Report of the capacity building activity for estimating the camel productions in the study areas of the PROCAMED project (Montpellier, 14-18 April 2014)

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1. Introduction and objective of the activity

Two visitors (Moharram Fouad El-Bassiony from DRC Egypt, and Mohamed Jaouad from IRA Tunisia) were hosted by CIRAD Montpellier (UMR SELMET, Campus International de Baillarguet) for the period 14-18 April 2013.

The objective of the visit was to reinforce the capacity of the visitors (trainees) for estimating the camel productions at the scale of the PROCAMED project study areas using herd growth models. This visit was the continuation of a first training delivered by CIRAD in June 2012 on the ALIVE toolkit for estimating national productions of ruminants' populations.

2. Program of the activity

- Day 1: Module STEADY1 of DYNMOD, general principles and examples (M. Lesnoff, CIRAD)
- Days 2-3: Building of the herd parameters tables (input data for DYNMOD) for Egypt and Tunisia and simulation of the camel productions using the module STEADY1 of DYNMOD (M. Lesnoff, CIRAD)
- Day 4: Using module PROJ of DYNMOD to estimate the camel productions over a 20-year period (M. Lesnoff, CIRAD)
- Day 5: Training on the economic modules of the ALIVE Toolkit (C. Dutilly, CIRAD)

3. Method

During the visit, the camel productions of the study areas of the PROCAMED project (Egypt and Tunisia) were estimated by using the simple herd growth spreadsheet model DYNMOD (http://livtools.cirad.fr). Two modules of DYNMOD were used by the trainees: STEADY1, which represents one single average year of production, and PROJ, which represents a 20-year projection for which the annual parameters can be constant or variable with time. The ALIVE toolkit was also used for economical calculations (financial performances and household analysis): ECORUM (implementation of DYNOD-PROJ) and the household sheet.

The capacity building activity with DYNMOD focused on two main objectives: (1) estimating the production of a livestock population, (2) estimating the impact of different interventions or strategies on the productions (giving the bases for cost-benefit analyses of the strategies and interventions).

For Egypt, the PROCAMED study area was the Marsa-Matrouh governorate composed of three regions: Matrouh, Barani and Nigela. For Tunisia, the PROCAMED study area was composed of three governorates: Medinine, Gabes, Tataouine and Kibeli.

The input data used for the DYNMOD simulations are presented below in preliminary summary tables of the herd performances. These input data were summarized from national reports (Egypt and Tunisia) and guess estimates of the trainees. These tables represented average camel herd parameters for situations with no shocks, i.e. without major outbreaks or drought.

- **Animal numbers (living stock)**

Egypt

| | Minstry of Agriculture | | | | | FAOSTAT | | |
| | Nb. animals | | | | | Nb. animals | Nb. imported | Estimated nb. living animals |
Year	Matrouh	Barani	Nigela	Total Gov.	Total Egypt	Total Egypt		
2000	-	-	-			141 000	61 354	79 646
2001	-	-	-	-	-	134 000	99 651	34 349
2002	-	-	-	-	-	127 000	77 284	49 716
2003	-	-	-	-	-	135 000	48 867	86 133
2004	-	-	-	-	-	135 000	39 711	95 289
2005	-	-	-	-	-	120 000	45 456	74 544
2006	-	-	-	-	-	148 000	63 791	84 209
2007	-	-	-	-	-	83 951	64 371	19 580
2008	-	-	-	-	-	107 372	33 379	73 993
2009	-	-	-	23 000	-	137 112	37 540	99 572
2010	-	-	-	17 700	140 000	110 571	53 271	57 300
2011	-	-	-	18 000	140 500	107 000	-	-
2012	-	-	-	-	-	-	-	-
2013	-	-	-	-	-	-	-	-
2014	2 500	5 000	2 500	10 000	-	-	-	-

Tunisia

| Ministry of Agriculture | | | | | | | |
| Nb. adult females | | | | | | | |
Year	Medenine	Tataouine	Kebili	Gabes	Total 4 gov.	Total Tunisia	
2001	14 600	25 000	13 823	1 100	54 523	69 123	
2002	14 100	25 000	13 814	1 100	54 014	68 614	
2003	14 100	25 000	13 814	1 400	54 314	68 914	
2004	18 930	25 000	8 000	1 400	53 330	67 930	
2005	18 800	25 000	13 750	1 400	58 950	73 550	
2006	18 800	25 000	13 750	1 400	58 950	73 550	
2007	19 000	25 000	13 750	1 400	59 150	73 750	
2008	19 000	25 000	13 750	1 400	59 150	73 750	
2009	19 000	9 000	13 750	1 300	43 050	57 650	
2010	19 000	9 000	13 750	600	42 350	56 950	
2011	19 000	9 000	13 750	600	42 350	56 950	
2012	19 000	11 700	13 750	1 550	46 000	60 600	
							FAOSTAT
Estimated Nb. animals (assuming that adult females represents 51% of the population)							**Nb. animals**
Year	Medenine	Tataouine	Kebili	Gabes	Total 4 gov.	Total Tunisia	Total Tunisia
2001	28 627	49 020	27 104	2 157	106 908	135 535	235 000
2002	27 647	49 020	27 086	2 157	105 910	134 537	235 000
2003	27 647	49 020	27 086	2 745	106 498	135 125	235 000
2004	37 118	49 020	15 686	2 745	104 569	133 196	235 000
2005	36 863	49 020	26 961	2 745	115 588	144 216	235 000
2006	36 863	49 020	26 961	2 745	115 588	144 216	235 000
2007	37 255	49 020	26 961	2 745	115 980	144 608	235 000
2008	37 255	49 020	26 961	2 745	115 980	144 608	235 000
2009	37 255	17 647	26 961	2 549	84 412	113 039	235 000
2010	37 255	17 647	26 961	1 176	83 039	111 667	235 000
2011	37 255	17 647	26 961	1 176	83 039	111 667	237 000
2012	37 255	22 941	26 961	3 039	90 196	118 824	-

- **Demographic data**

Egypt

Sex	Age class	Structure (%)	Rates (%)	
			Parturition	**Death**
F	J	8	–	9-13
	SA	19	–	6
	A	64	36-44	2
M	J	4	–	9-13
	SA	3	–	6
	A	1	–	2

Tot.	F	92	–	–
	M	8	–	–

Tunisia

Sex	Age class	Structure (%)	Rates (%)	
			Parturition	**Death**
F	J	9	–	8-10
	SA	29	–	6
	A	51	40-45	2
M	J	7	–	8-10
	SA	3	–	6
	A	1	–	2

Tot.	F	89	–	–
	M	11	–	–

- **Other production data**

Egypt

Sex	Age class	Live weight (kg/animal)	Financial value (1,000 L.E/animal)
F	J	95 (40-150)	3.5 (3-4)
	SA	325 (150-500)	5 (4.5-5.5)
	A	500	7.5 (7-8)
M	J	95 (40-150)	3.7 (3.5-4)
	SA	375 (150-600)	6 (5-7)
	A	600	10 and more

Meat price	30 L.E/kg meat
Dressing-out percentage	55%
Milk yield/female/lactation (for farmer)	Intensive system 1800 l Extensive system 2l/days over 10 months (7-12 months) = 606 l PROCAMED study area: 99% are extensive farms ➔ 606 l
Milk price	8 L.E./l

Tunisia

Sex	Age class	Live weight (kg/animal)	Financial value (1,000 dinars/animal)
F	J	100 (95-105)	1
	SA	285	1.3
	A	490	2
M	J	100 (95-105)	1
	SA	285	1.5
	A	510	1.7

Meat price	7 dinars / kg meat
Dressing-out percentage	50%
Milk yield/female/lactation (for farmer)	909 l 6l/days/female over 10 months = 1818 l; half of this production is given to the young
Milk price	5 dinars/l

4. Examples of results

4.1. STEADY1 outputs

The objective was to predict the 1-year productions and dry matter requirements (year 2014 for Egypt and year 2012 for Tunisia) of the camel populations of the project study areas under two hypothetical scenarios of annual population growth rate (0% and 2%). Estimates calculated from STEADY1 are presented below.

Egypt

Initial camel population size of 10,000 animals (2014)

Annual productions	Scenario 0%		Scenario 2%	
	Total production (Offtake + SV)	Offtake[a]	Total production (Offtake + SV)	Offtake
Animal number	1,896	–	1,911	1,714
Rate (%)	19.0	–	18.9	17.0
Live weight (t)	457	–	469	392
Meat (t)	251	–	258	216
Financial (1,000 L.E.)	9,328	–	9,564	8,338

(a) For the scenario "growth rate 0%", the offtake are equal to the total production (the stock variation SV is zero).

Milk production [a]	Scenario 0%	Scenario 2%
Quantity (1,000 l)	1,419	1,430
Rate (l/adult female/year)	242	245

(a) Milk collected by the farmers.

Dry mater requirements	Scenario 0%	Scenario 2%
Quantity (t)	36,119	36,468

Tunisia

Initial camel population size of 90,200 animals (2012)

Productions	Scenario 0%		Scenario 2%	
	Total production (Offtake + SV)	Offtake[a]	Total production (Offtake + SV)	Offtake
Animal number	16,034	–	16,604	14,801
Rate (%)	17.8	–	18.2	16.2
Live weight (t)	4,402	–	4,467	3,805
Meat (t)	2,201	–	2,234	1,903
Financial (1,000 d.)	22,885	–	23,448	20,495

(a) For the scenario "growth rate 0%", the offtake are equal to the total production (the stock variation SV is zero).

Milk production [a]	Scenario 0%	Scenario 2%
Quantity (1,000 l)	18,186	18,696
Rate (l/adult female/year)	382	386

(a) Milk collected by the farmers.

Dry mater requirements	Scenario 0%	Scenario 2%
Quantity (t)	301,231	305,518

4.2. PROJ outputs

The objective was to predict the 20-year productions and dry matter requirements (from year 2014 for Egypt and year 2012 for Tunisia) of the camel populations of the project study areas under two hypothetical scenarios of annual population growth rate (0% and 2%). Estimates calculated from PROJ are presented below.

Egypt

Initial camel population size of 10,000 animals (2014)

Scenario of growth rate	Productions	Mean/year		Cumulated over projection	
		Total production (Offtake + SV)	Offtake[a]	Total production (Offtake + SV)	Offtake[a]
0%	Animal number	1,898	–	37,962	–
	Rate (%)	19.0	–	19.0	–
	Live weight (t)	458	–	9,154	–
	Meat (t)	252	–	5,035	–
	Financial (1,000 d.)	9,347	–	186,935	–
2%	Animal number	2,305	2,070	46,097	41,390
	Rate (%)	18.9	17.0	18.9	17.0
	Live weight (t)	567	472	11,332	9,446
	Meat (t)	312	260	6,232	5,195
	Financial (1,000 d.)	11,550	10,049	231,003	200,989

(a) For the scenario "growth rate 0%", the offtake are equal to the total production (the stock variation SV is zero).

Scenario of growth rate	Milk production [a]	Mean/year	Cumulated over projection
0%	Quantity (1,000 l)	1,422	28,435
	Rate (l/adult female/year)	242	242
2%	Quantity (1,000 l)	1,726	34,527
	Rate (l/adult female/year)	242	242

(a) Milk collected by the farmers.

Scenario of growth rate	Dry mater requirements	Mean/year	Cumulated over projection
0%	Quantity (t)	36,122	722,431
2%	Quantity (t)	44,009	880,186

Tunisia

Initial camel population size of 90,200 animals (2012)

Scenario of growth rate	Productions	Mean/year		Cumulated over projection	
		Total production (Offtake + SV)	Offtake [a]	Total production (Offtake + SV)	Offtake [a]
0%	Animal number	16,248	–	324,954	–
	Rate (%)	17,8	–	17,8	–
	Live weight (t)	4,468	–	89,352	–
	Meat (t)	2,234	–	44,676	–
	Financial (1,000 d.)	23,210	–	464,209	–
2%	Animal number	20,352	18,098	407,040	361,955
	Rate (%)	18.2	16.2	18.2	16.2
	Live weight (t)	5,481	4,643	109,619	92,856
	Meat (t)	2,740	2,321	54,810	46,428
	Financial (1,000 d.)	28,758	25,648	575,166	500,951

(a) For the scenario "growth rate 0%", the offtake are equal to the total production (the stock variation SV is zero).

Scenario of growth rate	Milk production [a]	Mean/year	Cumulated over projection
0%	Quantity (1,000 l)	18,432	368,633
	Rate (l/adult female/year)	382	382
2%	Quantity (1,000 l)	22,920	458,396
	Rate (l/adult female/year)	382	382

(a) Milk collected by the farmers.

Scenario of growth rate	Dry mater requirements	Mean/year	Cumulated over projection
0%	Quantity (t)	304,912	6,098,246
2%	Quantity (t)	374,181	7,483,612

5. Financial performance of camel production systems and household analysis

The last day of the visit was dedicated to household analysis (with C Dutilly) and consisted in:

- Exchanging about last updates regarding data collection and data entry
    - Tunisia: all expected sampled households (164) have been interviewed by December 2013. Only 114 have been entered and data entry is still under process.
    - Egypt: 200 households have been surveyed (using same questionnaire as Tunisian one). Data entry is still in process under Excel.

- Key variables creation:
    - Agricultural income: need to estimate it by multiplying the nb. ha cultivated of each crop by the net income of the crops.
    - Off-farm income: total number of month worked by all family members* average income per month
    - Labor allocation: average allocation per family members

- Typology:
    - Use a typology proposed by the toolkit and considering 2 or 3 classes of herd size (small/medium/large) balancing representativeness of herds and animal population in each class.
    - Specialized systems (milk/meat/tourism) should not be part of this "household" analysis and be analyzed separately (with specific ECORUM)

- Financial estimation in ECORUM (diagnostic)
    - Selection "option 2" in about
    - Reconsider milk production figures in projection!
    - Duplicate ECORUM filled during the visit 2 or 3 times (according if you work with 2 or 3 herd sizes)
    - In projection: change herd size according to average herd size of each class (coming from the household tool once the typo has been done there).
    - Fill the diagnostic for a representative herd of this size
    - Be careful! Always work with weighted costs considering some farmers will have the costs and other not (ex. Vaccination or herding costs).
    - Check for the price of meat that has been computed by the model and modify live animal process or weight if something is going wrong (remember this is price and weight for an animal in the middle of the age category)
    - Fill other parameters and % of meat/milk/skins that are self-consumed / sold directly / sold through intermediary / not used. Be careful with the % milk self-consumed that need to take into account for herd size and family size/consumption seasonality.
    - Look in synthesis for the main results you're going to use later on in the analysis: in particular net income per animal in H66 (always look at average year).

- Household tool and analysis
    - Select "Option 2a" in about
    - In worksheet "Option 2a" add as many ID (in column A) as you have observations, unprotect the worksheet if necessary (code is : ur18)

- Prepare in another excel sheet all the variables necessary using the same order of columns
- Copy and paste in the houshehold tool "option 2a" worksheet , columns (B, C, D, E, F, K, P, S, T, U, V, W, X, AD)
- Adapt the typology by default to your need in (I-J / 38-64) area: make it 1 herd size only for cattle, sheep, goat and poultry and 2 or 3 categories for camel). Play around with definition of classes until you are satisfied with the average herd size, % herd, % animals in each category (synthesis lines under 85). Use these average herd size of camel categories in the ECORUM above.
- In worksheet "param_A3" fill the TLU, per capita poverty line, and calorie/protein content in the top. Then input by hand (do not use the import button it is not activated) all net income / cash income/ production parameters per animal that you can derivate from the ECORUM synthesis results for camels. Same for % self-consumption.
- For other species either to a quick ECORUM with expert or using secondary data , doing a study state model or if available use referenced parameters. Make sure they are consistent with the camel results of ECORUM (you do not want a sheep having a net income higher than a cow or a camel!).
- Check that average income per capita in O45 in "typo_HHI" is not far from other sources of information (socio-economic studies). And that key results are in line with expected and coherent.
- Enjoy the analysis and build your report based on it!
- If necessary, do parallel stats analysis using your own stat software (spss, excel, ..) to complete / go deeper in certain aspects you would have had identified as important to develop.

Remember:
Never erase/add columns or lines. Be careful with formula in excel cells that are not in white
You can add/ modify the graphs as you want to fit them with your needs (add the camels in the figures , etc..)

- Perspectives
    - Tunisian and Egyptian teams are responsible to
        - Finalize data entry
        - Construct the key variables (income, labor, ..)
        - Define the typology
        - Do the financial analysis of ECORUM
        - Enter and interpret the results of the household tool
    - With Celine:
        - Plan for 2 days of work in Montpellier after summer with the objective to discuss the results and help in the interpretation.

6. Overall recommendations

- The numbers of heads of camels living in the PROCAMED study areas (population sizes) is a very important data for estimating the camel productions. Large uncertainties seem to exist on these population sizes, in particular for Tunisia where FAO data are very different from data of Ministry of Agriculture (see section 3). It is recommended to the trainees to consolidate these data on the population sizes with the national services and other available sources of data.

- The herd and animal performances data used for this activity (see summary tables of section 3) were preliminary estimates. These estimates could be improved by gathering more data from literature on camel production systems of Egypt, Tunisia and countries with similar production systems. It is recommended to the trainees to build such more detailed tables of camel herd and animal performances and to use them to get new average estimates.

- In particular, the average milk production per lactation (milk auto-consumed or commercialized) reported in the summary performance tables, and therefore the total milk production over the study areas, may have been highly overestimated. These averages should account for days where lactating females are not milked or where the milk is not used by the household. Longitudinal surveys could be planned by the national research teams to monitor over the year the milk production (auto-consumption or commercialization) in a sample of herds, and finally to better estimate the real camel milk productions in the study areas.

- The simulations implemented during this activity and the results presented in this report are only examples of possible outputs achievable by using herd growth models for estimating and predicting the camel productions. It is recommended to the trainees to pursue and enlarge the simulations: consolidation of the data, sensitivity analyses, other scenarios, etc. Comparisons could also be made between the actual DYNMOD estimates and other production estimates reported in literature. Finally, the DYNMOD estimates could be compared with some objectives of camel productions based on the human food requirements (meat, milk). If the production estimates are lower than the objectives, DYNMOD (STEADY1 or PROJ) could be used to predict the impact of different strategies to increase the productions. For instance, strategies could target the improvement of the herd and animal performances (e.g. increasing the parturition rate and the animal live weights) or the increase of the number of animals living in the considered areas (e.g. by decreasing the offtake rates or importing new animals).

7. Annex: Sheets of STEADY1 for the scenario of camel population growth of 2%

Egypt

STEADY1 — Parameters

Age classes

Length (month)			Exact age (year) from	to
Female	Juvenile	12	0.0	1.0
	Sub-adult	36	1.0	4.0
	Adult	192	4.0	20.0
Male	Juvenile	12	0.0	1.0
	Sub-adult	36	1.0	4.0
	Adult	132	4.0	15.0

Demography

Reproduction	Ref.	Coef.	Actual
Parturition rate (/year)	0.40	1.00	0.40
Net prolificacy rate	1.00	1.00	1.00
% of female at birth	50%	1.00	50%

Mortality (%)
- /age class if Length <1 year
- /year if Length >=1 year

		Ref.	Coef.	Actual
Female	J	11%	1.00	11%
	S	6%	1.00	6%
	A	2%	1.00	2%
Male	J	11%	1.00	11%
	S	6%	1.00	6%
	A	2%	1.00	2%

Offtake (%)
- /age class if Length <1 year
- /year if Length >=1 year

		Ref.	Coef.	Actual
Female	J	2%	1.00	2%
	S	10%	1.00	10%
	A	1%	1.00	1%
Male	J	87%	1.00	87%
	S	15%	1.00	15%
	A	30%	1.00	30%

Population growth rate (%) 2.0%

Population

		Size Initial	Structure Global	Intra-sex
Female	J	1 081.1	11%	12%
	S	2 263.3	23%	25%
	A	5 841.9	58%	64%
Male	J	479.1	5%	59%
	S	210.7	2%	26%
	A	123.9	1%	15%
Total	F	9 186.3	92%	100%
	M	813.7	8%	100%
	T	10 000.0	100%	

Feeding

Dry matter requirements (% of kg LW/day)

		Ref.	Coef.	Actual
Female	J	2.5%	1.00	2.5%
	S	2.5%	1.00	2.5%
	A	2.5%	1.00	2.5%
Male	J	2.5%	1.00	2.5%
	S	2.5%	1.00	2.5%
	A	2.5%	1.00	2.5%

Type	
	bov

Production

Live weight (kg/animal)

		Ref.	Coef.	Actual
Female	J	95	1.00	95
	S	325	1.00	325
	A	500	1.00	500
Male	J	95	1.00	95
	S	375	1.00	375
	A	600	1.00	600

Meat

Carcass yield (%)	55%		55%

Financial value (/animal)

		Ref.	Coef.	Actual
Female	J	3.5	1.00	4
	S	5.0	1.00	5
	A	7.5	1.00	8
Male	J	3.7	1.00	4
	S	6.0	1.00	6
	A	10.0	1.00	10

Milk

	Ref.	Coef.	Actual
Length of milking (day)	303	1.00	303
Milk offtake/day of milking (litre)	2.0	1.00	2.0
Milk offtake/ milking period (litre)	606		606

Skin and hides (kg/animal)

		Coef.	Actual
Female	J	1.00	0.0
	S	1.00	0.0
	A	1.00	0.0
Male	J	1.00	0.0
	S	1.00	0.0
	A	1.00	0.0

Wool (kg/animal)

	Coef.	Actual
J	1.00	0.0
S	1.00	0.0
A	1.00	0.0

Manure (kg/animal/day)

	Coef.	Actual
J	1.00	0.0
S	1.00	0.0
A	1.00	0.0

Results

Population

Size

		Ini	End	Avg
Female	J	1 081.1	1 102.3	1 091.7
	S	2 263.3	2 307.6	2 285.5
	A	5 841.9	5 956.2	5 899.0
Male	J	479.1	488.4	483.8
	S	210.7	214.9	212.8
	A	123.9	126.3	125.1
Total	F	9 186.3	9 366.1	9 276.2
	M	813.7	829.6	821.6
	T	10 000.0	10 195.7	10 097.8

Mortality

Death

		Number	Nb./size	Nb./avg size
Female	J	126.4	11.7%	11.6%
	S	140.3	6.2%	6.1%
	A	118.9	2.0%	2.0%
Male	J	51.0	10.6%	10.5%
	S	13.0	6.2%	6.1%
	A	2.5	2.0%	2.0%
Total	F	385.6	4.2%	4.2%
	M	66.5	8.2%	8.1%
	T	452.1	4.5%	4.5%

Production

Offtake

		Number	Nb./size	Nb./avg size	Stock variation + Offtake Number	Nb./size	Nb./avg size
Female	J	23.2	2.1%	2.1%	44.4	4.1%	4.1%
	S	246.6	10.9%	10.8%	290.9	12.9%	12.7%
	A	345.5	5.9%	5.9%	459.9	7.9%	7.8%
Male	J	1 019.2	212.8%	210.7%	1 028.6	214.7%	212.6%
	S	35.4	16.8%	16.6%	39.5	18.7%	18.6%
	A	44.9	36.3%	35.9%	47.3	38.2%	37.8%
Total	F	615.4	6.7%	6.6%	795.2	8.7%	8.6%
	M	1 099.5	135.1%	133.8%	1 115.4	137.1%	135.8%
	T	1 714.9	17.1%	17.0%	1 910.6	19.1%	18.9%

Live weight equivalent (kg)

Avg liv. stock	3 996 468
Offtake	392 159
SV + Offtake	468 935

Milk (litre)

Avg per reprod. fem.	245
Total	1 429 922

Meat equivalent (kg)

Avg liv. stock	2 198 057
Offtake	215 688
SV + Offtake	257 914

Skin & hides (kg) 0

Wool (kg) 0

Manure (kg) 0

Financial equivalent

Avg liv. stock	63 803
Offtake	8 338
SV + Offtake	9 564

Animal productivity measures

Nb. new sub-adult/adult f.	36%
Nb. new adult/adult f.	30%

Feeding

Feed requirements (kg)

Dry matter	36 467 772

Tunisia

STEADY1   Parameters   Results

Age classes

Length (month) — Exact age (year)

		Length	from	to
Female	Juvenile	12	0.0	1.0
	Sub-adult	36	1.0	4.0
	Adult	192	4.0	20.0
Male	Juvenile	12	0.0	1.0
	Sub-adult	36	1.0	4.0
	Adult	132	4.0	15.0

Demography

Reproduction

	Ref.	Coef.	Actual
Parturition rate (/year)	0.42	1.00	0.42
Net prolificacy rate	1.00	1.00	1.00
% of female at birth	50%	1.00	50%

Mortality (%)
- /age class if Length <1 year
- /year if Length >=1 year

		Ref.	Coef.	Actual
Female	J	9%	1.00	9%
	S	6%	1.00	6%
	A	2%	1.00	2%
Male	J	9%	1.00	9%
	S	6%	1.00	6%
	A	2%	1.00	2%

Offtake (%)
- /age class if Length <1 year
- /year if Length >=1 year

		Ref.	Coef.	Actual
Female	J	2%	1.00	2%
	S	3%	1.00	3%
	A	6%	1.00	6%
Male	J	75%	1.00	75%
	S	30%	1.00	30%
	A	35%	1.00	35%

Population growth rate (%)   2.0%

Population

		Size Initial	Structure Global	Intra-sex
Female	J	9 512.7	11%	12%
	S	22 267.4	25%	28%
	A	48 487.1	54%	60%
Male	J	5 387.6	6%	54%
	S	3 388.8	4%	34%
	A	1 156.3	1%	12%
Total	F	80 267.3	89%	100%
	M	9 932.7	11%	100%
	T	90 200.0	100%	

Feeding

Dry matter requirements (% of kg LW/day)

		Ref.	Coef.	Actual
Female	J	2.5%	1.00	2.5%
	S	2.5%	1.00	2.5%
	A	2.5%	1.00	2.5%
Male	J	2.5%	1.00	2.5%
	S	2.5%	1.00	2.5%
	A	2.5%	1.00	2.5%

Type   bov

Production

Live weight (kg/animal)

		Ref.	Coef.	Actual
Female	J	100	1.00	100
	S	285	1.00	285
	A	490	1.00	490
Male	J	100	1.00	100
	S	285	1.00	285
	A	510	1.00	510

Meat

	Ref.	Coef.	Actual
Carcass yield (%)	50%		50%

Financial value (/animal)

		Ref.	Coef.	Actual
Female	J	1.0	1.00	1
	S	1.3	1.00	1
	A	2.0	1.00	2
Male	J	1.0	1.00	1
	S	1.5	1.00	2
	A	1.7	1.00	2

Milk

	Ref.	Coef.	Actual
Length of milking (day)	303	1.00	303
Milk offtake/day of milking (litre)	3.0	1.00	3.0
Milk offtake/ milking period (litre)	909		909

Skin and hides (kg/animal)

		Ref.	Coef.	Actual
Female	J		1.00	0.0
	S		1.00	0.0
	A		1.00	0.0
Male	J		1.00	0.0
	S		1.00	0.0
	A		1.00	0.0

Wool (kg/animal)

	Ref.	Coef.	Actual
J		1.00	0.0
S		1.00	0.0
A		1.00	0.0

Manure (kg/animal/day)

	Ref.	Coef.	Actual
J		1.00	0.0
S		1.00	0.0
A		1.00	0.0

Results

Population

Size / **Mortality Death**

		Ini	End	Avg	Number	Nb./size	Nb./avg size
Female	J	9 512.7	9 702.8	9 607.8	901.0	9.5%	9.4%
	S	22 267.4	22 712.5	22 490.0	1 385.0	6.2%	6.2%
	A	48 487.1	49 456.2	48 971.7	985.1	2.0%	2.0%
Male	J	5 387.6	5 495.3	5 441.5	480.1	8.9%	8.8%
	S	3 388.8	3 456.5	3 422.6	207.8	6.1%	6.1%
	A	1 156.3	1 179.4	1 167.9	23.1	2.0%	2.0%
Total	F	80 267.3	81 871.5	81 069.4	3 271.1	4.1%	4.0%
	M	9 932.7	10 131.3	10 032.0	711.1	7.2%	7.1%
	T	90 200.0	92 002.8	91 101.4	3 982.2	4.4%	4.4%

Production

Offtake / **Stock variation + Offtake**

		Number	Nb./size	Nb./avg size	Number	Nb./size	Nb./avg size
Female	J	202.3	2.1%	2.1%	392.4	4.1%	4.1%
	S	703.3	3.2%	3.1%	1 148.4	5.2%	5.1%
	A	4 511.6	9.3%	9.2%	5 480.7	11.3%	11.2%
Male	J	7 640.8	141.8%	140.4%	7 748.5	143.8%	142.4%
	S	1 240.5	36.6%	36.2%	1 308.3	38.6%	38.2%
	A	502.3	43.4%	43.0%	525.4	45.4%	45.0%
Total	F	5 417.2	6.7%	6.7%	7 021.5	8.7%	8.7%
	M	9 383.7	94.5%	93.5%	9 582.2	96.5%	95.5%
	T	14 800.9	16.4%	16.2%	16 603.7	18.4%	18.2%

Live weight equivalent (kg)

		Milk (litre)	
Avg liv. stock	33 481 400	Avg per reprod. fem.	386
Offtake	3 805 161	Total	18 696 375
SV + Offtake	4 467 025		

Meat equivalent (kg) / **Skin & hides (kg)** 0

Avg liv. stock	16 740 700
Offtake	1 902 581
SV + Offtake	2 233 513

Wool (kg) 0

Financial equivalent / **Animal productivity measures**

Avg liv. stock	149 348	Nb. new sub-adult/adult f.	38%
Offtake	20 495	Nb. new adult/adult f.	32%
SV + Offtake	23 448		

Manure (kg) 0

Feeding

Feed requirements (kg)

Dry matter	305 517 778