

MCC - MEAL CRITERION CALCULATION - START GUIDE

MCC CURRENT VERSION: 2.1.9316.18601

START GUIDE VERSION: 2025-07-21

SCRIPT: 1.9.12 (July 3rd, 2025)



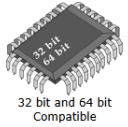
Download

DOWNLOAD MCC

www.nutritionmodels.com/mcc.html

REQUIREMENTS

- R Software www.r-project.org
- Microsoft .NET Framework 4.8.1 (Web Installer)
www.microsoft.com/en-us/download/details.aspx?id=17851



MCC GENERAL INFO

- MCC works with most PC-compatible computers (Microsoft Windows 7 or later, 32 or 64-bits)
- The MCC software is programmed with Microsoft Visual Studio 2010 using Visual Basic and .NET 4.0 framework; It uses R scripting v. 2.0 or later to perform calculations

INSTALL MCC



Download MCC >> [Click here to download ...](#) >> "mcc_setup.zip" >> Extract and run: "mcc_setup.exe"

Open MCC Application

The MCC App already have an update icon to provide the latest versions of the software scripts



If needed (not mandatory) the MCC script files can be downloaded from the MCC website

- We recommend always using the latest script version (for example: Version 1.9.12)
- Download the latest MCC Script; it will be a ZIP file ("mcc_1-9-12.zip")
 - This ZIP file has the ZZZ and ZZX scripts: "mcc v1.9.12.ZZZ" and "mcc v1.9.12.ZZX"
- Unzip (extract) the ZIP file containing the MCC script
 - Copy the mcc*.zxx and mcc*.zxx files to
 - "[C:\ ... \Documents\NutritionModels\MCC Files]"
- Only the mcc*.zxx or mcc*.zxx script files will be used by the MCC software
- Once the MCC is installed, you will be able to run it 10x before it must be purchased and registered.
- Register by submitting the registration number on the Purchase Page.

DEVELOPERS



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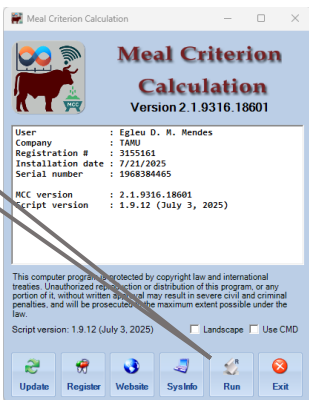
Egleu D. M. Mendes, M.Sc.
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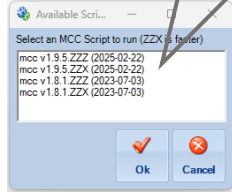
1. OPEN

A

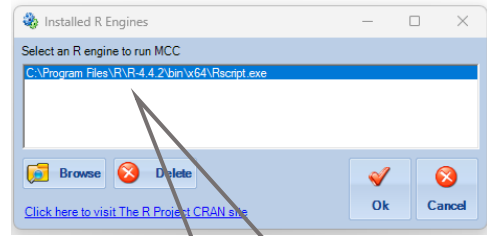
Click RUN



Select version (ZZX)

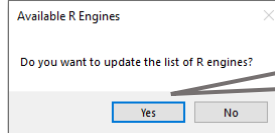


B



Update R (if needed)

Select R version (Browse one if needed)



C

Select behavior file to run (RAW SYSTEM FILE FORMAT only)

DATASET SYSTEM NOTES

SYSTEM	CSV	Excel	Access
Vytelle	●	●	●
Hokafarm	●		
C-Lock	-	-	-
Ponta	-	-	-

*C-Lock (Smart Feed) and Ponta will be available in future versions

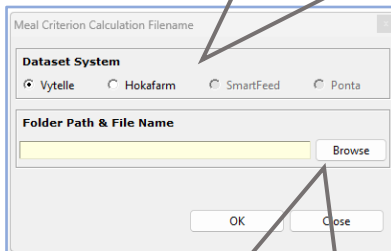
HOKAFARM NOTES

- Hokafarm files are provided as *.csv; one per day; select all
- For EID values with length <15, "999000" will be added to it
- MCC will compile all *.csv files; compiled files will be in the folder selected (*-MCC.csv; *-RAW.csv)

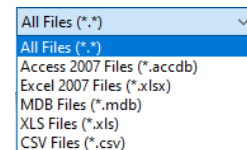
RAW SYSTEM DATA NOTES

- **Must use system original behavior RAW FILE FORMAT TO RUN ON MCC**

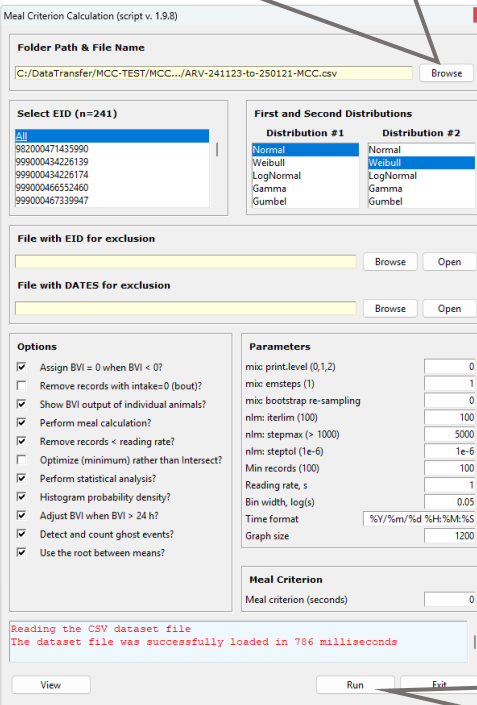
Select your System



Select the File to run



Run = run the calculations
Exit = exit the application



C.1 - COMMENTS

- MCC will create a folder ("Output") in the file location from the selected MCC data to run
- All output data, graphs, etc., will be in this Output folder

C.2 - FILE



- **FILES FORMAT TO USE WITH MCC MUST BE: M. Access, M. Excel, or CSV; MUST BE RAW DATA ONLY**
 - MAKE SURE THE FILE HAS THE CORRECT HEADER; **DO NOT CHANGE ORIGINAL HEADERS**
 - **THE CSV MUST BE SEPARATE BY A COMMA (NOT A SEMICOLON)**
 - **DATE/TIME MUST BE SET AS: YYYY-MM-DD HH:MM:SS (Most common error reported)**
 - **YOU CAN REMOVE ROWS FROM THE RAW DATA, BUT YOU CAN'T CHANGE THE HEADERS**

2. RUN

A

- Select All or animal by animal

B

- Select the 1st and 2nd Distributions
- Recommendation: NORMAL - WEIBULL

[Bailey, J. C., L. O. Tedeschi, E. D. M. Mendes, J. E. Sawyer, and G. E. Carstens. 2012. Evaluation of bimodal distribution models to determine meal criterion in heifers fed a high-grain diet.](#)

C

- Select the file with EID and DATES for exclusion (not mandatory)

D

- Assign BVI = 0 when BVI < 0
 - Adjustments for BVI overlaps
- Remove records with intake=0 (bout)?
 - If intake=0, remove the data
- Show BVI output of individuals animals?
 - Show Bunk Visit Intervals (BVI)
- Perform meal calculation?
- Remove records < reading rate?
 - Remove records when the duration of the feeding event < "Reading rate, s"
- Optimize (minimum) rather than Intersect?
 - Meal criterion value will be based on optimization rather than the intersection of the distributions
- Perform statistical analysis
- Histogram probability density?
- Adjust BVI when BVI > 24h
 - Applied when BVI >24h (86400 seconds)
 - Missing days (Gaps) in the database
- Detect and count ghost events
 - Count Ghost events
 - Details at the end of this manual
- Use the root between means
 - Determines the best interception value, especially when behavior shows three BVI curves instead of two

E

- mix: print.level (0,1,2)
- mix: emsteps (1)
- mix: bootstrap re-sampling
- nlm: iterlim (100)
- nlm: stepmax (>1000)
- nlm: steptol (1e-6)

Meal Criterion Calculation (script v. 1.9.8)

Folder Path & File Name

C:/DataTransfer/MCC-TEST/MCC.../ARV-241123-to-250121-MCC.csv Browse

Select EID (n=241)

All

982000471435990
999000434226139
999000434226174
999000466552460
999000467339947

First and Second Distributions

Distribution #1	Distribution #2
Normal	Normal
Weibull	Weibull
LogNormal	LogNormal
Gamma	Gamma
Gumbel	Gumbel

File with EID for exclusion

File with DATES for exclusion

Options

- Assign BVI = 0 when BVI < 0?
- Remove records with intake=0 (bout)?
- Show BVI output of individual animals?
- Perform meal calculation?
- Remove records < reading rate?
- Optimize (minimum) rather than Intersect?
- Perform statistical analysis?
- Histogram probability density?
- Adjust BVI when BVI > 24 h?
- Detect and count ghost events?
- Use the root between means?

Parameters

mix: print.level (0,1,2)	0
mix: emsteps (1)	1
mix: bootstrap re-sampling	0
nlm: iterlim (100)	100
nlm: stepmax (> 1000)	5000
nlm: steptol (1e-6)	1e-6
Min records (100)	100
Reading rate, s	1
Bin width, log(s)	0.05
Time format	%V/%m/%d %H:%M:%S
Graph size	1200

Meal Criterion

Meal criterion (seconds) 0

Reading the CSV dataset file
The dataset file was successfully loaded in 786 milliseconds

View Run Exit

E (continue)

- Min records (100)
 - Animal minimum records to run MCC
- Reading rate, s (standard = 1 second)
 - System EID reading rate in seconds (latest systems use 1 second; EID read/second)
- Bin width, log(s)
- Time format
- Graph Size

F

- Meal Criterion (MC) calculation
 - 1 = MC by average of all animals; meal data will be based on the average
 - (it is "-1", minus 1)
 - 0 = MC based on individual MC; meal data will be based on individual MC

3. OUTPUT - FILES

- bvi_ghost1_day.csv
- bvi_ghost1_scales.csv
- bvi_ghost2_day.csv
- bvi_ghost2_scales.csv
- bvi_nodays_day.csv
- bvi_nodays_scales.csv
- out_all_bvi.csv
- output_bvi.csv
- output_bvi2.csv
- output_meal.csv
- bvi_Ghost1_p1.png (p1, p2, p3)
- bvi_ghost2_p1.png (p1, p2, p3)
- BVI_HIST.png
- bvi_nodays_p1.png (p1, p2, p3)
- Histogram_xxxx.png (x = animal EID)
- Histogram_All.png
- Intersect_999999999.png
- Intersect_xxxx.png (x = animal EID)
- MixPlot_xxxx.png (x = animal EID)
- MixPlot_All.png
- Output_xxxx.txt (x = animal EID)
- Output_All.txt
- Output_meal.txt
- stats_bvi.txt

NOTE: SOME FILES MIGHT NOT BE PROVIDED

output_meal.csv

	Date	MealFreq	EID	MeanMealDur	MeanMealIntake	SumMealDur	SumMealIntake
49	2021-10-21	11	982000446107114	490.0909092	1432.727273	5391.000001	15760
50	2021-10-22	11	982000446107114	751.1818181	1885.454545	8262.999999	20740
51	2021-10-23	13	982000446107114	587.3076922	1703.076923	7634.999999	22140
52	2021-10-24	11	982000446107114	602.4545455	1531.818182	6627	16850

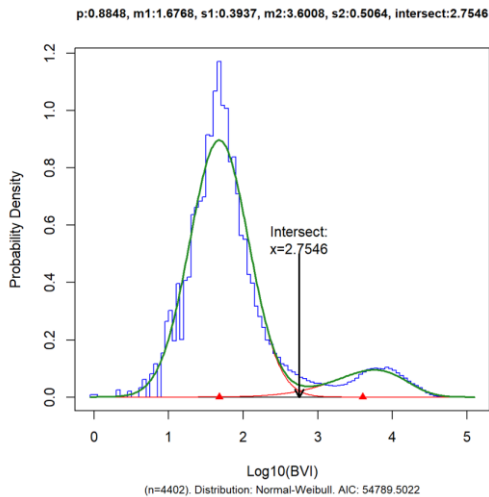
- Date: YYYY-MM-DD
- MealFreq: events/day
- MeanMealDur: mean meal duration in seconds
- MeanMealIntake: mean meal intake in grams
- SumMealDur: sum of meal duration in seconds
- SumMealIntake: sum of meal intake in grams
- COMMENTS: The data is based on the settings from Meal Criterion (MC) calculation
 - -1 = meal data based on average MC of all animals; 0 = meal data based on individual MC

output_bvi.csv

- dist1-dist2: distribution 1 and distribution 2 used for analysis
- p
- mu1
- s1
- mu2
- Intersect: use to calculate the Meal criterion for each animal (**MC in seconds = 10 ^ Intersect**)
- AIC: Akaike information criterion (AIC); evaluate how well the model fits the data
- Best Dist
- Least AIC
- Least Intersect

EID	dist1-dist2	p	mu1	s1	mu2	s2	Intersect	AIC	Best Dist	Least AIC	Least Intersect
1	982000446107114 Normal-Weibull	0.654321312	1.721225779	0.21563511	2.667655581	0.961755417	2.180065726	453.4655054	Normal-Weibull	453.4655054	2.180065726
2	982000446107115 Normal-Weibull	0.851560589	1.608191914	0.382429459	3.592802474	0.535258314	2.643412234	465.565713	Normal-Weibull	465.565713	2.643412234
3	982000446107116 Normal-Weibull	0.841236577	1.586350531	0.3739677	3.490465363	0.578772839	2.566742991	481.164274	Normal-Weibull	481.164274	2.566742991
4	999999999 Normal-Weibull	0.837984234	1.648574217	0.367585948	3.499825891	0.57016141	2.604952668	1326.048261	Normal-Weibull	1326.048261	2.604952668

- MC (Meal Criterion); calculated per individual (0) or as the average of all animals (-1)
- Intersect
 - LOG10 of BVI (bunk visit interval)
 - The result in seconds = $10^{\text{intersect}}$ (e.g.: $10^{2.7546} = 568.33 \text{ sec} = 9.47 \text{ minutes}$)
 - 1st distribution = short BVI | 2nd distribution = long BVI
- More information about this data is on: "Histogram_All.png", and "Output_All.txt":
- Each animal will have its own MixPlot_xxx graph (e.g.: "MixPlot_982000446107412.png"), Histogram_xxx.png and Output_xxx.txt



4. OTHER NOTES

- **BVI > 24h ERROR**
 - BVI values greater than 24 h likely happen because of missing days in the database.
 - In this case, BVI values were re-computed to only include the initial hours of the day.
 - MCC assumes that the BVI event started at midnight of the day that had a BVI value greater than 24 h (86400 seconds).
 - The occurrence frequency of this error (known as "NoDays") is recorded and shown in a new bar plot by days on feed and scales (i.e., feed bunks)
- **GHOST EVENT ERRORS**
 - A ghost event happens when the current feeding event starts before the end of the previous feeding event. Two ghost event scenarios can occur next:
 - Ghost event case 1 (complete overlap).
 - This error occurs when the end of the current feeding event is GREATER than the end of the previous feeding event.
 - The occurrence frequency of this error (known as "Ghost case 1") is recorded and shown in a new bar plot by days on feed and scales (i.e., feed bunks)
 - Ghost event case 2 (partial overlap).
 - This error occurs when the end of the current feeding event is LESSER than the end of the previous feeding event.
 - The occurrence frequency of this error (known as "Ghost case 2") is recorded and shown in a new bar plot by days on feed and scales (i.e., feed bunks).

5. RAW DATA MANAGEMENT


RAW DATA ERRORS >> WRONG FORMAT, WRONG COLUMNS, OR CHANGING HEADERS




M. Excel

*.CSV

	A	B	C	D	E	F
1	EID	Time_label	Scale	Duration	HeadDown	Consumed
2	982000366869590	5/21/2014 1:44	001	366	225	190
3	982000366869465	5/21/2014 1:51	001	11	11	0
4	982000366869590	5/21/2014 1:52	001	14	10	50
5	982000366869581	2014-05-21 01:56:52	001	352	245	930
6	982000366869476	2014-05-21 02:02:50	001	109	99	330
7	982000366869499	2014-05-21 02:05:05	001	1042	760	2310

```
FeedingEvents - B.csv
File Edit View
EID,Time_label,Scale,Duration,HeadDown,Consumed
982000366869590,5/21/2014 1:44,001,366,225,190
982000366869465,5/21/2014 1:51,001,11,11,0
982000366869590,5/21/2014 1:52,001,14,10,50
982000366869581,2014-05-21 01:56:52,001,352,245,930
982000366869476,2014-05-21 02:02:50,001,109,99,330
```

- We used Vytelle Sense data for this example (exported from Access MDB file)
 - The original header format must be "EID,Time_label,Scale,Duration,HeadDown,Consumed"
- WRONG DATE FORMAT:  5/21/2014 1:44 >> Must be: YYYY-MM-DD hh:mm:ss
- CORRECT DATE FORMAT:  2014-05-21 01:44:34

	A	B	C	D	E	F	G
1	EID	VID 	Date  Time 	Bunks	Duration	HeadDown	Consumed
2	982000366869581	Animal 01	2014-05-21 01:56:52	001	352	245	930
3	982000366869476	Animal 02	2014-05-21 02:02:50	001	109	99	330
4	982000366869499	Animal 03	2014-05-21 02:05:05	001	1042	760	2310
5	982000366869485	Animal 04	2014-05-21 02:22:37	001	79	71	310
6	982000366869587	Animal 05	2014-05-21 02:24:53	001	47	44	230

RAW SYSTEM DATA NOTES

- Must use system original behavior
- RAW FILE FORMAT TO RUN ON MCC
- DO NOT ADD COLUMNS
- DO NOT CHANGE HEADERS

RAW SYSTEM DATA

- CLEAN YOUR DATA
 - You must clean your data to remove bad days, animals removed from trial, etc.
 - If you do not clean the data, outliers or errors might be included into the analysis
- EDITING RAW DATA
 - You can edit the Raw data
 - Remove or add rows if needed
 - YOU CAN'T CHANGE THE RAW DATA FORMAT
 - YOU CAN'T CHANGE HEADERS ORIGINAL NAME