M a n u a l

for the

Analysis of the Workload

according to the

Energy Consumption Method (EUSANA)

in the

Landwirtschaftliches Informations-System Landtechnik

>>> L I S L <<<

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Please note:

LISL was developed in the 70s of the last century in German language only.

The system CALDOC is a subsystem of LISL. It contains only the models of indoor farming. From this, in turn, only the models of "**Dairy Farming**" with their titles and the associated influencing variables have been translated into English.

Of course, CALDOC can also be used in German language for all other models of indoor farming with the mentioned leading model numbers (n)

- Bull fattening husbandry (1)

- Calf husbandry (3)

- Heifer husbandry (4)

- Solid and liquid manure application (8)

Their outputs into the "**Workload File**" are output by EUSANA in English layout.

In the case of the system use possibly still following outputs in German language are possible and should not contribute to the confusion.

- EUSANA -
© Prof. Dr. H. Auernhammer 1993, …, 2020 (V3A)

This program enables the analysis of the energy consumption values from the working times of the models in LISL with regard to the work types and to the energy consumption balance. It is necessary to make sure that the load "WLOAD-File" is created in the control file CALDOC.INI with the setting "y"!

In the present configuration, the program is started in the "LISL" directory via the batch file "Caldoc.bat" present there by tapping twice and then reports with the following DOS screen for sole input via keyboard:

```
LISL --- E U S A N A (V3A)        Source: http://mediatum.ub.tum.de/?id=1580101
Energy Consumption & Work Load Analysis from LISL-Workload-Files    21.12.2020
-------------------------------------------------------------------------
(c) Dr. H. Auernhammer 1993, 2005, 2010,2013, 2015, 2020

The program reads data from a file type "CalDoc_WloadEC-nnn.dat".

Input data are checked for correct allocation of energy consumption values.
Errors are logged to the standard output file "CalDoc_WloadEC-nnn_Erg.txt"

From input data profile data of energy balance and of
body position & work type are processed.

Output is given to three files named  "CalDocWloadECxxx-nnn_... .

These files contain:
 CalDoc_WloadEC-nnn_Erg.txt   Results in ASCII-Format,
 CalDoc_WloadEC-nnn_EUS.csv   Energy Consumption in csv-Format,
 CalDoc_WloadEC-nnn_KPA.csv   Working Position & Work Type in csv-Format.

The following WloadEC-Files are available:
CalDoc_WLoadEC-002.dat


What is the internal number of the Workload-File!   2
```

As input file a "CalDoc_WLoadEC-nnn.dat" must be present in this directory. This is assigned to the program by the calculation number contained in the name alone (leading zeros do not have to be entered).

The program then processes the input file. The current status is displayed on the screen.

The end of the program must be confirmed explicitly with any input, whereby the DOS window closes again.

The program creates 3 output files with identical name and different identifier in the file name while keeping the respective calculation number and file type designation required for further processing.

Output File: CalDoc_WloadEC-nnn_Erg.txt

This file contains important key figures of a detailed analysis from the energy consumption values for the "working position" (upper part) and "working types" (lower part) (see appendix 1). The respective working positions are presented with the frequency in the model, the relative share, the working time required for it and the relative working time share, as well as the average working time for the respective position.

Each part of the evaluation is then concluded with a total line in which the work duration and also the average duration of a position are shown.

Finally, the resulting energy consumption values are shown with the respective allocations to the energy consumption balance (ECB) of „Man" and "Women".

Output File: CalDoc_WloadEC-nnn_EUS.csv

The data in this file are used to create work load profiles according to energy consumption. They are prepared in such a way that individual graphs can be made for each partial process and also for the total work (see Appendix 2).

Assuming you want to create the work load profile for model 207, you will find the data required for this e.g. in columns A41 - P45. Now underlay the fields B44:P45 and then select in EXCEL - Insert the

- Graph type: Point (X;Y) and in it the
- Subtype: Points with straight lines.

Now EXCEL creates the profile for the duration of work to be done.

In the next step, under "Select data", insert the 3 load lines. You will find these:

- As average value under C42:D43 with legend in B42,
- As load balance (ECB) for woman under H42:I43 with legend in G42 and
- as load balance (ECB) for the man under M42:N43 with legend in L42.

Now you have to insert the heading (C41), the X-axis label (B44) and the Y-axis label (B45). For the sake of completeness, the correct legend label for data series 1 from A41 should also be inserted and you will then have a complete graphic.

For a better overview, auxiliary grid lines should also be inserted.

Possible cosmetic additions then make this graphic perfect and lead to a layout as shown below for the example of TV 2072:

TV 2072 Milking with bucket milking plant in tied-up stall
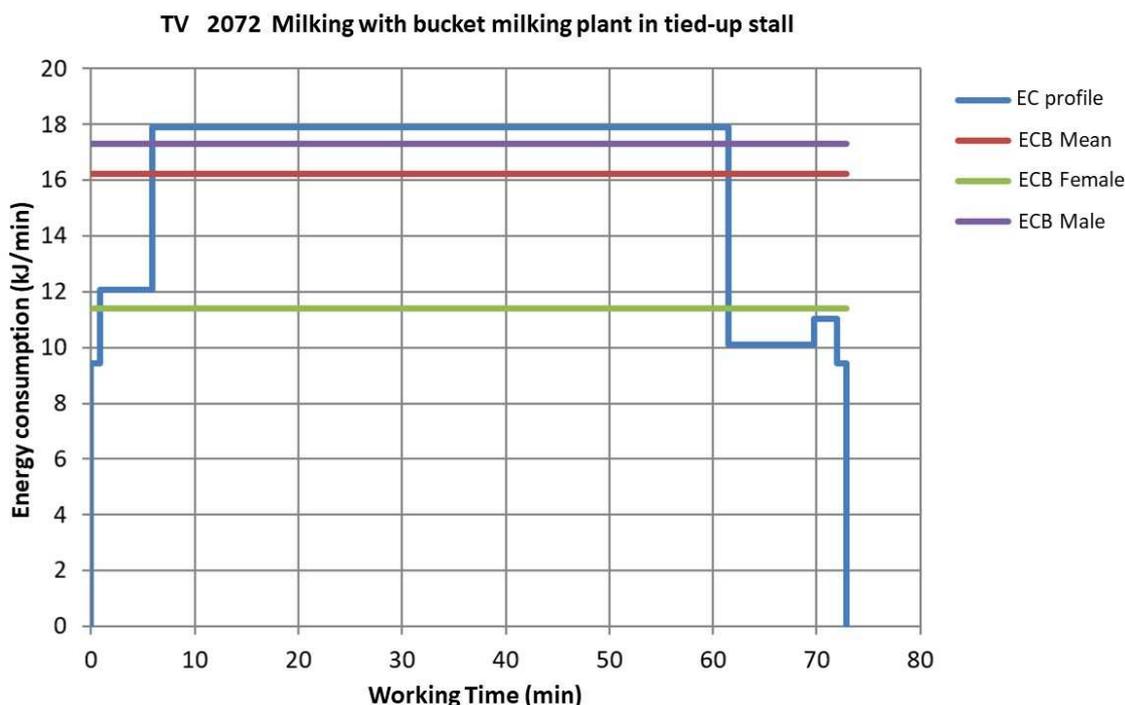
Note: *If a VG model has been calculated, all energy consumption profiles of the TV sub models are also available according to Appendix 2. As shown, these can also be displayed individually and thus serve for an in-depth analysis of the overall model.*

Similar to a part of daily work (sub-process) the work load of the whole working process e.g. "Dairying" can be established using the data from "Entire Work"! As an example, the layout of model 20 is shown below:

GA   20 Dairy farming in tied-up stalls with pocket milking plant
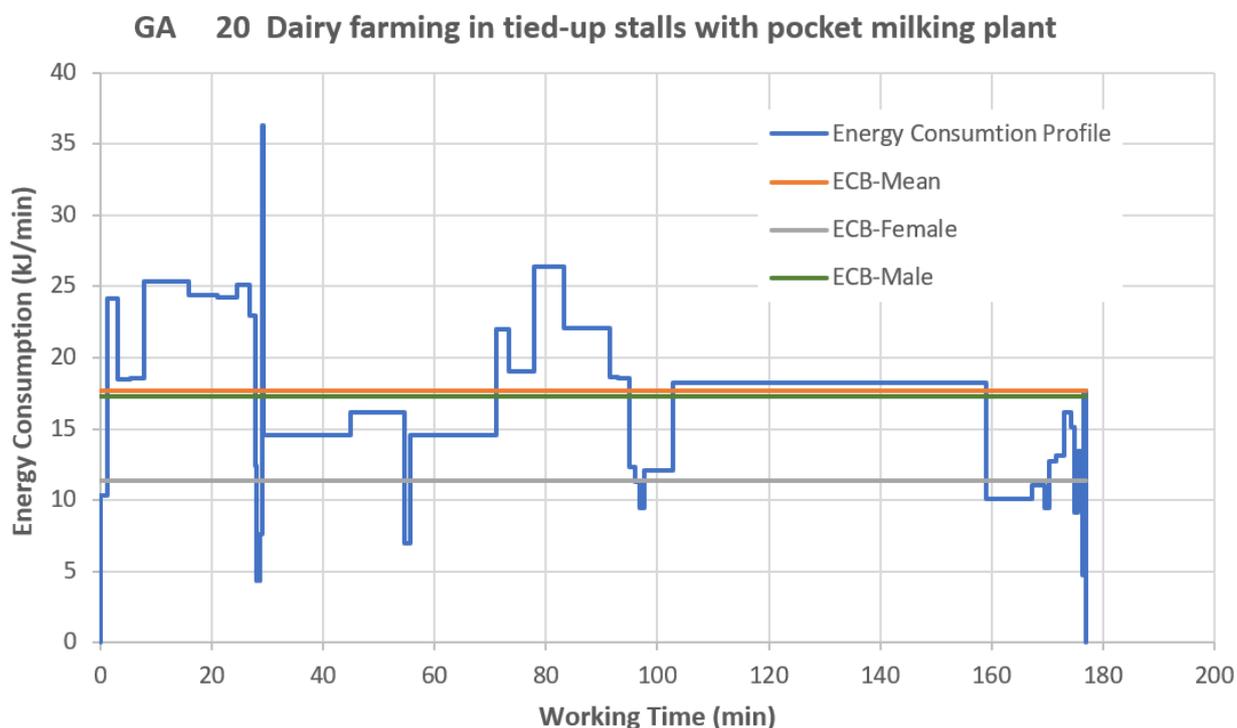
Output File: CalDoc_WloadEC-nnn_KPA.csv

This file is also structured in such a way that any representation of the workload according to the working position and according to the types of work can be carried out very quickly and very easily with it.

Assuming you want to compare the respective workloads for the four milking parlor types bucket milking system, pipe milking system, herringbone milking system and rotary milking system, proceed as follows based on the data in Appendix 3: First underlay the data of the bucket milking parlor in B10:U12 and then select in EXCEL - Insert the.

- Graphic type: Columns with the
- Subtype: Grouped columns

Now EXCEL creates a grouped bar chart with the first data series. Insert as further data series the pipe milking plant with the rel. proportion data in B17:U18. Then follow the insertion of the data series B23:U24 for the herringbone milking parlor and with B29:U30 the rotary milking parlor, whereby now the grouped representation is ready as basic graphic.

It makes sense to replace the legend names by the respective milking system or milking parlor type.

Again, the axis titles for X must be taken over from A11 and for Y from A12. The graphic heading must also be inserted and the text must be designed in such a way that the content is clearly described.

Finally, the X-axis labels should be aligned at an angle so that they can be easily read by the viewer (select 45 ° in "Axis formatting" under "Axis alignment"). Also, the auxiliary grid lines should be adjusted so that they contain the respective grouped columns.

Finally, further cosmetic changes and additions can be made.

The graphic created in this way with would then have the following layout:
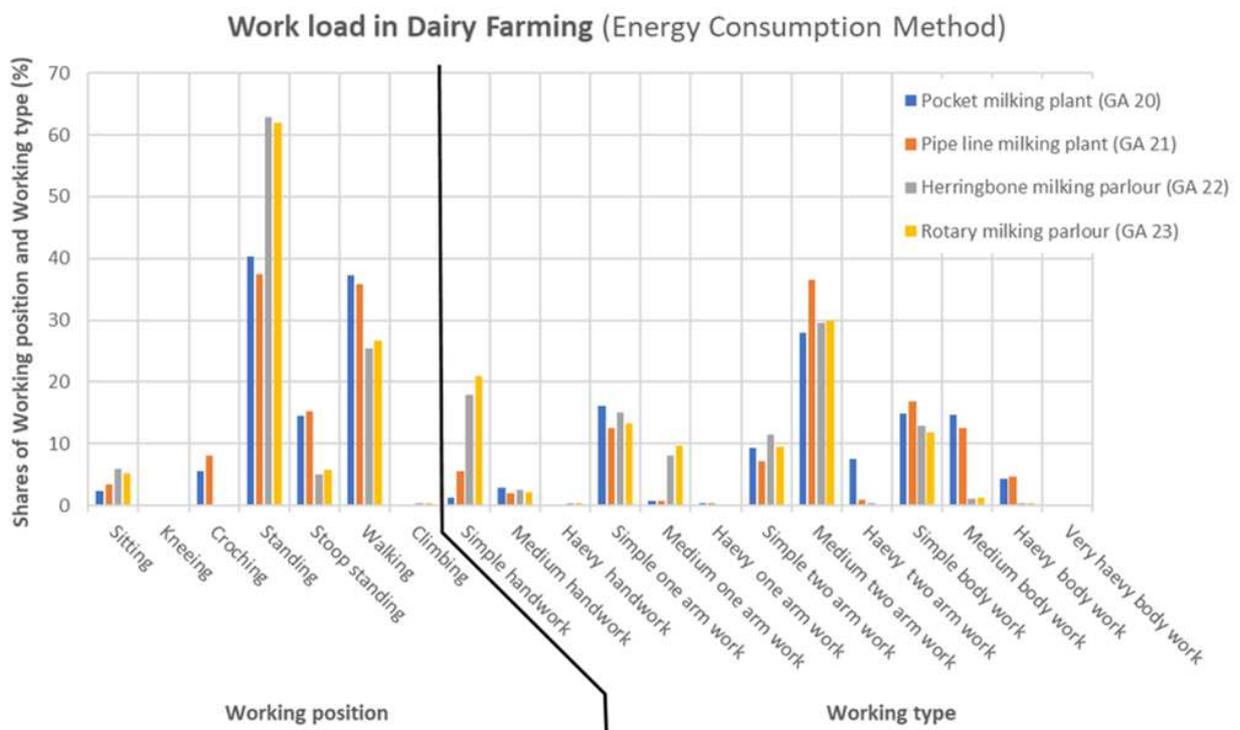
Appendix 1:   Output file (CalDoc_WloadEC-127_Erg.txt) in Word-Format

```
Working Posture Analyses:   WLoad-File: CalDoc_WLoadEC-002.dat      on 20-12-20
--------------------------------------------------------------------------------

GA    20 :  Dairy farming in tied-up stalls with pocket milking plant
********************************************************************************


No.    Working position        Frq    %    Time (MPmin)    %    min/Pos
--------------------------------------------------------------------------------
  1  Sitting                    39   9.8      4.2        2.4     .11
  2  Kneeing                     0    .0       .0         .0     .00
  3  Croching                    2    .5      9.8        5.5    4.90
  4  Standing                  124  31.2     71.3       40.3     .58
  5  Stoop standing             62  15.6     25.8       14.6     .42
  6  Walking                   152  38.3     65.8       37.2     .43
  7  Climbing                   18   4.5       .1         .1     .01
--------------------------------------------------------------------------------
282  Singel values             397 100.0    177.0      100.0     .45
--------------------------------------------------------------------------------


No.    Working type            Frq    %    Time (MPmin)    %    min/Type  Sum-%
--------------------------------------------------------------------------------
  8  Simple handwork            30   7.4      2.3        1.3     .08
  9  Medium handwork            24   5.9      4.9        2.8     .21
 10  Haevy  handwork             1    .2       .0         .0     .01       4.1

 11  Simple one arm work       155  38.0     28.6       16.1     .18
 12  Medium one arm work         4   1.0      1.3         .7     .32
 13  Haevy  one arm work         2    .5       .6         .4     .32      17.2

 14  Simple two arm work        62  15.2     16.5        9.3     .27
 15  Medium two arm work        36   8.8     49.6       28.0    1.38
 16  Haevy  two arm work         6   1.5     13.3        7.5    2.22      44.8

 17  Simple body work           70  17.2     26.2       14.8     .37
 18  Medium body work           12   2.9     26.1       14.7    2.17
 19  Haevy  body work            6   1.5      7.7        4.3    1.28      33.9
 20  Very haevy body work        0    .0       .0         .0     .00       .0
--------------------------------------------------------------------------------
282  Single values             408 100.0    177.0      100.0     .43     100.0
--------------------------------------------------------------------------------


Time shares unfavorable working position           35.6 MPmin   20.1 %
Time shares unfavorable type of work               21.6 MPmin   12.2 %

Time shares above energy consumption balance "Female"  155.1 MPmin   87.6 %
Time shares above energy consumption balance "Male"     76.4 MPmin   43.2 %

--------------------------------------------------------------------------------
```

Appendix 2:   Output File (CalDoc_WloadEC-127_EUS) in EXCEL-Format

| A1 | | fx | File: CalDoc_WLoadEC-002.dat | from: 20-12-20 | Source: http://mediatum.ub.tum.de/?id=1580101 | | | | | | | | | | | |

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	File: CalDoc_WLoadEC-002.dat		from: 20-12-20			Source: http://mediatum.ub.tum.de/?id=1580101												
2																		
3	Energy Consumption Analyses for Model: GA 20 Dairy farming in tied-up stalls with pocket milking plant																	
4																		
5	Energy Consu	Sub-Model:	TV 2000 Setup-work at feeding begin															
6	X-Values	ECB-Mean	0	1.33				ECB-Female	0	1,33		ECB-Male		0	1,33			
7	Y-Values	(Line)	10.30	10.30				(Line)	11,4	11,4		(Line)		17,3	17,3			
8	X-Values	Working Time	0	0	.20	.20	.32	.32	.41	.41	.54	.54	.60	.60	.71	.71	1.33	1.33
9	Y-Values	Energy Consu	0	14.80	14.80	6.30	6.30	6.30	6.30	6.30	6.30	14.80	14.80	14.80	14.80	9.80	9.80	
10																		
11	Energy Consu	Sub-Model:	TV 2001 Cleaning of feeding trough															
12	X-Values	ECB-Mean	0	1.83				ECB-Female	0	1,83		ECB-Male		0	1,83			
13	Y-Values	(Line)	24.13	24.13				(Line)	11,4	11,4		(Line)		17,3	17,3			
14	X-Values	Working Time	0	0	.08	.08	1.71	1.71	1.75	1.75	1.83	1.83						
15	Y-Values	Energy Consu	0	13.10	13.10	25.40	25.40	14.80	14.80	13.10	13.10		0					
16																		
17	Energy Consu	Sub-Model:	TV 2002 Load trash from feeding trough and move it away															
18	X-Values	ECB-Mean	0	2.29				ECB-Female	0	2,29		ECB-Male		0	2,29			
19	Y-Values	(Line)	18.48	18.48				(Line)	11,4	11,4		(Line)		17,3	17,3			
20	X-Values	Working Time	0	0	.05	.05	1.16	1.16	1.59	1.59	1.70	1.70	2.29	2.29				
21	Y-Values	Energy Consu	0	22.90	22.90	14.40	14.40	22.90	22.90	16.50	16.50	22.90	22.90		0			
22																		
23	Energy Consu	Sub-Model:	TV 2010 Take concentrate feed from bin and distribute by hand work															
24	X-Values	ECB-Mean	0	2.44				ECB-Female	0	2,44		ECB-Male		0	2,44			
25	Y-Values	(Line)	18.56	18.56				(Line)	11,4	11,4		(Line)		17,3	17,3			
26	X-Values	Working Time	0	0	.26	.26	.39	.39	2.05	2.05	2.18	2.18	2.44	2.44				
27	Y-Values	Energy Consu	0	14.80	14.80	6.30	6.30	21.60	21.60	6.30	6.30	14.80	14.80		0			
28																		
29	Energy Consu	Sub-Model:	TV 2020 Load silage from silo to barrow, transport and distribute															
30	X-Values	ECB-Mean	0	8.05				ECB-Female	0	8,05		ECB-Male		0	8,05			
31	Y-Values	(Line)	25.36	25.36				(Line)	11,4	11,4		(Line)		17,3	17,3			
32	X-Values	Working Time	0	0	.20	.20	.28	.28	.32	.32	2.62	2.62	2.66	2.66	4.89	4.89	6.05	6.05

CalDoc_WloadEC-002_EUS

Appendix 3:   Output File (CalDoc_WloadEC-127_KPA) in EXCEL-Format

A1 | File: CalDoc_WLoadEC-002.dat   from: 20-12-20   Source: http://mediatum.ub.tum.de/?id=1580101

#	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	File: CalDoc_WLoadEC-002.dat from: 20-12-20 Source: http://mediatum.ub.tum.de/?id=1580101																				
2																					
3	Analyses of Working Positions and Working Types according to the Energy Consumption Method																				
4																					
5	x-Axes	Coding for Working position (1-7) & Working type (8-20)																			
6	y-Axes	Rel. Shares of Working position and Working type (%)																			
7																					
8	Model:	GA 20 Dairy farming in tied-up stalls with pocket milking plant							Working Du	177.0	min										
9	Code no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
10	Code type	Sitting	Kneeing	Croching	Standing	Stoop stanc	Walking	Climbing	Simple hanc	Medium ha	Haevy hanc	Simple one	Medium on	Haevy one	Simple two	Medium tw	Haevy two	Simple bod	Medium bo	Haevy bod	Very haevy bc
11	Working posit	2.4	0.0	5.5	40.3	14.6	37.2	0.1													
12	Working type (%)								1.3	2.8	0.0	16.1	0.7	0.4	9.3	28.0	7.5	14.8	14.7	4.3	0.0
13																					
14	Model:	GA 21 Dairy farming in tied-up stall with pipe line milking plant							Working Du	245.8	min										
15	Code no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
16	Code type	Sitting	Kneeing	Croching	Standing	Stoop stanc	Walking	Climbing	Simple hanc	Medium ha	Haevy hanc	Simple one	Medium on	Haevy one	Simple two	Medium tw	Haevy two	Simple bod	Medium bo	Haevy bod	Very haevy bc
17	Working posit	3.4	0.0	8.0	37.4	15.3	35.9	0.1													
18	Working type (%)								5.5	1.9	0.0	12.6	0.8	0.3	7.2	36.6	0.9	16.9	12.6	4.7	0.0
19																					
20	Model:	GA 22 Dairy farming in cubicle houses, herringbone milking parlour							Working Du	309.7	min										
21	Code no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
22	Code type	Sitting	Kneeing	Croching	Standing	Stoop stanc	Walking	Climbing	Simple hanc	Medium ha	Haevy hanc	Simple one	Medium on	Haevy one	Simple two	Medium tw	Haevy two	Simple bod	Medium bo	Haevy bod	Very haevy bc
23	Working posit	6.0	0.0	0.1	62.9	5.1	25.4	0.4													
24	Working type (%)								17.9	2.6	0.4	15.1	8.1	0.1	11.4	29.6	0.3	13.0	1.1	0.4	0.0
25																					
26	Model:	GA 23 Dairy farming in cubicle houses, rotary milking parlour							Working Du	499.3	min										
27	Code no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
28	Code type	Sitting	Kneeing	Croching	Standing	Stoop stanc	Walking	Climbing	Simple hanc	Medium ha	Haevy hanc	Simple one	Medium on	Haevy one	Simple two	Medium tw	Haevy two	Simple bod	Medium bo	Haevy bod	Very haevy bc
29	Working posit	5.3	0.0	0.1	61.9	5.7	26.7	0.3													
30	Working type (%)								20.9	2.2	0.4	13.3	9.7	0.1	9.5	30.0	0.2	11.9	1.3	0.4	0.0
31																					
32																					

CalDoc_WloadEC-002_KPA