with- and without cash flow discounting procedures, the whole flock structures had minor changes. In other words, only the cumulative number of the lambs sold was affected (but dramatically) in a reverse direction, from a 0.5% larger number, to a 7% smaller one in the DYNCSTBL.XLS model in comparison with that in the other model, in a without- and in a with cash flow discounting manner, respectively. This is in agreement and interrelated with the phenomenon of changing the shape of the profit curve in Figure 12, which was referred to above and earlier in Chapter Two. The items in Table 10 are similar to those in Table 9, but are derived without application of the cash flow discounting method.

Table 10. In a different experiment the initial number of the ewes in the DYNCSTBL.XLS model was adjusted to attain the closest possible amount of the cumulative net profit to that in the DYNCVRBL.XLS, in the final year - without cash flow discounting.

Name of the model	DYNCSTBL.XLS	DYNCVRBL.XLS
Strategy	Dynamic	Dynamic
Number of ewes in the flocks , Years	Stable	Variable
Total number of the ewes to start with	***985***	***500***
Cumulative discounted net profit	**1040693**	**1040658**
Cumulative number of the ewes	14970	16741
Cumulative number of the lambs sold	14875	14806
Avg. discounted net profit/ewe	69.52	62.16

Moreover, contrasting Tables 9 and 10, it can be seen that the cumulative number of the ewes in the above-named model was decreased proportionately from a 11.8% smaller number in without- to a 20.3% smaller one in with cash flow discounting procedure, compared with that in the other model.

Also, with the same status as above, the average cumulative net profit per ewe in the DYNCSTBL.XLS model was 11.8% higher, in without cash flow discounting procedure. It increased by a 20.2% higher amount, after discounting was applied.

Therefore, in the DYNCSTBL.XLS model, the average cumulative net profit per ewe remained almost proportionately higher, in accordance with the cumulative number of the ewes which was held proportionately lower, when discounting was applied, although the initial number of the ewes for commencing the system did not change proportionately from with- to without cash flow discounting procedure. There was 16% difference

between the changes occurred (from 500, the initial number of the ewes) in this number in same comparable economical circumstances applied to both models.

Accordingly, the cumulative number of the ewes and the average cumulative net profit gained per ewe are important factors for the models, as they changed almost proportionately in the different conditions applied. It appears that the necessary changes first occur in the number of the lambs sold, prior to any changes in the aforementioned cases by the models.

4.3 - Sensitivity of the models

With minor changes in the input data, the flock structures remain unaffected, although the other output parameters are influenced by these changes. This could mean that the models allow little variations in the flock structures from optimality e.g., small proportions of the female lambs and/or hogget ewes can be sold with negligible effect on the optimal profitability of the proposed systems.

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Chapter Five

APPENDICES

Microsoft Excel 5.0 Answer Report
Worksheet: [DYNCSTBL.XLS]Sheet2

Target Cell (Max)

Cell	Name	Original Value	Final Value
L550	Cumu. discounted net profit	52 3860	528270

Adjustable Cells

Cell	Name	Original Value	Final Value
Q20	Variable 1	0.3)1146	0.277858
Q129	Variable 1	0.9 '3230	0.973227
Q130	Variable 2	0.0)0024	0.000029
Q131	Variable 3	0.0)0011	0.000022
Q183	Variable 1	0.4 56700	0.456701
Q184	Variable 2	0.8 96532	0.896529
Q238	Variable 1	0.9 99975	0.999972
Q239	Variable 2	0.0)0001	0.000001
Q293	Variable 1	0.9 99975	0.999972
Q294	Variable 2	0.1 19953	0.195681
Q348	Variable 1	0.9 99975	0.999973
Q349	Variable 2	0.0 99887	0.151318
Q403	Variable 1	0.9 99975	0.999973
Q404	Variable 2	0.0 54287	0.110649
Q458	Variable 1	0.9 99975	0.999973
Q459	Variable 2	0.0 20353	0.080224
Q513	Variable 1	0.9 90761	0.999973
Q514	Variable 2	0.0)0001	0.058230

Constraints

Cell	Name	Cell Value	Formula	Status	Slack
E92	No. sold Fm	97	E92>=0	Not Binding	97
H92	No. sold Fm	142	H92>=0	Not Binding	142
C127	Hoggets	35	C127>=0.001	Not Binding	35
G127	Hoggets	0	G127>=0.001	Binding	0
G135	Hoggets	90	G135>=0.001	Not Binding	90
K135	Hoggets	0	K135>=0.001	Binding	0
E147	No. sold Fm	5	E147>=0	Not Binding	5
H147	No. sold Fm	162	H147>=0	Not Binding	162
E202	No. sold Fm	0	E202>=0	Binding	0
H202	No. sold Fm	54	H202>=0	Not Binding	54
G182	Hoggets	16	G182>=0	Not Binding	16
K190	Hoggets	82	K190>=0	Not Binding	82
G190	Hoggets	9	G190>=0.001	Not Binding	9
E36	No. sold Fm	0	E36>=0	Binding	0
H36	No. sold Fm	0	H36>=0	Binding	0
G31	Lambs	668	G31>=0.001	Not Binding	668
G237	Hoggets	36	G237>=0	Not Binding	36
K245	Hoggets	0	K245>=0	Binding	0
E257	No. sold Fm	0	E257>=0	Binding	0
H257	No. sold Fm	77	H257>=0	Not Binding	77
G245	Hoggets	93	G245>=0.001	Not Binding	93
H123	Hogg's	325	H123>=0.001	Not Binding	325
H178	Hogg's	86	H178>=0	Not Binding	86
H233	Hogg's	86	H233>=0	Not Binding	86

C347	Hoggets	0	C347>=0.001	Binding	0
C402	Hoggets	0	C402>=0.001	Binding	0
C457	Hoggets	0	C457>=0.001	Binding	0
C512	Hoggets	0	C512>=0.001	Binding	0
G292	Hoggets	36	G292>=0	Not Binding	36
G347	Hoggets	36	G347>=0	Not Binding	36
G402	Hoggets	37	G402>=0	Not Binding	37
G457	Hoggets	37	G457>=0	Not Binding	37
G512	Hoggets	37	G512>=0	Not Binding	37
G300	Hoggets	74	G300>=0.001	Not Binding	74
G355	Hoggets	78	G355>=0.001	Not Binding	78
G410	Hoggets	82	G410>=0.001	Not Binding	82
G465	Hoggets	85	G465>=0.001	Not Binding	85
G520	Hoggets	87	G520>=0.001	Not Binding	87
K300	Hoggets	18	K300>=0	Not Binding	18
K355	Hoggets	14	K355>=0	Not Binding	14
K410	Hoggets	10	K410>=0	Not Binding	10
K465	Hoggets	7	K465>=0	Not Binding	7
K520	Hoggets	5	K520>=0	Not Binding	5
E312	No. sold Fm	0	E312>=0	Binding	0
E367	No. sold Fm	0	E367>=0	Binding	0
E422	No. sold Fm	0	E422>=0	Binding	0
E477	No. sold Fm	90	E477>=0	Not Binding	90
E532	No. sold Fm	91	E532>=0	Not Binding	91
H312	No. sold Fm	73	H312>=0	Not Binding	73
H367	No. sold Fm	76	H367>=0	Not Binding	76
H422	No. sold Fm	78	H422>=0	Not Binding	78
H477	No. sold Fm	209	H477>=0	Not Binding	209
H532	No. sold Fm	210	H532>=0	Not Binding	210
H288	Hogg's	86	H288>=0	Not Binding	86
H343	Hogg's	87	H343>=0	Not Binding	87
H453	Hogg's	87	H453>=0	Not Binding	87
H508	Hogg's	87	H508>=0	Not Binding	87
H398	Hogg's	87	H398>=0	Not Binding	87
E130		139	E130>=0.001	Not Binding	139
I131		361	I131>=0.001	Not Binding	361
J122	Hogg's	325	J122>=0.001	Not Binding	325
E75		139	E75>=0.001	Not Binding	139
I76		361	I76>=0.001	Not Binding	361
E185		139	E185>=0.001	Not Binding	139
I186		361	I186>=0.001	Not Binding	361
E240		139	E240>=0.001	Not Binding	139
I241		361	I241>=0.001	Not Binding	361
E295		139	E295>=0.001	Not Binding	139
I296		361	I296>=0.001	Not Binding	361
E350		139	E350>=0.001	Not Binding	139
I351		361	I351>=0.001	Not Binding	361
E405		139	E405>=0.001	Not Binding	139
I406		361	I406>=0.001	Not Binding	361
E460		139	E460>=0.001	Not Binding	139
I461		361	I461>=0.001	Not Binding	361
E515		139	E515>=0.001	Not Binding	139
I516		361	I516>=0.001	Not Binding	361
J177	Hogg's	325	J177>=0.001	Not Binding	325
J232	Hogg's	325	J232>=0.001	Not Binding	325
J287	Hogg's	325	J287>=0.001	Not Binding	325
J342	Hogg's	325	J342>=0.001	Not Binding	325
J397	Hogg's	325	J397>=0.001	Not Binding	325
J452	Hogg's	325	J452>=0.001	Not Binding	325

J507	Hogg's	325	J507>=0.001	Not Binding	325
D31	Lambs	257	D31>=0.001	Not Binding	257
C182	Hoggets	19	C182>=0.001	Not Binding	19
C237	Hoggets	0	C237>=0.001	Binding	0
C292	Hoggets	0	C292>=0.001	Binding	0
Q129	Variable 1	0.9732?7	Q129<=1	Not Binding	0.026773
Q129	Variable 1	0.9732?7	Q129>=0.000001	Not Binding	0.973226
Q130	Variable 2	0.0000?9	Q130<=1	Not Binding	0.999971
Q130	Variable 2	0.0000?9	Q130>=0	Binding	0.000000
Q131	Variable 3	0.0000?2	Q131<=1	Not Binding	0.999978
Q131	Variable 3	0.0000?2	Q131>=0.000001	Binding	0.000000
Q183	Variable 1	0.4567?1	Q183>=0	Not Binding	0.456701
Q184	Variable 2	0.8965?9	Q184<=1	Not Binding	0.103471
Q184	Variable 2	0.8965?9	Q184>=0.000001	Not Binding	0.896528
Q239	Variable 2	0.0000?1	Q239<=1	Not Binding	0.999999
Q239	Variable 2	0.0000?1	Q239>=0.000001	Binding	0.000000
Q293	Variable 1	0.9999?2	Q293<=1	Binding	0.000000
Q293	Variable 1	0.9999?2	Q293>=0	Not Binding	0.999972
Q294	Variable 2	0.1956?1	Q294<=1	Not Binding	0.804319
Q294	Variable 2	0.1956?1	Q294>=0.000001	Not Binding	0.195680
Q348	Variable 1	0.9999?3	Q348<=1	Binding	0.000000
Q348	Variable 1	0.9999?3	Q348>=0	Not Binding	0.999973
Q349	Variable 2	0.1513?8	Q349<=1	Not Binding	0.848682
Q349	Variable 2	0.1513?8	Q349>=0.000001	Not Binding	0.151317
Q403	Variable 1	0.9999?3	Q403<=1	Binding	0.000000
Q403	Variable 1	0.9999?3	Q403>=0	Not Binding	0.999973
Q404	Variable 2	0.1106?9	Q404<=1	Not Binding	0.889351
Q458	Variable 1	0.9999?3	Q458<=1	Binding	0.000000
Q458	Variable 1	0.9999?3	Q458>=0	Not Binding	0.999973
Q459	Variable 2	0.0802?4	Q459<=1	Not Binding	0.919776
Q459	Variable 2	0.0802?4	Q459>=0.000001	Not Binding	0.080223
Q513	Variable 1	0.9999?3	Q513<=1	Binding	0.000000
Q513	Variable 1	0.9999?3	Q513>=0	Not Binding	0.999973
Q514	Variable 2	0.0582?0	Q514<=1	Not Binding	0.941770
Q514	Variable 2	0.0582?0	Q514>=0.000001	Not Binding	0.058229
Q20	Variable 1	0.2778?8	Q20>=0.0001	Not Binding	0.277758
Q404	Variable 2	0.1106?9	Q404>=0.000001	Not Binding	0.110648
Q183	Variable 1	0.4567?1	Q183<=1	Not Binding	0.543299
Q238	Variable 1	0.9999?2	Q238<=1	Binding	0.000000
Q238	Variable 1	0.9999?2	Q238>=0	Not Binding	0.999972

Microsoft Excel 5.0 Answer Report
Worksheet: [DYNCVRBL.XLS]Sheet2

Target Cell (Max)

Cell	Name	Original Value	Final Value
L550	Cumu. discounted net profit	1040576	1040697

Adjustable Cells

Cell	Name	Original Value	Final Value
Q20	Variable 1	0.999103	0.999103
Q73	Variable 1	0.999102	0.999102
Q74	Variable 2	1.000000	1.000000
Q75	Variable 3	1.000000	1.000000
Q76	Variable 4	1.000000	1.000000
Q129	Variable 1	0.189798	0.237328
Q130	Variable 2	0.966966	0.964907
Q131	Variable 3	0.003835	0.003835
Q132	Variable 4	0.970721	0.970690
Q133	Variable 5	1.000000	1.000000
Q134	Variable 6	0.999848	0.999848
Q135	Variable 7	0.082363	0.083364
Q183	Variable 1	0.999979	0.999979
Q184	Variable 2	0.973234	0.973234
Q185	Variable 3	0.000081	0.000085
Q186	Variable 4	0.000001	0.000000
Q187	Variable 5	0.972589	0.972614
Q188	Variable 6	1.000000	1.000000
Q189	Variable 7	1.000000	1.000000
Q190	Variable 8	0.023600	0.022716
Q238	Variable 1	0.999869	0.999869
Q239	Variable 2	0.000003	0.000003
Q240	Variable 3	0.975377	0.975340
Q241	Variable 4	0.000001	0.000001
Q242	Variable 5	0.972052	0.972053
Q243	Variable 6	1.000000	1.000000
Q244	Variable 7	1.000000	1.000000
Q245	Variable 8	0.000073	0.000073
Q293	Variable 1	1.000000	1.000000
Q294	Variable 2	0.000002	0.000002
Q295	Variable 3	0.974824	0.974831
Q296	Variable 4	0.000001	0.000001
Q297	Variable 5	0.972052	0.972052
Q298	Variable 6	1.000000	1.000000
Q299	Variable 7	1.000000	1.000000
Q300	Variable 8	0.000072	0.000080
Q348	Variable 1	0.999032	0.999032
Q349	Variable 2	0.974561	0.974589
Q350	Variable 3	0.000087	0.000087
Q351	Variable 4	0.000001	0.000001
Q352	Variable 5	0.972722	0.972737
Q353	Variable 6	1.000000	1.000000
Q354	Variable 7	1.000000	1.000000
Q355	Variable 8	0.000014	0.000014
Q403	Variable 1	1.000000	1.000000
Q404	Variable 2	0.000002	0.000002
Q405	Variable 3	0.974397	0.974430

Q406	Variable 4	0.000001	0.000001
Q407	Variable 5	0.972786	0.972795
Q408	Variable 6	1.000000	1.000000
Q409	Variable 7	1.000000	1.000000
Q410	Variable 8	0.000021	0.000021
Q458	Variable 1	1.000000	1.000000
Q459	Variable 2	0.000002	0.000002
Q460	Variable 3	0.974565	0.974587
Q461	Variable 4	0.971920	0.971927
Q462	Variable 5	0.030670	0.030739
Q463	Variable 6	1.000000	1.000000
Q464	Variable 7	1.000000	1.000000
Q465	Variable 8	0.000201	0.000201
Q513	Variable 1	1.000000	1.000000
Q514	Variable 2	0.974440	0.974455
Q515	Variable 3	0.000047	0.000047
Q516	Variable 4	0.000001	0.000001
Q517	Variable 5	0.972706	0.972721
Q518	Variable 6	1.000000	1.000000
Q519	Variable 7	1.000000	1.000000
Q520	Variable 8	0.000000	0.000000

Constraints

Cell	Name	Cell Value	Formula	Status	Slack
E92	No. sold Fm	0	E92>=0	Binding	0
H92	No. sold Fm	0	H92>=0	Binding	0
C127	Hoggets	110	C127>=0.001	Not Binding	110
G127	Hoggets	0	G127>=0.001	Not Binding	0
G135	Hoggets	340	G135>=0.001	Not Binding	340
K135	Hoggets	0	K135>=0.001	Binding	0
E147	No. sold Fm	0	E147>=0	Binding	0
H147	No. sold Fm	0	H147>=0	Binding	0
E202	No. sold Fm	0	E202>=0	Binding	0
H202	No. sold Fm	0	H202>=0	Binding	0
G182	Hoggets	0	G182>=0	Not Binding	0
K190	Hoggets	0	K190>=0	Binding	0
G190	Hoggets	0	G190>=0.001	Binding	0
E36	No. sold Fm	0	E36>=0	Binding	0
H36	No. sold Fm	0	H36>=0	Binding	0
G31	Lambs	1	G31>=0.001	Not Binding	1
G237	Hoggets	189	G237>=0	Not Binding	189
K245	Hoggets	0	K245>=0	Binding	0
E257	No. sold Fm	0	E257>=0	Binding	0
H257	No. sold Fm	0	H257>=0	Binding	0
G245	Hoggets	345	G245>=0.001	Not Binding	345
H123	Hogg's	0	H123>=0.001	Binding	0
H178	Hogg's	0	H178>=0	Binding	0
H233	Hogg's	0	H233>=0	Binding	0
C347	Hoggets	452	C347>=0.001	Not Binding	452
C402	Hoggets	0	C402>=0.001	Binding	0
C457	Hoggets	0	C457>=0.001	Binding	0
C512	Hoggets	837	C512>=0.001	Not Binding	837
G292	Hoggets	155	G292>=0	Not Binding	155
G347	Hoggets	354	G347>=0	Not Binding	354
G402	Hoggets	504	G402>=0	Not Binding	504
G457	Hoggets	0	G457>=0	Not Binding	0
G512	Hoggets	549	G512>=0	Not Binding	549
G300	Hoggets	432	G300>=0.001	Not Binding	432

G355	Hoggets	0	G355>=0.001	Binding	0
G410	Hoggets	470	G410>=0.001	Not Binding	470
G465	Hoggets	868	G465>=0.001	Not Binding	868
G520	Hoggets	0	G520>=0.001	Binding	0
K300	Hoggets	0	K300>=0	Binding	0
K355	Hoggets	0	K355>=0	Binding	0
K410	Hoggets	0	K410>=0	Binding	0
K465	Hoggets	336	K465>=0	Not Binding	336
K520	Hoggets	0	K520>=0	Binding	0
E312	No. sold Fm	0	E312>=0	Binding	0
E367	No. sold Fm	0	E367>=0	Binding	0
E422	No. sold Fm	0	E422>=0	Binding	0
E477	No. sold Fm	693	E477>=0	Not Binding	693
E532	No. sold Fm	1543	E532>=0	Not Binding	1543
H312	No. sold Fm	0	H312>=0	Binding	0
H367	No. sold Fm	0	H367>=0	Binding	0
H422	No. sold Fm	0	H422>=0	Binding	0
H477	No. sold Fm	1132	H477>=0	Not Binding	1132
H532	No. sold Fm	815	H532>=0	Not Binding	815
H288	Hogg's	0	H288>=0	Binding	0
H343	Hogg's	0	H343>=0	Binding	0
H453	Hogg's	0	H453>=0	Not Binding	0
H508	Hogg's	0	H508>=0	Binding	0
H398	Hogg's	0	H398>=0	Binding	0
E130		485	E130>=0.001	Not Binding	485
I131		340	I131>=0.001	Not Binding	340
J122		0	J122>=0.001	Binding	0
E75		499	E75>=0.001	Not Binding	499
I76		0	I76>=0.001	Not Binding	0
E185		812	E185>=0.001	Not Binding	812
I186		250	I186>=0.001	Not Binding	250
E240		790	E240>=0.001	Not Binding	790
I241		529	I241>=0.001	Not Binding	529
E295		737	E295>=0.001	Not Binding	737
I296		826	I296>=0.001	Not Binding	826
E350		1346	E350>=0.001	Not Binding	1346
I351		615	I351>=0.001	Not Binding	615
E405		1496	E405>=0.001	Not Binding	1496
I406		928	I406>=0.001	Not Binding	928
E460		1099	E460>=0.001	Not Binding	1099
I461		1895	I461>=0.001	Not Binding	1895
E515		2194	E515>=0.001	Not Binding	2194
I516		1406	I516>=0.001	Not Binding	1406
J177	Hogg's	0	J177>=0.001	Binding	0
J232	Hogg's	0	J232>=0.001	Binding	0
J287	Hogg's	0	J287>=0.001	Binding	0
J342	Hogg's	0	J342>=0.001	Binding	0
J397	Hogg's	0	J397>=0.001	Binding	0
J452	Hogg's	0	J452>=0.001	Not Binding	0
J507	Hogg's	0	J507>=0.001	Binding	0
D31	Lambs	924	D31>=0.001	Not Binding	924
C182	Hoggets	449	C182>=0.001	Not Binding	449
C237	Hoggets	0	C237>=0.001	Binding	0
C292	Hoggets	0	C292>=0.001	Binding	0
Q129	Variable 1	0.237328	Q129<=1	Not Binding	0.762672
Q129	Variable 1	0.237328	Q129>=0.000001	Not Binding	0.237327
Q130	Variable 2	0.964907	Q130<=1	Not Binding	0.035093
Q130	Variable 2	0.964907	Q130>=0	Not Binding	0.964907
Q131	Variable 3	0.003835	Q131<=1	Not Binding	0.996165

Q131	Variable 3	0.003835	Q131>=0.000001	Not Binding	0.003834
Q73	Variable 1	0.999102	Q73<=1	Binding	0.000000
Q73	Variable 1	0.999102	Q73>=0	Not Binding	0.999102
Q132	Variable 4	0.970690	Q132<=1	Not Binding	0.029310
Q132	Variable 4	0.970690	Q132>=0	Not Binding	0.970690
Q133	Variable 5	1.000000	Q133<=1	Binding	0.000000
Q133	Variable 5	1.000000	Q133>=0	Not Binding	1.000000
Q134	Variable 6	0.999848	Q134<=1	Binding	0.000000
Q134	Variable 6	0.999848	Q134>=0.000001	Not Binding	0.999847
Q74	Variable 2	1.000000	Q74<=1	Binding	0.000000
Q74	Variable 2	1.000000	Q74>=0	Not Binding	1.000000
Q75	Variable 3	1.000000	Q75<=1	Binding	0.000000
Q75	Variable 3	1.000000	Q75>=0	Not Binding	1.000000
Q76	Variable 4	1.000000	Q76<=1	Binding	0.000000
Q76	Variable 4	1.000000	Q76>=0	Not Binding	1.000000
Q135	Variable 7	0.083364	Q135<=1	Not Binding	0.916636
Q135	Variable 7	0.083364	Q135>=0	Not Binding	0.083364
Q183	Variable 1	0.999979	Q183<=1	Binding	0.000000
Q183	Variable 1	0.999979	Q183>=0	Not Binding	0.999979
Q184	Variable 2	0.973234	Q184<=1	Not Binding	0.026766
Q184	Variable 2	0.973234	Q184>=0.000001	Not Binding	0.973233
Q185	Variable 3	0.000085	Q185<=1	Not Binding	0.999915
Q185	Variable 3	0.000085	Q185>=0	Binding	0.000000
Q186	Variable 4	0.000000	Q186<=1	Not Binding	1.000000
Q186	Variable 4	0.000000	Q186>=0.000001	Binding	0.000000
Q187	Variable 5	0.972614	Q187<=1	Not Binding	0.027386
Q187	Variable 5	0.972614	Q187>=0	Not Binding	0.972614
Q188	Variable 6	1.000000	Q188<=1	Binding	0.000000
Q188	Variable 6	1.000000	Q188>=0	Not Binding	1.000000
Q189	Variable 7	1.000000	Q189<=1	Binding	0.000000
Q189	Variable 7	1.000000	Q189>=0	Not Binding	1.000000
Q190	Variable 8	0.022716	Q190<=1	Not Binding	0.977284
Q190	Variable 8	0.022716	Q190>=0	Not Binding	0.022716
Q238	Variable 1	0.999869	Q238<=1	Binding	0.000000
Q238	Variable 1	0.999869	Q238>=0	Not Binding	0.999869
Q239	Variable 2	0.000003	Q239<=1	Not Binding	0.999997
Q239	Variable 2	0.000003	Q239>=0.000001	Binding	0.000000
Q240	Variable 3	0.975340	Q240<=1	Not Binding	0.024660
Q240	Variable 3	0.975340	Q240>=0	Not Binding	0.975340
Q241	Variable 4	0.000001	Q241<=1	Not Binding	0.999999
Q241	Variable 4	0.000001	Q241>=0.000001	Binding	0.000000
Q242	Variable 5	0.972053	Q242<=1	Not Binding	0.027947
Q242	Variable 5	0.972053	Q242>=0	Not Binding	0.972053
Q243	Variable 6	1.000000	Q243<=1	Binding	0.000000
Q243	Variable 6	1.000000	Q243>=0	Not Binding	1.000000
Q244	Variable 7	1.000000	Q244<=1	Binding	0.000000
Q244	Variable 7	1.000000	Q244>=0	Not Binding	1.000000
Q245	Variable 8	0.000073	Q245<=1	Not Binding	0.999927
Q245	Variable 8	0.000073	Q245>=0	Binding	0.000000
Q293	Variable 1	1.000000	Q293<=1	Binding	0.000000
Q293	Variable 1	1.000000	Q293>=0	Not Binding	1.000000
Q294	Variable 2	0.000002	Q294<=1	Not Binding	0.999998
Q294	Variable 2	0.000002	Q294>=0.000001	Binding	0.000000
Q295	Variable 3	0.974831	Q295<=1	Not Binding	0.025169
Q295	Variable 3	0.974831	Q295>=0	Not Binding	0.974831
Q296	Variable 4	0.000001	Q296<=1	Not Binding	0.999999
Q297	Variable 5	0.972052	Q297<=1	Not Binding	0.027948
Q297	Variable 5	0.972052	Q297>=0	Not Binding	0.972052
Q298	Variable 6	1.000000	Q298<=1	Binding	0.000000

Q298	Variable 6	1.0	00000	Q298>=0	Not Binding	1.000000
Q299	Variable 7	1.0	00000	Q299<=1	Binding	0.000000
Q299	Variable 7	1.0	00000	Q299>=0	Not Binding	1.000000
Q300	Variable 8	0.0	00080	Q300<=1	Not Binding	0.999920
Q300	Variable 8	0.0	00080	Q300>=0	Binding	0.000000
Q348	Variable 1	0.9	99032	Q348<=1	Binding	0.000000
Q348	Variable 1	0.9	99032	Q348>=0	Not Binding	0.999032
Q349	Variable 2	0.9	74589	Q349<=1	Not Binding	0.025411
Q349	Variable 2	0.9	74589	Q349>=0.000001	Not Binding	0.974588
Q352	Variable 5	0.9	72737	Q352>=0	Not Binding	0.972737
Q353	Variable 6	1.0	00000	Q353<=1	Binding	0.000000
Q353	Variable 6	1.0	00000	Q353>=0	Not Binding	1.000000
Q354	Variable 7	1.0	00000	Q354<=1	Binding	0.000000
Q354	Variable 7	1.0	00000	Q354>=0	Not Binding	1.000000
Q355	Variable 8	0.0	00014	Q355<=1	Not Binding	0.999986
Q355	Variable 8	0.0	00014	Q355>=0	Binding	0.000000
Q403	Variable 1	1.0	00000	Q403<=1	Binding	0.000000
Q403	Variable 1	1.0	00000	Q403>=0	Not Binding	1.000000
Q404	Variable 2	0.0	00002	Q404<=1	Not Binding	0.999998
Q405	Variable 3	0.9	74430	Q405<=1	Not Binding	0.025570
Q405	Variable 3	0.9	74430	Q405>=0	Not Binding	0.974430
Q406	Variable 4	0.0	00001	Q406<=1	Not Binding	0.999999
Q406	Variable 4	0.0	00001	Q406>=0.000001	Binding	0.000000
Q407	Variable 5	0.9	72795	Q407<=1	Not Binding	0.027205
Q407	Variable 5	0.9	72795	Q407>=0	Not Binding	0.972795
Q408	Variable 6	1.0	00000	Q408<=1	Binding	0.000000
Q408	Variable 6	1.0	00000	Q408>=0	Not Binding	1.000000
Q409	Variable 7	1.0	00000	Q409<=1	Binding	0.000000
Q409	Variable 7	1.0	00000	Q409>=0	Not Binding	1.000000
Q410	Variable 8	0.0	00021	Q410<=1	Not Binding	0.999979
Q458	Variable 1	1.0	00000	Q458<=1	Binding	0.000000
Q458	Variable 1	1.0	00000	Q458>=0	Not Binding	1.000000
Q459	Variable 2	0.0	00002	Q459<=1	Not Binding	0.999998
Q459	Variable 2	0.0	00002	Q459>=0.000001	Binding	0.000000
Q410	Variable 8	0.0	00021	Q410>=0	Binding	0.000000
Q460	Variable 3	0.9	74587	Q460<=1	Not Binding	0.025413
Q460	Variable 3	0.9	74587	Q460>=0	Not Binding	0.974587
Q461	Variable 4	0.9	71927	Q461<=1	Not Binding	0.028073
Q461	Variable 4	0.9	71927	Q461>=0.000001	Not Binding	0.971926
Q462	Variable 5	0.0	30739	Q462<=1	Not Binding	0.969261
Q462	Variable 5	0.0	30739	Q462>=0	Not Binding	0.030739
Q463	Variable 6	1.0	00000	Q463<=1	Binding	0.000000
Q463	Variable 6	1.0	00000	Q463>=0	Not Binding	1.000000
Q464	Variable 7	1.0	00000	Q464<=1	Binding	0.000000
Q464	Variable 7	1.0	00000	Q464>=0	Not Binding	1.000000
Q465	Variable 8	0.0	00201	Q465<=1	Not Binding	0.999799
Q465	Variable 8	0.0	00201	Q465>=0	Binding	0.000000
Q513	Variable 1	1.0	00000	Q513<=1	Binding	0.000000
Q513	Variable 1	1.0	00000	Q513>=0	Not Binding	1.000000
Q514	Variable 2	0.9	74455	Q514<=1	Not Binding	0.025545
Q514	Variable 2	0.9	74455	Q514>=0.000001	Not Binding	0.974454
Q515	Variable 3	0.0	00047	Q515<=1	Not Binding	0.999953
Q515	Variable 3	0.0	00047	Q515>=0	Binding	0.000000
Q516	Variable 4	0.0	00001	Q516<=1	Not Binding	0.999999
Q516	Variable 4	0.0	00001	Q516>=0.000001	Binding	0.000000
Q517	Variable 5	0.9	72721	Q517<=1	Not Binding	0.027279
Q517	Variable 5	0.9	72721	Q517>=0	Not Binding	0.972721
Q518	Variable 6	1.0	00000	Q518<=1	Binding	0.000000
Q518	Variable 6	1.0	00000	Q518>=0	Not Binding	1.000000

Q519	Variable 7	1.(	00000	Q519<=1	Binding	0.000000
Q519	Variable 7	1.(	00000	Q519>=0	Not Binding	1.000000
Q520	Variable 8	0.(	00000	Q520<=1	Not Binding	1.000000
Q520	Variable 8	0.(	00000	Q520>=0	Binding	0.000000
Q350	Variable 3	0.(	00087	Q350<=1	Not Binding	0.999913
Q350	Variable 3	0.(	00087	Q350>=0	Binding	0.000000
Q351	Variable 4	0.(	00001	Q351<=1	Not Binding	0.999999
Q352	Variable 5	0.9	72737	Q352<=1	Not Binding	0.027263
Q20	Variable 1	0.9	99103	Q20<=1	Binding	0.000000
Q20	Variable 1	0.9	99103	Q20>=0.0001	Not Binding	0.999003
Q296	Variable 4	0.(	00001	Q296>=0.000001	Binding	0.000000
Q351	Variable 4	0.(	00001	Q351>=0.000001	Binding	0.000000
Q404	Variable 2	0.(	00002	Q404>=0.000001	Binding	0.000000