Study on the Kenyan Animal Feed and Fodder Sub-sectors

Trends in the Development of the Dutch Fodder Sub-Sector

(Sub-report VII)

BLGG Research bv

BLGG RESEARCH

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SNV/Kenya Netherlands Development Organisation



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1. INTRODUCTION

The BLGG consortium was contracted by SNV Kenya to carry out an Animal Feed and Fodder study in the context of the Kenya Market-led Dairy Program (KMDP). For further details on the consortium and objectives of this study reference is made to sub-report I: "Summary Report".

The goal of this study was to identify the gaps/bottlenecks that hamper the development and growth of the Kenyan feed and fodder sub-sectors, and as a result the Kenyan dairy industry. One of the objectives was to benchmark the Kenyan fodder sub-sector against the Dutch fodder sector.

This comprehensive assignment was divided in a number of sub-studies which resulted in the sub-reports as listed below. This document is sub-report VII.

No	Title	Author
Ι	Summary report	BLGG Consortium
П	Kenya dairy sector structure	BLGG Research bv
Ш	Kenya feed industry policy and regulatory issues	ABS TCM Ltd
IV	Interviews and HACCP audits of Kenyan feed manufacturers	BLGG Kenya Ltd/
		AgriQ Quest Ltd
V	Quality analysis of animal feedstuffs and fodders in Kenya	BLGG Research bv
VI	Trends in the Kenyan fodder sub-sector	Perfometer Solutions
VII	Trends in the Dutch fodder sub-sector	BLGG Research bv

Study on the Kenyan animal feed and fodder sub-sectors: Overview of the sub-reports

This short case study – which is sub-study VII of the wider study - looks into key trends in the Dutch fodder sub-sector and tries to see what lessons can be learned.

Over the past 50 years dairy farming in the Netherlands greatly intensified with emphasis on improved genetics and focus on high quality feed and fodder. These developments are described in more detail in chapter 3 of sub-report II of this study, which deals with the Dairy Sector Life Cycle in NW Europe.

During all phases of dairy farm development, primary attention was on optimization of farm income and profitability. This was achieved by a continuous and combined effort and focus by farmers, extension services and research, on milk yield per animal and reduction of the cost price of milk.

To realize higher profitability and increased total incomes from milk, dairy farmers increased the number of cows per farm and milk production per animal. The latter was achieved through breeding (genetics) and feeding: optimal rations for milk production.

The cost of feeding reduced significantly with the introduction of high protein and energy rich grasses and maize (for grazing and ensiling), with concentrates only used as supplement. The importance of on-farm establishment and preservation of fodder (crops) was witnessed by high attention for seed breeding and selection of optimal fodder crops and grasses, soil analysis and fertilization, mechanisation and innovation in harvesting and preservation technologies and logistics. This led to increased production of fodder crops per hectare and nutritive value per ton of dry matter, which helped to reduce cost price of production and seasonality in supply over the year.

The following chapters give a short overview of the key interventions that helped realize this scenario.

2. OVERVIEW OF THE DAIRY SECTOR AND FODDER CROP PRODUCTION IN THE NETHERLANDS

2.1 First half of the 20th century (1900-1950): Start-up phase

During the first half of the 20th century (1900-1950), dairy farms in the Netherlands were small (average of ± 10 cows around 1950). The main fodders used in that period were fresh grass (grazing), grass hay, fodder beets and some cereals (rye and oats). Especially the use of fodder beets as a forage for dairy cows, increased sharply during this period (Figure 1). Nowadays fodder beets have been replaced almost entirely by other fodders, mainly maize.

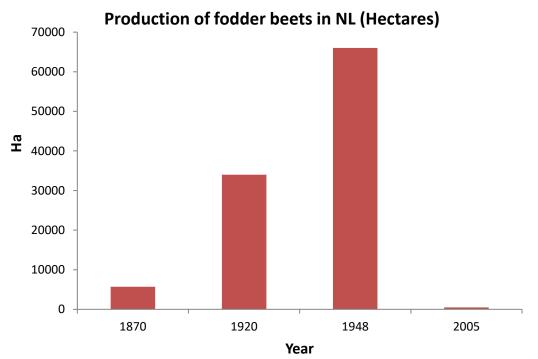


Figure 1. Production of fodder beets in the Netherlands (source: CBS Statline).

2.2 Second half of the 20th century (1950-2000): Growth phase

In the second half of 20th century (1950-2000) the dairy sector intensified quickly, mainly due to:

- Mechanisation (milking machines, forage harvesters and other farm equipment etc.)
- Increased knowledge
- New fodders (maize) and increased quality of feeds
- Use of compounded feeds (concentrates)
- Improved genetics of dairy cows
- Use of fertilizers
- Support by the government

This intensification of the dairy sector is well-illustrated by the average production of milk per dairy cow in the period 1950-2000 (Figure 2).

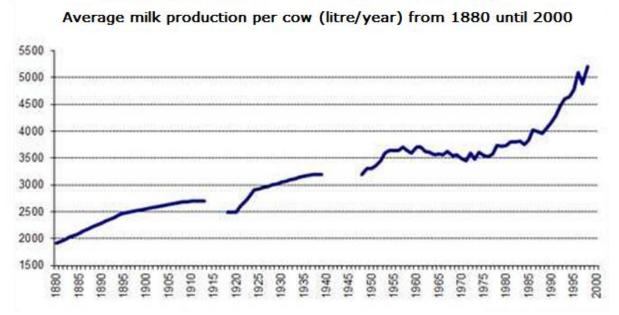


Figure 2. Average milk production per cow (litre/year) from 1880 until 2000.

This rapid increase of milk production from 1975 onwards corresponds with the increased use of maize silage (Figure 3). Although figure 3 shows a stabilization of acreages under maize from 2000 onwards, it should be noted that Dutch farmers and forage traders started leasing land and buying maize for silage in Germany and as far as Poland, indicating that the actual use of fodder maize is still growing.

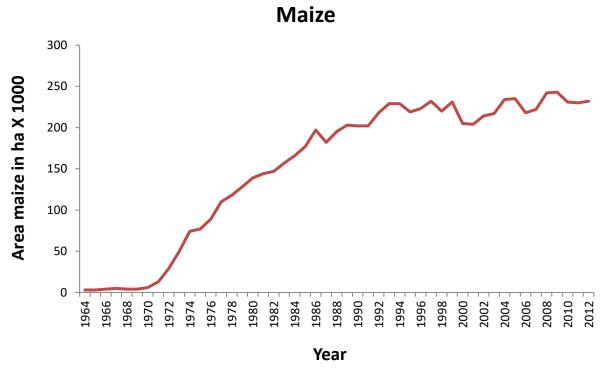


Figure 3. Area of maize production in the Netherlands from 1964-2012 (Source: CBS Statline).

In addition to the increased use of maize silage in the diet of dairy cows, the nutritive value of this maize silage increased sharply due to improved seed breeding and genetics, production and harvesting techniques, fertilization etc. The VEM (Dutch standard for net energy) increased with more than 40% in about 20 years' time, due to higher dry matter yields (bigger plants) and increased starch content of the maize (Figure 4).

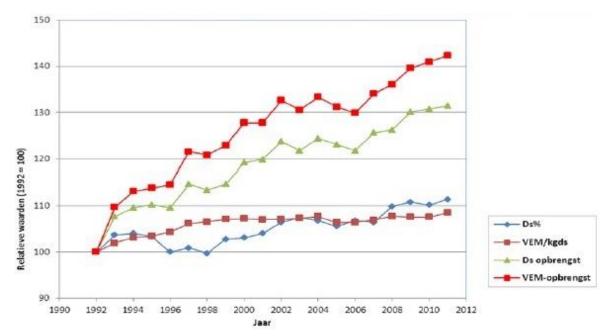


Figure 4. Increase in dry matter % (Ds%), net energy per kg DM (VEM/kgds), total dry matter yield (Ds opbrengst) and total net energy yield (VEM-opbrengst) of maize silages in the Netherlands (Source: BLGG).

Also the quality of grass silage improved significantly from ±1980 until 2010. The net energy (VEM) content of grass silages increased (Figure 5), while crude ash content decreased (Figure 6).

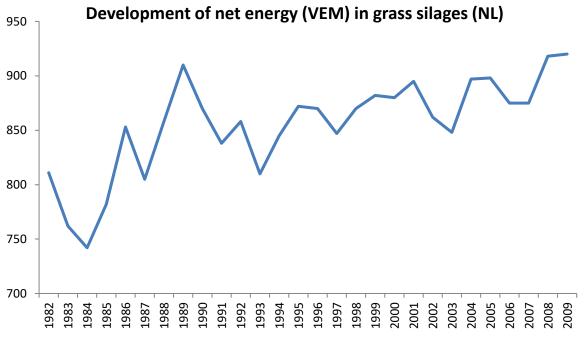


Figure 5. Development of net energy (VEM) in grass silages in the Netherlands (Source: BLGG).

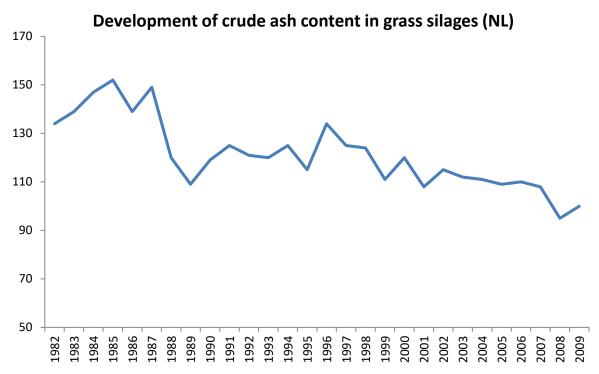


Figure 6. Development of crude ash content in grass silages in the Netherlands (Source: BLGG).

As dairy farming became more intensified and circumstances improved (e.g. genetics) the need for high quality feed and fodder increased. As a result, grass hay was largely replaced by grass silage which has a higher nutritional value (Table 1). In addition, maize silage was introduced (which replaced i.e. fodder beets) with high energy and starch content. These fodders enabled dairy farmers in the Netherlands to increase their milk production and reduce their cost price of milk at the same time, since fodders are cheaper than dairy meals.

	Grass silage	Grass hay
Net energy (VEM)	909	725
OM digestibility (%)	77	65
Crude protein	157	106
Crude fat	38	23
Sugar	106	102
NDF	488	584
NDF digestibility (%)	72	52
ADF	266	324
ADL	22	37

Table 1. Average nutritive value of grass silage vs grass hay (both *Lolium perenne*) in The Netherlands (2012, Source: BLGG).

3. TRENDS IN THE DEVELOPMENT OF TECHNOLOGY AND MECHANISATION

One of the important drivers that enabled the fodder sub-sector to develop and intensify was mechanisation and the introduction of various innovative technologies. For example, the use of advanced forage harvesters allowed that the maize was harvested at a more mature stage (with higher starch content but also tougher kernels). The kernel processor crushes the maize kernels which improves the digestibility and therefore utilization of nutrients (especially starch) of maize silage (Figure 7). The use of this technology allowed the nutritional value of maize silage to increase significantly as shown in previous chapter.



Figure 7. Example of a kernel processor on a modern harvester.

Another important factor was the adoption of improved silage preservation techniques for grass or maize silage. This is important since optimal preservation prevents the loss of nutrients during storage of the silage. The use of improved machinery and preservation techniques enabled the formation of large silo's or pits for preservation of grass and maize silage (Figure 8). Due to the optimized circumstances, nutrient losses were minimized and the nutritional value of grass silage increased significantly (Figure 5 and 6).



Figure 8. Grass silage production in The Netherlands.

Top left: mowing of grass. Top right: harvesting of dried grass. Bottom left: establishment of the grass silo or pit. Bottom right: preserved grass silage ready to feed to the animal.

A more recent development in technology is the use of ensiled bales. This technology is used both for maize and grass silage. The pictures below concern grass bale ensilaging.

After the grass is mowed and dried on the field it is baled and wrapped in plastic and the silage process takes place in the bale (Figure 9). This practice has a few advantages:

- No spoilage/heating since only one bale is opened at a time
- Faster conservation since bales are smaller than a large silo
- Higher nutritive value per kg dry matter.
- More flexible in logistics, transportable and tradable

Annex 1 gives an overview of gains in milk and meat production when using maize silage bales versus maize bunker or pit silage.



Figure 9. Production of grass silage bales. Left: square bales. Right: round bales.



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Forage test : October 2008 - August 2009

Forage :	Maize, harvested from same field, the same day.
Conservation 1:	Orkel MP 2000 bales
Conservation 2:	Bunker silo, concrete walls and floor
Conservation time:	Conservation time: October 2008 - August 2009

Forage analysis Aug. 5th 09:	Orkel bale	Bunker silo
Hd	4,4	3,8
N-NH3/N	S	п
Mycotoxines (ppm(mg/kgDM))	1200	2500
Temperature 24 h after distribution of maize (°C)	17,04	23,30
Temperature 48 h after distribution of maize (°C)	18,70	32,00

Feeding test of cows prepared for slaughtery

Finishing 90 days fed with 50% maize and 50% concentration beefmash Breed: White Belgian Blue (BBB)

	Orkel bale	Orkel bale Bunker silo
Number of cows in feeding test	12	12
Days of feeding	90	90
mix consumption (kg, average/cow)	1467	1782
Live weight by time of slaughtery (kg, average)	781	774
Weight of body after slaughtery (kg, average)	486	470
Weight of cold body after 48 h (kg, average)	478	455
Slaughtery percentage: (cold weight/live weight-5%)	64,4	61,9

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GEMBLOUX



Professor Yves Beckers



Forage test : October 2008 - August 2009

Economical consequence sample			Difference
			in favour of
	Orkel bale	Bunker silo	Orkel bale
Weight of cold body after 48 h (kg, average) / slaughtery			1.50
percentage	478/64,40%	455/61,90%	23 kg
Meat price to farmer (EUR/kg)	4,30	4,30	98,90 €
Production cost maize (EUR/ton)	47	35	
Consumption of forage mix (kg/90days)	1467	1782	315 kg
Cost price of forage mix consumed pr cow (EUR)	435,69	507,87	72,18 €
Difference or 100 cows			17 108.00 €

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Further comments to the economics:

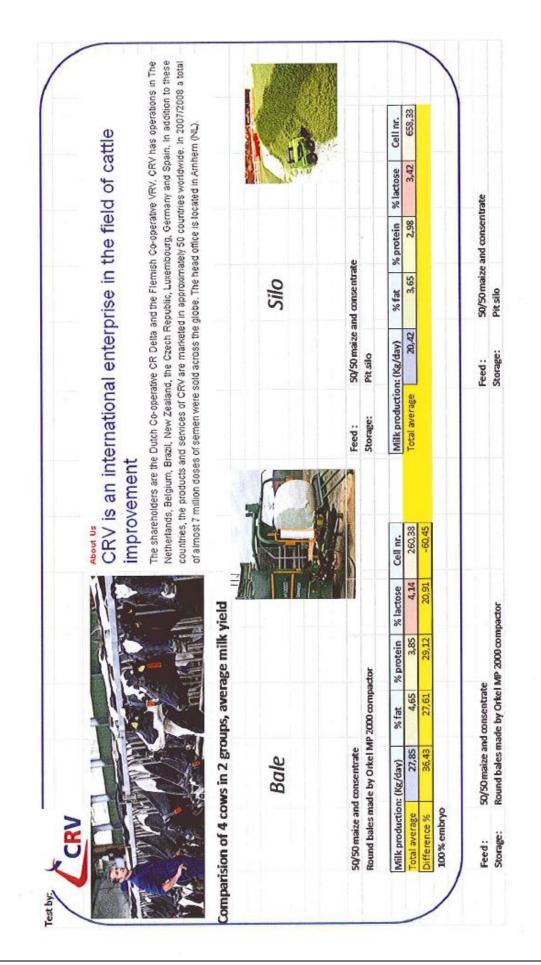
f the maize is dry (< 40 % d.m.) at the time of harvesting, it is experienced to be Forage losses in bunker silo normally high during summertime. (not calculated) difficult to achieve a good conservation in the bunker silo.

rumen by 46 minutes. The benefit of the Orkel bale is confirmed to be less use of starch, soluble sugars etc. This was stated by a delay of fermentation in the cow The experience of the Orkel bale is a complete different reaction of lactic acids, energy in the cow's rumen, which also implies less production of methane.



ANNEX 1:

started



lorage:		d consentrate					Feed :	50/50 maize a	and consentr	ate		
	Round bales ma	de by Orkel M	1P 2000-comp	actor			Storage:	Pitsilo			1	
ame of cow							Name of cow:	Elke 007				
eg. number om date:	12.02.2008						Reg. number: Born date:	n1342544441 08.03.2006				
st lactation:							Ist lactation:	22.07.2010				
ather:	Kian						Father:	Kian				
Aother:	Minke 40						Mother:	Minke 40				
	Milk production	(Kg/day)	% fat	% protein	% factose	Cell nr.	Milk productio		% fat	% protein	% lactose	Cell nr.
	20.08.2010	285	4,88	3,41	4,59	52 39	28.08.2010 20.09.2010	23	4,15	3,21 3,06	4	1795
	20.09.2010 21.10.2010	30,5	4,89	3,88 8.82	4,58	41	21.10.2010	22,5	3,69	2,95	3,84	450
	21.11.2010	29	4,68	3,87	4,49	87	21.11.2010	19	3,54	2,98	3,06	620
	20.12.2010	26	4,71	3,97	4,41	343	20.12.2010 18.01.2010	18	3,23	3,02	3,01 2,88	650 415
	18.01.2010 Total	24,5	4,47	4,01	4,36	122	Total	122	34	4,14	1,000	
	Average/day:	28,08	4,74	4,66	4,55	114,00	Average / day:	20,33	3,62	2,99	3,43	813,8
	Difference %	38,11	30,83	55,94	32,54	-85,99						
							Feed:	50/50 maize	and consents	-		
	50/50 maize and Round bales ma		AP 2000 comp	actor			Storage:	Pitsilo				
lame of cov							Name of cow:	Jenny 018				
Reg. number Born date:	n1342544410						Reg. number: Born date:	14.03.2008				
Born date: 1st lactation:	01.03.2008						Ist lactation:	24.07.2010				
Father:	Klan						Father:	Kian .				
Mother:	Minke 40						Mother:	Minke 40				
	Milk production	:(Kg/day)	% fat	% protein	% lactose	Cellinz.	Milkproductio		% fat	% protein	% lactose	Cell nr.
	20.08.2010	29	4,8	3.51	43	94	28.06.2010	26	4,08	3,16	3,88	510 280
	20.09.2010	29,5 29	4,85	3,98 4,01	4,23 4,16	87	20.09.2010	24 22,5	4,01	3,04	3,65	280 655
	21.11.2010	28	4,6	3,4	4,21	72	21.11.2010	19	3,52	2,88	3,05	1210
	20.12.2010	27	4,56	3,28	4,17	69	20.12.2010	16,5	3,18	2,69	3,02	850 740
	18.01.2010 Total	25,5	4,4	3,74	4,19	107	18.01.2010 Total	15	3,05	2,7	2,85	740
	Average / day:	28,00	4,65	3,65	4,21	83,00	Average / day:	20,50	3,58	2,90	3,28	707,5
	Difference %	36,59	29,87	26,19	28,42	-88,27						
	50/50 maize an						Feed : Storage:	50/50 maize Pit silo	and consent/	ate		
	Round bales ma	ade by Orkol N	AP 2000 comp	sactor								
							Storager					
	et Delta014						Name of cow:	Beffte 39				
Reg. number	n: n134254441						Name of cown Reg. number:	Befke 39 n1342544431	-			
Reg. number Born date:	r: nl 34254441 09.02.2008						Name of cow:	Beffte 39	-			
Reg. number Born date: Ist factation Father:	r: nl 34254441 09.02.2008 : 16.07.2010 K72m	5					Name of cow: Reg. number: Boen date: Bet lactation: Father:	Befre 39 nl342544431 03.03.2008 23.07.2010 Klan				
Reg. number Born date: Ist lactation	r: nl 34254441 09.02.2008 : 16.07.2010						Name of cow. Reg. number: Born date: Ist lactation:	Befke 39 nl342544431 03.03.2008 23.07.2010				
Reg. number Born date: Ist factation Father:	r: nl 34254441 09.02.2008 r: 16.07.2010 Ki an Minke 40		Sfat	% protein	% lactose	Cell nr.	Name of cow: Reg. number: Boen date: Bet lactation: Father:	Befke 39 ni342544431 03.03.2008 23.07.2010 Kan Minke 40	% fat	% protein	% lactose	Cell nr.
Reg. number Born date: Ist factation Father:	r: nl 34254441 09.02.2008 : 16.07.2010 67 an Minke 40 Milk production 28.06.2010	n: (Kg/day) 28,5	4,78	% protein 3,48	4,36	110	Name of course Bogg number: Boan date: Bat lactation: Father: Mother: Milk productio 28.08.2010	Befite 39 ni342544431 03.03.2008 23.07.2010 Kan Minke 40 n: (Kg/day) 23	4,2	3,24	4,18	552
Reg. number Born date: Ist factation Father:	r: nl 34254441 99:02-2008 16:07-2010 16 an Minke 40 Milk production 28:06:2010 20:09:2010	n: (Kg/day) 28,5 29,5	4,78 4,76	3,48 3,78	4,36 4,2	110 94	Name of source Beg. number: Bonn date: Extinction Father: Mother: Milk productio 28.08.2010 20.09.2010	Beffre 39 n1342544431 03.03.2008 23.07.2010 81an Minke 40 n: (Kg/day) 23 22,5	4,2 4,28	3,24 3,26	4,18 3,6	552 612
Reg. number Born date: Ist factation Father:	r: nl 34254441 09.02,2008 r: 16.07,2010 65 an Minke 40 Milk production 28.08,2010 20.09,2010 21.10,2010	n: (Kg/day) 28,5 29,5 28	4,78 4,76 4,71	3,43 3,78 3,62	4,36 4,2 4,16	110	Name of course Bogg number: Boan date: Bat lactation: Father: Mother: Milk productio 28.08.2010	Befite 39 ni342544431 03.03.2008 23.07.2010 Kan Minke 40 n: (Kg/day) 23	4,2	3,24	4,18	552
Reg. number Born date: Ist factation Father:	r: nl 14254441 09.02 2008 15 II.6.07 2010 15 II.6.07 2010 15 II.6.07 2010 15 II.6.07 2010 28.08 2010 20.09 2010 21.11 2010 20.12 2010	28,5 29,5 28 27,5 26	4,78 4,76 4,71 4,68 4,59	3,48 3,78 3,62 3,31 3,3	4,36 4,2 4,16 4,17 1,29	110 94 88 101 84	Name of cours Reg. number: Born date: Ist lactation: Father: Mother: Milk production 28.08.2010 20.09.2010 21.10.2010 21.11.2010 20.32.2010	Befike 39 n/342544431 03.03.2008 23.07.2010 Kian Minke 40 n: (Kg/day) 23 22,5 24 21 18	4,2 4,28 3,69 3,65 3,34	3,24 3,26 3,12 3,08 3,01	4,18 3,6 3,54 3,25 3,25 3,2	552 612 550 595 953
Reg. number Born date: Ist factation Father:	r: nl 33254441 09.02 2008 (5 an Minke 40 Mink production 28.08.2010 21.10.2010 21.10.2010 20.12.2010 18.01.2010	*: (Kg/day) 28,5 29,5 28 27,5 28 27,5 26 25	4,78 4,76 4,71 4,68	3,43 3,78 3,62 3,31	4,36 4,2 4,16 4,17	110 94 88 101	Name of cours Beg. number: Both date: Ist lactation: Father: Milk productio 28.08.2010 20.09.2010 21.11.2010 21.11.2010 18.01.2010 18.01.2010	Befie 39 n1342544431 03.03.2008 23.07.2010 Ninke 40 n: (Xg/day) 23 22,5 24 21 18 17	4,2 4,28 3,69 3,65	3,24 3,26 3,12 3,08	4,18 3,6 3,54 3,25	552 612 550 595
Reg. number Born date: Ist factation Father:	r: nl 34254441 0 90,02 2000 16 20,02 2010 16 20 nn Milke geoduction 28,06 2010 20,09 2010 21,10 2010 20,11 2010 21,11 2010 20,12 20,10 20,12 20,10,	e: (Kg/day) 28,5 29,5 28 27,5 26 25 164,5 27,42	4,78 4,76 4,71 4,68 4,59 4,36 4,65	3,48 3,78 3,62 3,31 3,3 3,56 3,55	4,36 4,2 4,16 4,17 1,29 4,02 3,70	110 94 88 101 84 118 99,17	Name of cours Reg. number: Born date: Ist lactation: Father: Mother: Milk production 28.08.2010 20.09.2010 21.10.2010 21.11.2010 20.32.2010	Befike 39 n/342544431 03.03.2008 23.07.2010 Kian Minke 40 n: (Kg/day) 23 22,5 24 21 18	4,2 4,28 3,69 3,65 3,34	3,24 3,26 3,12 3,08 3,01	4,18 3,6 3,54 3,25 3,25 3,2	552 612 550 595 953 1100
Reg. number Born date: Ist factation Father:	r: nl 34254441 09.02.2008 Gan Minke 40 Milk production 20.08,2010 20.09,2010 21.10.2010 21.11.2010 20.12,2010 18.00,2020 18.00,2020 19.0000 19.00000 19.00000 19.00000 19.00000 19.00000 19.00000 19.0000000000	x: (Kg/day) 285 29,5 28 27,5 26 25 164,5	4,78 4,76 4,71 4,68 4,59 4,36 4,65	3,48 3,78 3,62 3,31 3,3 3,55 3,55	4,36 4,2 4,16 4,17 1,29 4,02 3,70	110 94 88 101 84 118	Name of cours Reg. number: Born date: Ist lactation: Father: Milk productio 28.08.2010 21.0.2010 21.11.2010 20.12.2010 18.0.2010 18.0.2010 18.0.2010 18.0.2010 18.0.2010 18.0.2010 18.0.2010 18.0.2010 19.	Beffre 39 n1342544431 03.03.2008 23.07.2010 Bian Minke 40 21 22,5 24 21 18 17 125,5 20,92	4,2 4,28 3,69 3,65 3,34 3,21 3,73	3,24 3,26 3,12 3,08 3,01 2,28 3,00 3,00	4,18 3,6 3,54 3,26 3,2 3,2 3,18	552 612 550 595 953
Reg. number Born date: Ist factation Father:	r: nl 34254441 0 90,02 2000 16 20,02 2010 16 20 nn Milke geoduction 28,06 2010 20,09 2010 21,10 2010 20,11 2010 21,11 2010 20,12 20,10 20,12 20,10,	e: (Kg/day) 285 295 28 27,5 26 25 164,5 164,5 31,08	4,78 4,76 4,71 4,68 4,59 4,35 4,65 24,63	3,48 3,78 3,62 3,31 3,3 3,55 3,55 3,55 17,01	4,36 4,2 4,16 4,17 1,29 4,02 3,70	110 94 88 101 84 118 99,17	Name of cours Reg. number: Born date: Ist lactation: Father: Milk productio 28.08.2010 21.0.2010 21.11.2010 20.12.2010 18.0.2010 18.0.2010 18.0.2010 18.0.2010 18.0.2010 18.0.2010 18.0.2010 18.0.2010 19.	Beffre 39 n1342544431 03.03.2008 23.07.2010 Bian Minke 40 21 22,5 24 21 18 17 125,5 20,92	4,2 4,28 3,69 3,65 3,34 3,21	3,24 3,26 3,12 3,08 3,01 2,28 3,00 3,00	4,18 3,6 3,54 3,26 3,2 3,2 3,18	552 612 550 595 963 1100
Reg. number Born date: Ist factation Father:	r: nl 34254441 0 09.02.2008 1 86.07.2010 6 2an Mink groduction 28.08.2010 20.09.2010 21.11.2010 20.12.2010 12.11.2010 20.12.2010 13.01.2010 Total Average / day, Dxiference %	e: (Kg/day) 285 295 28 27,5 26 25 164,5 164,5 31,08	4,78 4,76 4,71 4,68 4,59 4,35 4,65 24,63	3,48 3,78 3,62 3,31 3,3 3,55 3,55 3,55 17,01	4,36 4,2 4,16 4,17 1,29 4,02 3,70	110 94 88 101 84 118 99,17	Name of cours Reg. number: Born date: Born date: Born date: Born date: Father: Mother: Milk production 28.08.2010 20.09.2010 21.10.2010 21.10.2010 20.12.2010 18.01.2010 Total Average / day. Feed : Storage: Name of cours:	Beffre 39 n/342544431 03.03.2008 23.07.2010 Kian Minke 40 n: (Kg/day) 23 22,5 24 18 17 21 18 17 20,92 S0/50 maize Pit silo Jenna 110	4,2 4,28 3,69 3,65 3,34 3,21 3,73 8,73	3,24 3,26 3,12 3,08 3,01 2,28 3,00 3,00	4,18 3,6 3,54 3,26 3,2 3,2 3,18	552 612 550 595 963 1100
Reg. number Born date: Ist lactation Father: Mother: Mother: Name of cov Reg. number	r. nl 34254441 09.02.2008 16.07.2010 16.2m Mink groducties 28.06.2010 20.09.2010 21.11.2010 20.12.2010 13.09.2010 Total Average / day: Difference % SQ/S0 malce an Round bales m w: 21ma 337 r. nl 34254441	as (Kg/day) 28,5 29,5 28 27,5 26 25 164,5 27,42 31,08 d contentrate ade by Orkel A	4,78 4,76 4,71 4,68 4,59 4,35 4,65 24,63	3,48 3,78 3,62 3,31 3,3 3,55 3,55 3,55 17,01	4,36 4,2 4,16 4,17 1,29 4,02 3,70	110 94 88 101 84 118 99,17	Name of com: Reg. number: Born date: Ist lactation: Father: Mother: Milk production 28.08.2010 21.01.2010 21.11.2010 20.02.2010 21.11.2010 20.02.2010 21.11.2010 18.01.2010 Total Average / day. Feed : Storage: Name of com: Reg. number:	Beffre 39 In JA2544431 05.03.2010 Kian Minke 40 n: (Kg/day) 23 22,5 24 21 18 37 125,5 20,92 50/50 maize Pit silo Jenna 110 In JA2544399	4,2 3,69 3,65 3,34 3,21 3,73 and contents	3,24 3,26 3,12 3,08 3,01 2,28 3,00 3,00	4,18 3,6 3,54 3,26 3,2 3,2 3,18	552 612 550 595 963 1100
Reg. number Born date: Ist lactation Father: Mother: Name of cov Rag. number Born date:	r: nl 34254441 0 09.02.2008 1 6.07.2010 16.20 Milk groduction 20.09.2010 21.11.2010 20.12.2010 13.01.2010 Total Average / day, Dolference % SQ/S0 malce an Round bales m Round bales m	285 29,5 28 27,5 26 25 164,5 27,42 31,08 d contentrate ade by Orkel J.	4,78 4,76 4,71 4,68 4,59 4,35 4,65 24,63	3,48 3,78 3,62 3,31 3,3 3,55 3,55 3,55 17,01	4,36 4,2 4,16 4,17 1,29 4,02 3,70	110 94 88 101 84 118 99,17	Name of cours Reg. number: Born date: Born date: Born date: Born date: Father: Mother: Milk production 28.08.2010 20.09.2010 21.10.2010 21.10.2010 20.12.2010 18.01.2010 Total Average / day. Feed : Storage: Name of cours:	Beffre 39 n/342544431 03.03.2008 23.07.2010 Kian Minke 40 n: (Kg/day) 23 22,5 24 18 17 21 18 17 20,92 S0/50 maize Pit silo Jenna 110	4,2 4,28 3,69 3,65 3,34 3,21 3,73 4,73	3,24 3,26 3,12 3,08 3,01 2,28 3,00 3,00	4,18 3,6 3,54 3,26 3,2 3,2 3,18	552 612 550 595 963 1100
Reg. number Born date: Isel lactation Father: Mother: Nother: Name of cov	r: nl 34254441 0 09.02.2008 1 6.07.2010 16.20 Milk groduction 20.09.2010 21.11.2010 20.12.2010 13.01.2010 Total Average / day, Dolference % SQ/S0 malce an Round bales m Round bales m	285 29,5 28 27,5 26 25 164,5 27,42 31,08 d contentrate ade by Orkel J.	4,78 4,76 4,71 4,68 4,59 4,35 4,65 24,63	3,48 3,78 3,62 3,31 3,3 3,55 3,55 3,55 17,01	4,36 4,2 4,16 4,17 1,29 4,02 3,70	110 94 88 101 84 118 99,17	Name of com: Reg. number: Born date: Both lactation: Father: Milk production 28.08.2010 20.09.2010 21.11.2010 20.12.2010 10.11.2010 20.12.2010 Rol.2010 Total Average / day: Feed : Storage: Name of come: Reg. number: Born date: Ist lactation: Father:	BetRe 39 n/342544433 03.03.2008 23.07.2010 Kran Minke 40 n: (Kg/day) 23 22,5 24 21 18 37 125,5 20,92 50/50 maizee Pit si lo Jenna 310 n/342544319 05.05.2026 19.07.2010 Kian	4,2 4,28 3,69 3,65 3,34 3,21 3,73 4,73	3,24 3,26 3,12 3,08 3,01 2,28 3,00 3,00	4,18 3,6 3,54 3,26 3,2 3,2 3,18	552 612 550 595 963 1100
Reg. number Born date: Iss lactation Father: Mother: Mother: Reg. number Born date: Ist lactation Born date:	r: nl 34254441 0 90,02,2000 1 86,07,2010 1 62 an Minke 40 Minke production 20,09,2010 21,11,2010 20,12,2010 13,00,2010 20,12,2010 13,00,2010 20,12,2010 13,00,2010 Childreenne 50 SQ/SO malce an Round bales m w: 21na 337 r: nl 34254441 0 8,03,2000 0 8,03,2000 1 8,03,2000 1 2,07,2011 1 8,03,2000 1 8,03,2000 1 8,03,2000 1 1,07,2011 1 1,07,2011	285 29,5 28 27,5 26 25 164,5 27,42 31,08 d contentrate ade by Orkel J.	4,78 4,76 4,71 4,68 4,59 4,35 4,65 24,63	3,48 3,78 3,62 3,31 3,3 3,55 3,55 3,55 17,01	4,36 4,2 4,16 4,17 1,29 4,02 3,70	110 94 88 101 84 118 99,17	Name of cover Reg. number: Bern date: Ist lactation: Father: Milk production 28.08.2010 20.02.2010 21.10.2010 21.10.2010 20.12.2010 18.01.2010 Total Average / day. Feed : Storage: Name of cover. Reg. number: Born date: Ist lactation:	Beffre 39 n/342544431 03.03.2008 23.07.2010 Kian Minke 40 122,5 24 18 17 125,5 20,92 50/50 maize Pit silo Jenna 110 n(342544399 06.03.2008 19.07.2010	4,2 4,28 3,69 3,65 3,34 3,21 3,73 4,73	3,24 3,26 3,12 3,08 3,01 2,28 3,00 3,00	4,18 3,6 3,54 3,26 3,2 3,2 3,18	552 612 550 595 953 1100
Reg. numbes Born date: Isi lactation Father: Mother: Nother: Name of cov Reg. number Born date: Ist lactation Father:	r: nl 34254441 0 90.0 2000 1 86.07.2010 1 67.07.2010 1 67.07.2010 1 67.07.2010 20.09.2010 20.09.2010 20.09.2010 20.19.2010 20.19.2010 20.12.201	285 295 28 27,5 28 27,5 26 25 25 25 25 25 25 25 25 25 27,42 31,08	4,78 4,76 4,71 4,68 4,59 4,55 24,63 24,63	3,48 3,62 3,62 3,31 3,3 3,55 3,55 12,01	4,36 4,2 4,16 4,17 3,29 4,02 3,70 5,92	110 94 88 101 84 118 99,17	Name of com: Reg. number: Born date: Both lactation: Father: Milk production 28.08.2010 20.09.2010 21.11.2010 20.12.2010 10.11.2010 20.12.2010 Rol.2010 Total Average / day: Feed : Storage: Name of come: Reg. number: Born date: Ist lactation: Father:	BetRe 39 n/34254431 02.03 2010 X3.07.2010 X3.07.2010 X3.07.2010 X3.07.2010 X3.07.2010 X5.07.2010 X3.07.2010 X5.07.2010 X5.0	4,2 4,28 3,69 3,65 3,34 3,21 3,73 4,73	3,24 3,26 3,12 3,08 3,01 2,28 3,00 3,00	4,18 3,6 3,54 3,26 3,2 3,2 3,18	552 612 550 595 953 1100
Reg. numbes Born date: So la ctation Father: Mother: Mother: Mother: Solar date: Ist lactation Born date: Ist lactation	e: nd 34254441 09.02.2008 16.07.2017 16.20 16.20 16.20 16.20 16.20 16.20 16.20 10.20 20.09.2010 21.11.2010 20.09.2010 21.11.2010 20.12.2010 13.00.2010 Total Average / day: Difference % SQ/S0 make an Round bales m w: 21na 337 c. 1034254441 03.03.2009 (21.07.2017 16.20 10.2017 21.07.2017 16.20 10.2017 21.07.2017 16.20 10.2017 21.07.2017 16.20 10.2017 21.07.2017 16.20 10.2017 1	285 295 28 27,5 28 27,5 26 25 25 25 25 25 25 25 25 25 27,42 31,08	4,78 4,76 4,71 4,68 4,59 4,35 4,65 24,63	3,48 3,78 3,62 3,31 3,3 3,55 3,55 3,55 17,01	4,36 4,2 4,16 4,17 3,70 5,92 5,92 5,92	110 94 88 101 84 118 99,17 -86,35 Cell m.	Name of com: Reg. number: Bosn date: Bosn date: Basn date: Father: Mother: Milk productio 28.08.2010 20.09.2010 21.10.2010 21.10.2010 20.12.2010 18.01.2010 Total Average / day. Feed : Storage: Name of com: Reg. number: Born date: Ist lactation: Father: Milk productio 32.08.2010	BetRe 39 n/342544431 03.03.2008 23.07.2010 Rian Minke 40 12.37 22,5 24 21 28 17 125,5 20,92 50/50 maize Pit silo Inflazzs4419 06.03.2008 19.07.2010 Kian Minke 40 Norike 40	4,2 4,28 3,69 3,65 3,34 3,21 3,73 4,73 and convent.	324 325 312 303 301 2,28 3,00 3,00 3,00 3,00	4,18 3,6 3,54 3,25 3,2 3,18 3,49 3,49	552 612 559 596 963 1100 722,0 722,0 6 6 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
Reg. numbes Born date: Isi lactation Father: Mother: Nother: Name of cov Reg. number Born date: Ist lactation Father:	r: nl 34254441 09.02.2008 16.07.2017 16.2m Milk groductile 28.06.2010 20.09.2010 21.11.2010 20.09.2010 21.11.2010 20.12.2010 13.09.2010 Total Average / day: Difference 56 SO(50 malce an Round bales m v: 21ma 337 r: nl 34254441 08.08.2000 21.07.2019 Kian Milk productio 28.08.2010 29.09.2010 29.09.2010 20	x: (Kg/day) 28,5 29,5 28 27,5 26 25 164,5 27,42 31,08 d consentrate ade by Orkel A	4,78 4,76 4,71 4,68 4,59 4,68 4,68 4,68 4,68 24,68 24,68 24,68 24,68 24,63 24,63 24,63 24,63	3,45 3,78 3,62 3,31 3,33 3,55 3,55 12,01 12,01 12,01 12,01 12,01 3,62 3,82	4,36 4,2 4,16 4,17 3,70 5,92 5,92 5,92 5,92	110 94 88 101 84 115 99,17 -86,36 Cell m. 118 52	Name of com: Reg. number: Born date: Ist lactation: Father: Mother: Milk production 28.08.2010 21.11.2010 20.02.2010 21.11.2010 20.12.2010 ISt.2010 Total Average / day. Feed : Storage: Name of com: Reg. number: Born date: Ist lactation: Father: Mother: Milk production 20.02.2010 20.03.2010 20.03.2010 20.03.2010 20.03.2010 20.03.2010	Beffre 39 In JA254433 23.07.2010 Kian Minke 40 123 22,5 24 21 18 37 125,5 20,92 50/50 msize Pit silo Jenna 310 Marke 40 Minke 40 18 37 125,5 20,92 21 21 18 37 125,5 20,92 20,92 50/50 msize Pit silo Marke 40 Marke 40 Marke 40 Minke 4	4,2 4,28 3,69 3,65 3,34 3,21 3,73 and consent: 56 fast. 4,14 3,99	3,24 3,26 3,12 3,03 3,00 3,00 3,00 3,00 7,310 5,500,10,10 3,00	4,18 3,6 3,54 3,25 3,18 3,49 3,49 5,18ctose 4,1 3,9	552 612 559 596 963 1100 722,0 722,0 722,0 722,0 120 722,0 120 722,0
Reg. numbes Born date: Isi lactation Father: Mother: Nother: Name of cov Reg. number Born date: Ist lactation Father:	r: nl 34254441 0 09.02.2008 1 6.07.2010 1 6.07.2010 1 6.07.2010 1 6.07.2010 1 6.07.2010 1 6.07.2010 2 1.07.2010 2	c: (Kg/day) 28,5 29,5 28 27,5 26 25 164,5 27,42 31,08 d contentrate ade by Orkel A contentrate ade by Orkel A	4,78 4,76 4,71 4,68 4,59 4,68 4,59 4,68 24,63 24,63 24,63 24,63 24,63 24,63 24,63 24,63 24,63 24,63 24,64 24,74 4,76 4,72 4,78 4,72	3,45 3,78 3,62 3,31 3,55 3,55 12,01 12,01 12,01 3,52 3,62 3,62 3,82 3,82	4,36 4,2 4,16 4,17 3,29 4,02 5,92 5,92 5,92 5,92 5,92	110 94 88 101 84 118 99,17 -86,35 Cell ar, 118 52 64	Name of cover Reg. number: Bosn date: Bosn date: Father: Mother: Milk production 28.08.2010 20.09.2010 21.11.2010 21.11.2010 Total Average / day: Feed : Storage: Name of cover Reg. number: Born date: Ist lactation: Father: Mother: Milk production 23.09.2010 21.02.2010 2	BetRe 39 n/342544431 03.03.2008 23.07.2010 Rian Minke 40 12.37 22,5 24 21 28 17 125,5 20,92 50/50 maize Pit silo Inflazzs4419 06.03.2008 19.07.2010 Kian Minke 40 Norike 40	4,2 4,28 3,669 3,655 3,34 3,21 3,73 and convent 4,14 4,14 3,99 3,9	3,24 3,25 3,12 3,03 3,01 3,01 3,00 3,00 3,00 7 3,00 3,00 7 3,00 3,00	4,18 3,6 3,54 3,25 3,2 3,18 3,49 3,49	552 612 550 536 963 1100 722,0 722,0 6611 <i>nv</i> . 483
Reg. numbes Born date: Isi lactation Father: Mother: Nother: Name of cov Reg. number Born date: Ist lactation Father:	r: nl 34254441 09.02.2008 16.07.2017 16.2m Milk groductile 28.06.2010 20.09.2010 21.11.2010 20.09.2010 21.11.2010 20.12.2010 13.09.2010 Total Average / day: Difference 56 SO(50 malce an Round bales m v: 21ma 337 r: nl 34254441 08.08.2000 21.07.2019 Kian Milk productio 28.08.2010 29.09.2010 29.09.2010 20	x: (Kg/day) 28,5 29,5 28 27,5 26 25 164,5 27,42 31,08 d consentrate ade by Orkel A	4,78 4,76 4,71 4,68 4,59 4,68 4,68 4,68 4,68 24,68 24,68 24,68 24,68 24,63 24,63 24,63 24,63	3,45 3,78 3,62 3,31 3,33 3,55 3,55 12,01 12,01 12,01 12,01 12,01 3,62 3,82	4,36 4,2 4,16 4,17 3,70 5,92 5,92 5,92 5,92	110 94 88 101 84 115 99,17 -86,36 Cell m. 118 52	Name of cover. Reg. number: Born date: Born date: Both lactation: Father: Mother: Milk production 28.08.2010 21.11.2010 20.12.2010 Reg. number: Reg. number: Born date: Ist lactation: Father: Mother: Milk production 33.08.2010 20.12.2010 2	BetRe 39 n/342544431 03.032008 03.03.2008 23.07.2010 Kian Minke 40 n: (Kg/day) 23 22,5 24 21 18 37 125,5 20,92 50/50 maéze Pit si lo Jenna 310 ni342544339 06.03.2008 19.07.2010 Kian Kian 22 23 23 23 39.07.2010 Kian Minke 40 m: (Kg/day) 24 23 23 21 18 36,5	4,2 4,28 3,66 3,365 3,321 3,73 and consent: 8,174 4,14 4,14 3,99 3,9 3,9 3,21	3,24 3,26 3,12 3,03 3,01 2,28 3,00 3,00 3,00 5,18 3,21 3,08 3,11 3,03	4,18 3,6 3,54 3,25 3,18 3,18 3,49 3,49 3,49 3,49 3,49 3,49 3,5 3,21 3,18	552 612 559 555 555 555 555 555 555 555 722,0 722,0 722,0 722,0 1100 722,0 1100 722,0 310 320 330
Reg. numbes Born date: Stalactadion Father: Mother: Mother: Mother: Mother: Stalactadion Born date: Istlactation Geher:	r: nl 34254441 0 09.02.2008 1 6.07.2010 1 6.07.2010 1 6.07.2010 1 6.07.2010 1 6.07.2010 2 1.07.2010 2 1.07.2010 2 1.07.2010 2 1.17.2010 2 0.12.2010 1 3.07.2010 1 3.07.2010 2 1.07.2010 2	c: (Kg/day) 285 29,5 28 27,5 26 25 164,5 27,42 31,08 d contentrate ade by Orkel J. 27,5 28 29 30,5 28 28 28 28 28 28 28 28 28 28 28 28 28	4,78 4,76 4,71 4,68 4,59 4,65 24,63 24,63 4,95 24,63 4,92 2000.comj 4,92 2000.comj 4,7 4,78 4,7 4,78 4,78	3,48 3,78 3,62 3,31 3,35 3,55 12,010	4,36 4,2 4,16 4,17 3,70 5,92 5,92 5,92 5,92	110 94 88 101 84 118 99,17 -86,36 -86,36 -86,36 -86,36 -86,36 -86,36 -86,36 -86,36	Name of cover Reg. number: Bosn date: Bosn date: Father: Mother: Milk production 28.08.2010 20.09.2010 21.10.2010 21.10.2010 20.12.2010 20.12.2010 38.01.2010 Total Average / day: Feed : Storage: Name of cover: Reg. number: Born date: Ist lactation: Father: Mother: Milk production 28.08.2010 20.03.2010 21.10.2010	BetRe 29 n/342544431 03:03:2008 03:02:008 23:07:2010 Rian Minke 40 n: (\$\$\scale{stars}\$, (\$\scale{stars}\$, 23:07:2010 23 22:5 24 23 21 38 37 125:5 20,92 \$0,500 maizee Pit silo 1342544430 16:362544430 06:6:03:2008 19:07:2010 Nian Minke 40 23 21 18 36:5 21 18 36:5 21 18 36:5 317	4,2 4,28 3,66 3,65 3,21 3,73 and consent 3,73 and consent 4,14 3,99 3,9 3,65	3,24 3,26 3,12 3,01 2,28 3,00 3,01 3,00 3,00 3,00 3,00 3,00 3,00	4,18 3,6 3,54 3,55 3,2 3,18 3,49 3,49 3,49 3,49 3,5 4,1 3,9 3,5 1,21	552 612 550 555 555 555 555 722,0 722,0 722,0 722,0 480 180 180 180 180 420
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Reg. numbes Born date: So la ctation Father: Mother: Mother: Mother: Solar date: Ist lactation Born date: Ist lactation	r: nl 34254441 0 09.02.2008 1 6.07.2010 1 6.07.2010 1 6.07.2010 1 6.07.2010 1 6.07.2010 2 1.07.2010 2 1.07.2010 2 1.07.2010 2 1.17.2010 2 0.12.2010 1 3.07.2010 1 3.07.2010 2 1.07.2010 2	c: (Kg/day) 285 29,5 28 27,5 26 25 164,5 27,42 31,08 d contentrate ade by Orkel J. 27,5 28 29 30,5 28 28 28 28 28 28 28 28 28 28 28 28 28	4,78 4,76 4,71 4,68 4,59 24,63 24,63 24,63 24,63 24,63 24,63 24,63 24,63 24,63 24,63 24,63 24,63 24,63 24,63 24,63 24,63 24,63 24,63 24,74 24,74 24,75 24,63 24,53 24,5424,54 24,54	3,45 3,78 3,62 3,31 3,55 3,55 17,01 17,01 3,55 3,55 3,55 17,01 17,01 3,58 3,82 3,84 3,52 3,84 3,52 3,33 3,58	4,36 4,2 4,16 4,17 1,29 4,00 3,70 5,92 5,92 5,92 5,92 5,92 4,10 4,18 4,12 4,13 4,12 4,10 4,10 4,10	110 94 88 101 84 115 115 -86,36 -86,3	Name of cover Reg. number: Bosn date: Bosn date: Father: Mother: Milk production 28.08.2010 20.09.2010 21.10.2010 21.10.2010 20.12.2010 20.12.2010 38.01.2010 Total Average / day: Feed : Storage: Name of cover: Reg. number: Born date: Ist lactation: Father: Mother: Milk production 28.08.2010 20.03.2010 21.10.2010	Beffre 39 n/342544431 03.03.2008 23.07.2010 Kian Minke 40 21.22,5 24 21. 28 20,92 50/50 maizee Pit silo 50/50 maizee Pit silo 19.07.2010 Kian Minke 40 05.03.2008 19.07.2010 Kian Minke 40 05.03.2010 19.07.2010 Kian Minke 40 19.07.201	4,2 4,28 3,66 3,365 3,321 3,73 and consent: 8,174 4,14 4,14 3,99 3,9 3,9 3,21	3,24 3,26 3,12 3,03 3,01 2,28 3,00 3,00 3,00 3,00 3,18 3,21 3,03 3,18 3,21 3,03 3,2,68	4,18 3,6 3,54 3,25 3,18 3,18 3,49 3,49 3,49 3,49 3,49 3,49 3,5 3,21 3,18	552 612 550 555 555 555 555 7227 7227 400 120 320 320 330 580
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