

AnalysePlus

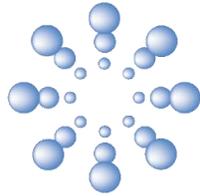
User Guide

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Foreword



**Dairy Production Information Systems
group, McGill University**



**Lactanet, the Canadian Network for Dairy
Excellence**

The **AnalysePlus** module is the product of a collaboration between McGill University's Dairy Production Information Systems research group and Lactanet, Canada's Network for Dairy Excellence (formerly PATLQ and Valacta).

The software was designed in collaboration with Diederik Pietersma, Ph.D.; Daniel Lefebvre, Ph.D., agr.; Lael Parrot, Ph.D.; René Lacroix, Ph.D., P.Eng. and Kevin Wade, Ph.D.

The programming was done by Diederik Pietersma and Simon Besner.

The artificial intelligence and machine learning technology for the automated analysis of lactation curves in the **AnalysePlus Lactation** sub-module was developed by Diederik Pietersma as part of his PhD work and published in the following papers:

Pietersma, D., R. Lacroix, D. Lefebvre, and K. M. Wade. 2002. *Machine-learning assisted knowledge acquisition to filter lactation curve data*. Transactions ASAE. 45:1637-1650.

Pietersma, D., R. Lacroix, D. Lefebvre, and K. M. Wade. 2002. *Decision-tree induction to interpret lactation curves*. Can. Biosys. Eng. 44:7.1-7.13

Pietersma, D., R. Lacroix, D. Lefebvre, and K. M. Wade. 2003 *Performance analysis for machine-learning experiments using small data sets*. Computers and Electronics in Agric. 38:1-17.

Pietersma, D., R. Lacroix, D. Lefebvre, and K. M. Wade. 2003 *Induction and evaluation of decision trees for lactation curve analysis*. Computers and Electronics in Agric. 38:19-32.

The reference data used as an interpretation standard for lactation curves was taken from Lactanet data and published in:

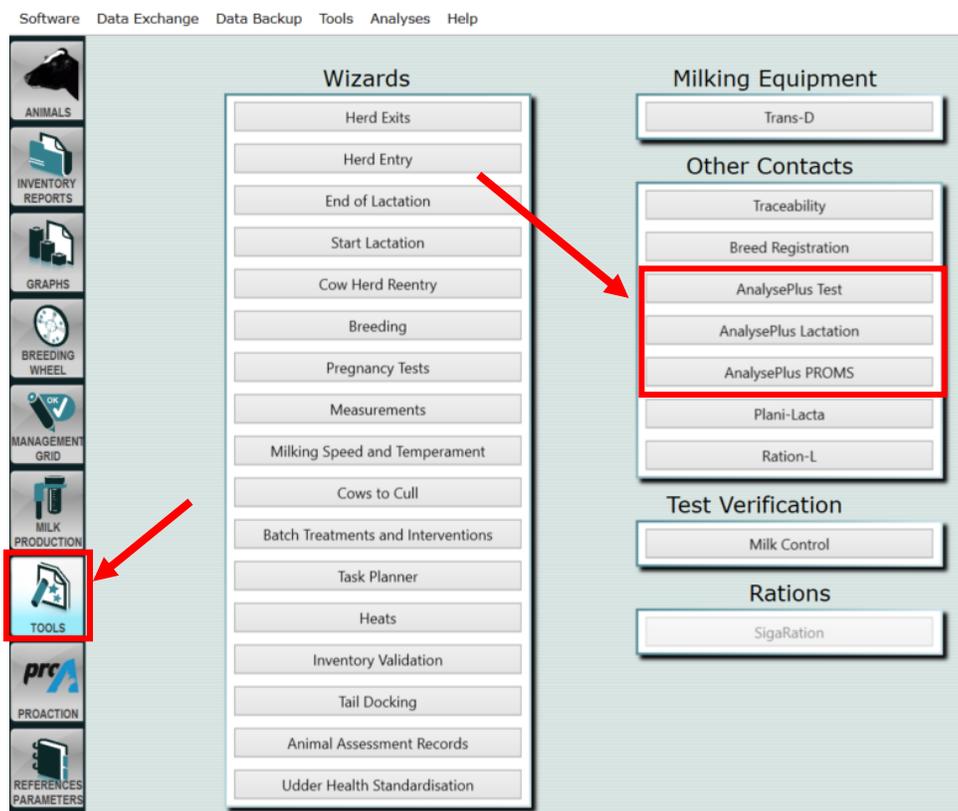
Lefebvre, D.M., D. Marchand, M. Léonard, C. Thibault, E. Block, T.J. Cannon. 1995. *Gestion de la Performance du Troupeau Laitier: Des Outils à Exploiter*. Compte rendu. 19e Symposium sur les bovins laitiers, CPAQ

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Overview of the AnalysePlus module

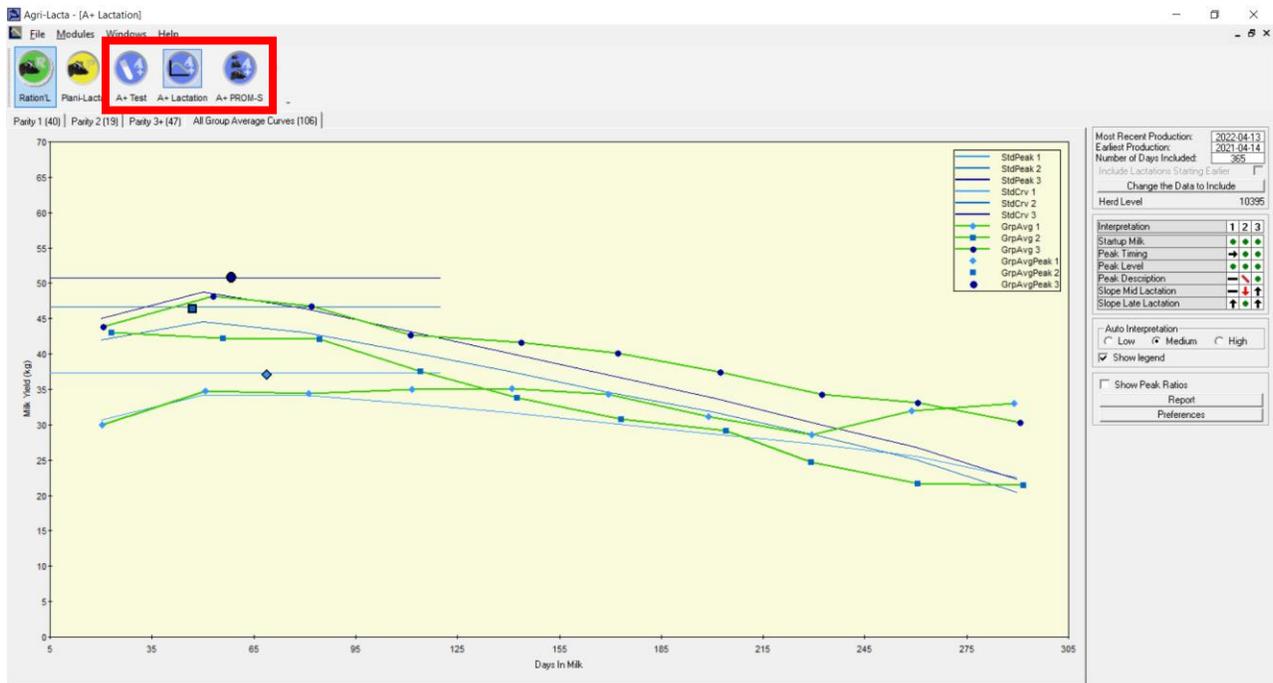
The *AnalysePlus* module has three sub-modules that can be accessed through the **Lac-T Tools** panel:



When *AnalysePlus* is open, the three sub-modules can be accessed through the icons at the top of the page:



- *AnalysePlus Lactation* and *AnalysePlus Test* are used for performance analysis of lactating cows;
- *AnalysePlus PROM-S* analyzes the growth performance of replacement subjects in height and weight.



The main objectives of the *AnalysePlus* module are:

- Provide **relevant information** on the herd's management performance
- Analyze the **results obtained** in relation to the breeding practices
- Increase the **quality of on-farm advisory services**
- Increase the **profitability of dairy farmers**.

Note : In this document, the expressions "left-click" or "right-click" refer to the mouse buttons. As everywhere in the *Windows* environment, right-clicking gives access to the context menu, i.e., options for moving from one window to another in *AnalysePlus*.

WARNING: The data presented in the graphs of these sections may be affected by the number of observations, milk tests, cows tested, and data included in the database, and thus can lead to an erroneous interpretation. We advise you to ask your Lactanet advisor for help if you wish to further analyze the data.

AnalysePlus Lactation



It is important to be aware that the production data used for the programming of *AnalysePlus Lactation* was collected primarily from **Holsteins**.

When you click on *AnalysePlus Lactation*, you will first see a **transfer bar** that confirms the loading of the data that will be used by the program. The default data used to create the curves is **the last 365 days from the most recent production date**. From all 24-hour production data and for all tests within the last 365 days, a composite curve is then created. It is important to keep in mind that for each of the points used to draw the curve, the number of observations is different.

The first dialog box on the right defines the **production interval considered**. It gives by default the date of the last test as the **Most Recent Production** date (here 2022-04-13) and an earlier date of one year as the **Earliest Production** date (2021-04-14). The number of days included is therefore 365.

At the bottom of this first box is the **Herd Level** between the two dates used to create the curves. In this case, the average is 10 395 kg of milk.

A screenshot of a dialog box with a light gray background. It contains the following fields and controls:

- "Most Recent Production:" with a date input field containing "2022-04-13".
- "Earliest Production:" with a date input field containing "2021-04-14".
- "Number of Days Included:" with a text input field containing "365".
- An unchecked checkbox labeled "Include Lactations Starting Earlier".
- A button labeled "Change the Data to Include".
- A label "Herd Level" followed by the value "10395".

Three red arrows point from the text in the surrounding paragraphs to these specific elements: one to the "Most Recent Production" date, one to the "Herd Level" label, and one to the "Change the Data to Include" button.

The **Change the Data to Include** button allows you to change the production dates or the number of days.

Change the Data to Include

Most Recent Production Date: 2022-04-13

Earliest Production Date Included: 2021-04-14

Number of Days Included: 365

Include Lactations Starting Before Earliest Production Date

Cancel Reload Data

The choices in data will change the dates used for the analysis: If a **production date is changed** (*most recent or earliest date*), the number of days included is **automatically recalculated**. If you change **the number of days included**, the program readjusts the **earliest production date** according to the number of days entered.

This window also includes the option **Include Lactations Starting Before Earliest Production Date**. The option is activated by checking the box. The program will then consider all production data from calving onwards for each cow in lactation as of the latest given date. This ensures that you have complete data for all current lactations during the defined interval.

When changes are made in the **Change the Data to Include** window, you **must** click on the **Reload Data** button to activate the changes. Otherwise, click on *Cancel* to return to the starting point.

When returning to the first box, if the *Include Lactations Starting Earlier* option was clicked, a check mark will appear at the end of the *Include Lactations Starting Earlier* line and the production levels will now be readjusted to reflect the new changes.

Most Recent Production: 2022-04-13

Earliest Production: 2021-04-14

Number of Days Included: 365

Include Lactations Starting Earlier

Change the Data to Include

Herd Level 10395

Still on the right of the screen, under the first box, a second box gives the result of the interpretations made by the program:

Interpretation	1	2	3
Startup Milk	●	●	●
Peak Timing	●	●	●
Peak Level	●	●	●
Peak Description	—	↘	●
Slope Mid Lactation	—	↓	↑
Slope Late Lactation	↑	●	↑

The interpretation is split according to **lactation number** (ex. 3 means 3rd lactation and higher).

Interpretation legend:

● : Normal (relative to the average)

↓ : Below average

↑ : Above average

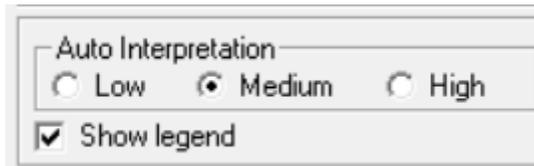
— : Peak (ascending phase, then sustained production)

↘ : No peak (production decreased at the beginning of lactation)

Parameters of the lactation curve that are considered:

- **Startup Milk:** This interpretation is based on production at the first test
- **Peak Timing:** The interpretation of this variable is based on a lactation peak of 65 days for primiparous cows and 55 DIM for multiparous cows
- **Peak Level:** This variable is an evaluation of the quantity of milk at peak lactation according to the production level of the herd. To analyze this variable, the program will take the highest point on the lactation curve before 120 DIM.
- **Peak Description:** This variable characterizes the duration and shape of the peak (see legend above).
- **Slope – Mid Lactation**
- **Slope – Late Lactation**

The third box on the right of the screen is the following, and **allows you to change the level of interpretation** of the results and to show the interpretation legend:



The screenshot shows a control box titled "Auto Interpretation". It contains three radio buttons: "Low", "Medium", and "High". The "Medium" radio button is selected. Below the radio buttons is a checked checkbox labeled "Show legend".

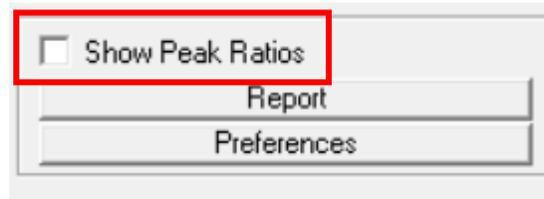
The fourth box on the right of the screen is the following, and allows you to **choose different stages of lactation** and change the interpretation of the lactation curves from mid to late lactation:



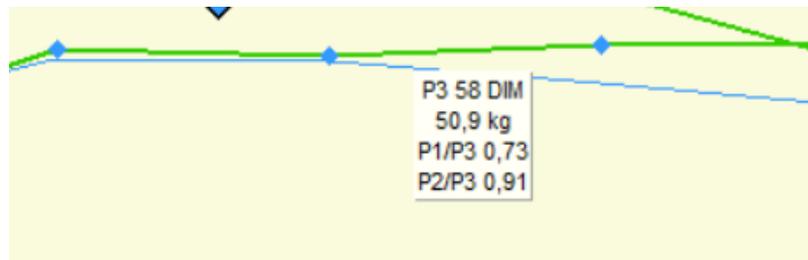
The screenshot shows two control boxes. The top box has a checked checkbox labeled "Include Stage 9". The bottom box is titled "Transition Point Mid - Late Lactation" and contains five radio buttons: "None", "Stg 5", "6", "7", and "8". The "Stg 5" radio button is selected.

Click **Include Stage 9** to include cows that exceed 305 DIM.

The fifth box on the right of the screen is the next one, and it gives the option to **Show Peak Ratios**:



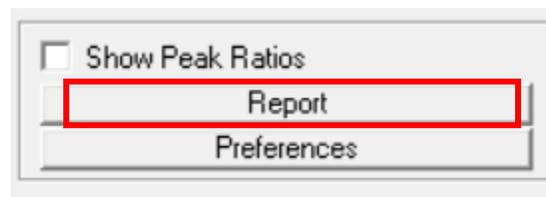
When this option is activated (checked), a **tooltip box** appears above the lactation curves:



The tooltip box provides the following information:

- P3 58 DIM: Parity 3, peak lactation at 58 DIM
- 50,9 kg: Average milk quantity at peak lactation
- P1/P3 0,73: Average milk ratio at peak lactation (parity 1 cows / parity 3 cows)
- P2/P3 0,91: Average milk ratio at peak lactation (parity 2 cows / parity 3 cows)

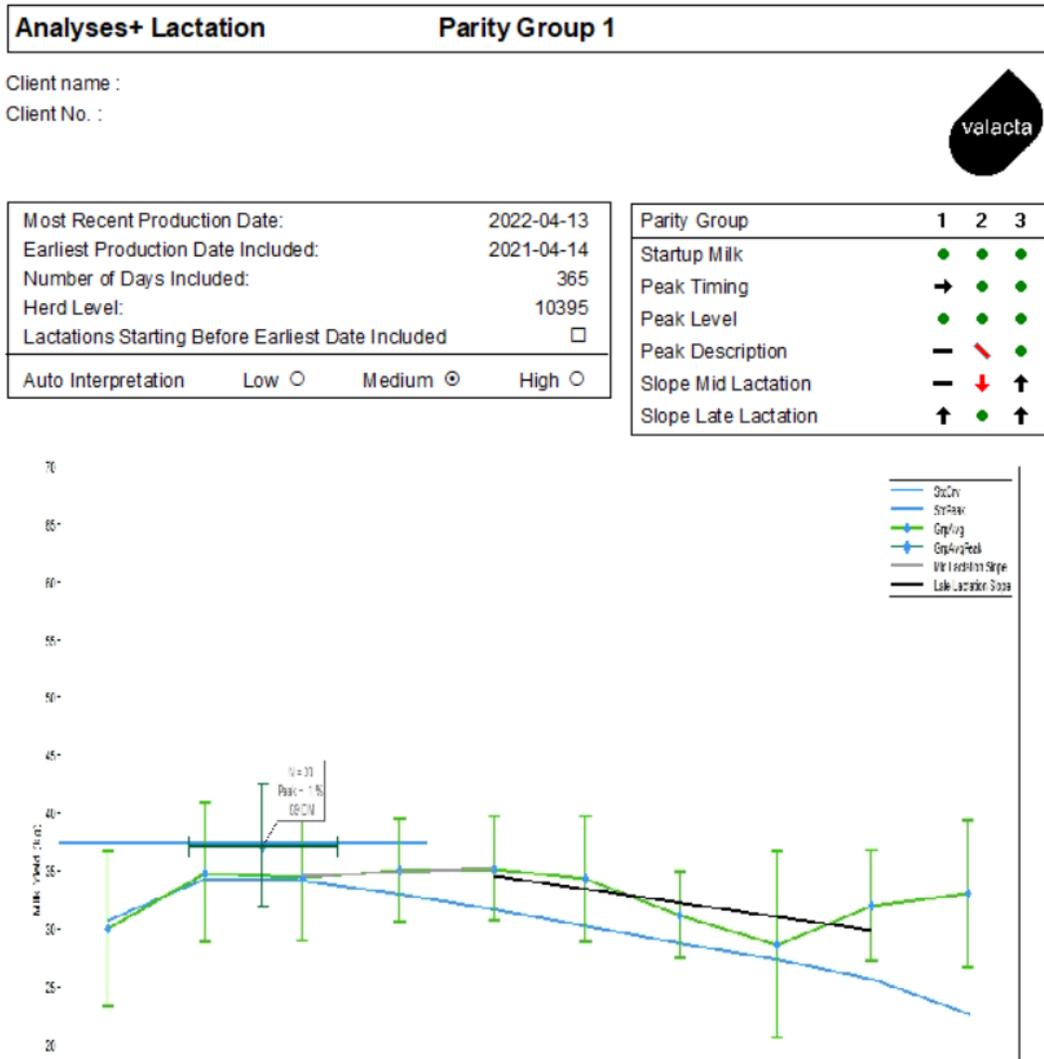
This fourth box also gives access to **printing** by clicking on the **Report** button:



A window opens in which you select the parity number to be printed, either 1, 2 or 3. The **Magnifying Glass** button adjusts the zoom, and the **Printer** icon initiates printing.

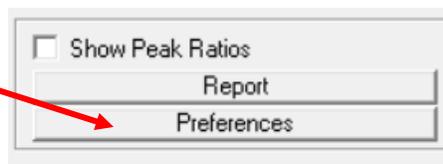


Here is a **sample** of the **printable report**:

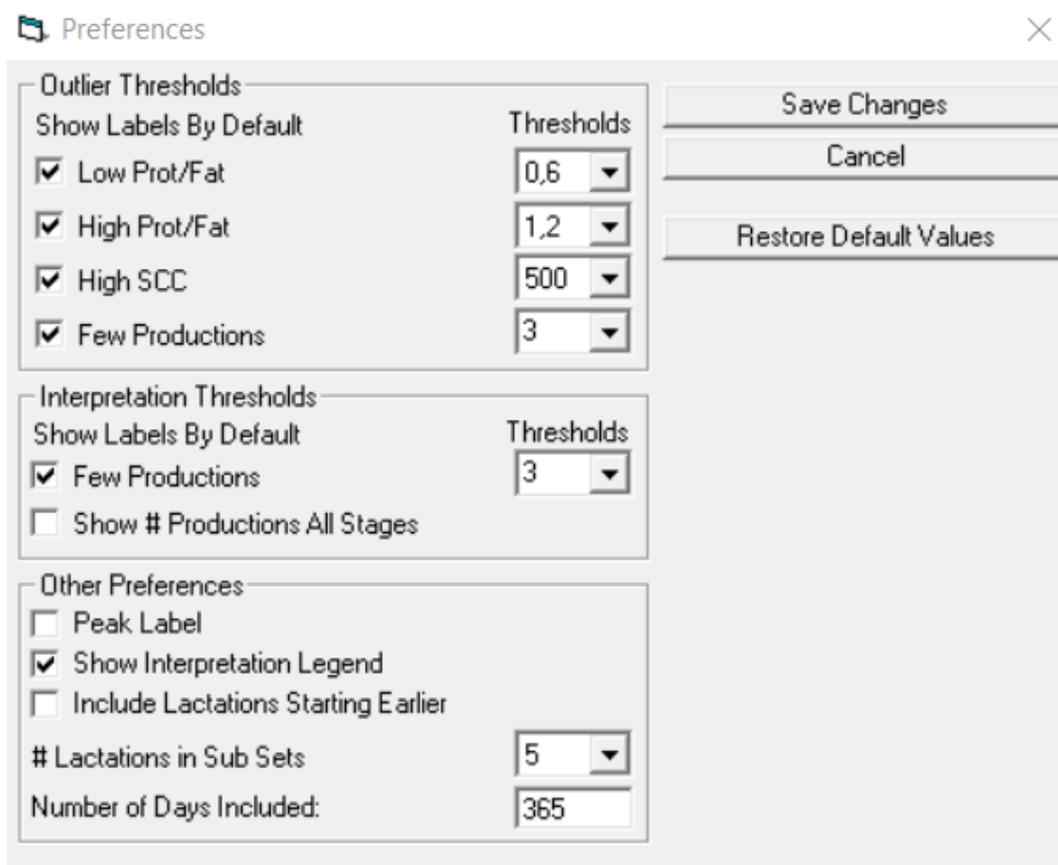


The header of the report displays two boxes: the first, on the left, describes the **data used** for analysis and the second, on the right, deals with the **interpretations of the average curve** for this parity. The **persistence** can be displayed at the bottom of the graph depending on the option used.

In the fourth box in the program, the **Preferences** button allows you to modify certain parameters for the interpretation of **AnalysePlus Lactation** results.



By clicking *Preferences*, the following window appears:



The left side has **3 sections**: *Outlier Thresholds*, *Interpretation Thresholds* and *Other Preferences*.

Outlier Thresholds: Allows you to change the **label display thresholds** for the following four parameters:

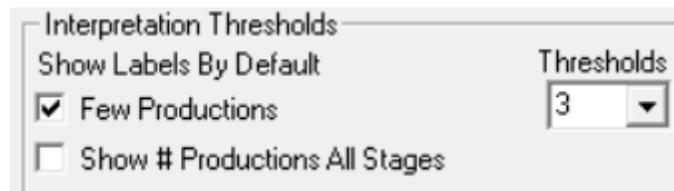
- *Low Prot/Fat,*
- *High Prot/Fat,*
- *High SCC,*
- *Few Productions.*

The **Few Productions** parameter refers to the number of production records used to establish an average. **If the number is lower** than this parameter, the user will be informed by a pop-up **label**.



The screenshot shows a dialog box titled "Outlier Thresholds". It has a section "Show Labels By Default" with four checked checkboxes: "Low Prot/Fat", "High Prot/Fat", "High SCC", and "Few Productions". To the right, under the heading "Thresholds", there are four dropdown menus with the following values: "0,6", "1,2", "500", and "3".

Interpretation Thresholds: Allows you to check the parameter **Few Productions** and to change the threshold to display a label.

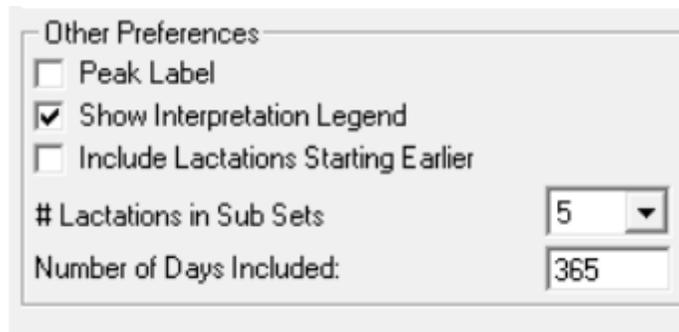


The screenshot shows a dialog box titled "Interpretation Thresholds". It has a section "Show Labels By Default" with two checkboxes: "Few Productions" (checked) and "Show # Productions All Stages" (unchecked). To the right, under the heading "Thresholds", there is a dropdown menu with the value "3".

For example, if the calculated data is based on **3 or fewer productions**, a label will be displayed to warn that the data is based on a low number of observations. A second option in this box, titled **Show # Productions All Stages**, allows you to display, for each point of the lactation curve, a label indicating the number of productions used in the calculation.

Other preferences: Allows you to configure the **AnalysePlus Lactation** program to show peak labels, to display the interpretation legend and to include lactations starting earlier than the defined dates.

It is also possible to predetermine a minimum **number of lactations per subset** (modify the default value from 5 should you so choose). A final option, **Number of Days Included** allows you to modify the number of days between the most recent production date and the earliest production date.



Individual curves: Individual production curves are accessed via one of the three **parity tabs** at the top left of the module. They cannot be accessed via the **All Group Average Curves** tab. If you click on the right side of the screen, the option **Go to Exclusions** appears, just **left click** on this option and you are in the individual curves screen. This screen **allows you to display only those cows that meet the preestablished conditions set in the Preferences, Outlier Thresholds.**



To the right of the **Outliers** screen, the following window allows you to **modify the threshold values**:

Labels	Threshold
<input checked="" type="checkbox"/> Low Prot/Fat	0,6
<input checked="" type="checkbox"/> High Prot/Fat	1,2
<input checked="" type="checkbox"/> High SCC	500
<input checked="" type="checkbox"/> Few Productions	3

Clear Production Info Labels

← → Lactations 1 - 47

All # Lactations 5

Show legend

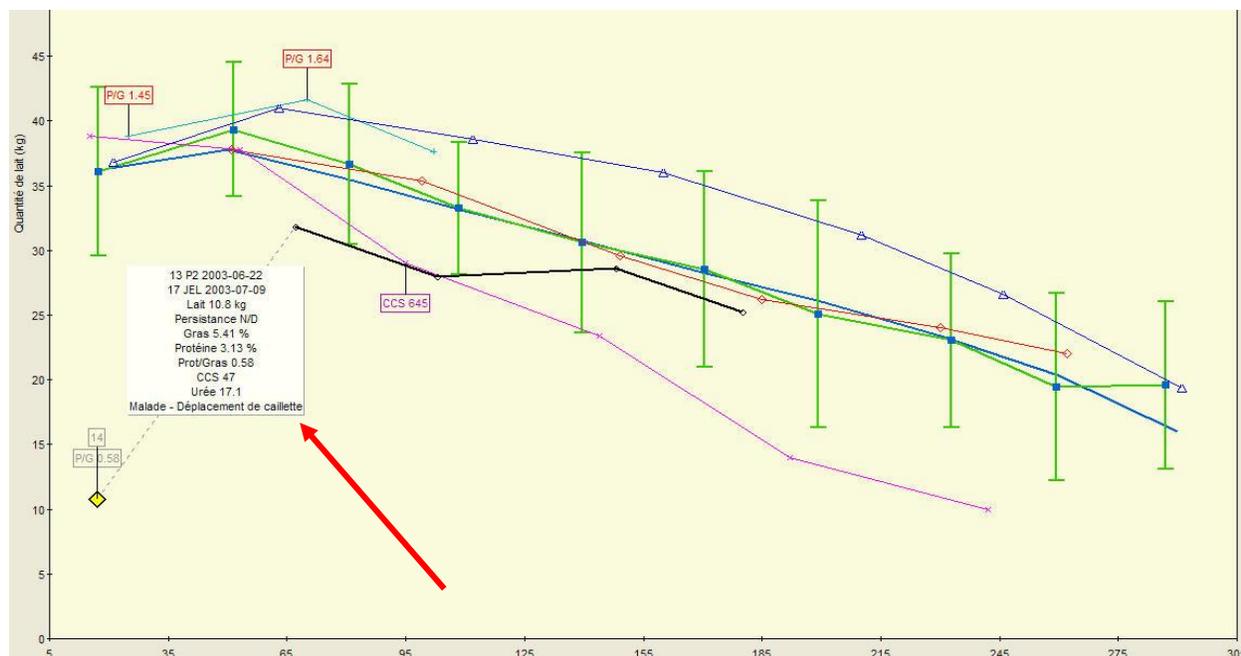
The **Clear Production Info Labels** button will clear all previously activated labels on the screen. The **# Lactations** box specifies the number of lactation curves displayed simultaneously on the screen (1 to 5). The **All** button displays all curves. The arrows scroll through the individual lactation curves (depending on the number of predetermined lactation curves).

It is also possible to display the legend on the screen by selecting the **Show Legend** box.

The **Outliers** section allows you to visualize the reasons why curves have been excluded. **Coloured boxes** are displayed over the curves according to the following schema:

- Blue** = Low P/F ratio;
- Red** = High P/F ratio;
- Pink** = High SCC;
- Grey** = The data was considered an outlier and therefore excluded from the group's average lactation curve.

The following figure shows an **example of excluded data point (in grey)**. Above the data, a grey box containing condition code 14 indicates that this cow had a displaced abomasum at the time of testing:



For each point of the curve, a **left click** on the point displays a **label** with the following information:

- Cow barn ID
- Calving date
- Number of days in milk
- Date of test
- Amount of milk
- Lactation Persistency
- Components: fat and protein
- Ratio P/F,
- Somatic cell
- MUN and, if applicable,
- Body Condition Score code

A **right-click** on a point of a curve allows you to either **include or exclude this data** from the group average, or to **exclude the whole lactation**.

To leave the **Outliers** section, simply right-click on the screen, a box entitled **Go to Interpretations** will appear: left-click and you are back in the **Interpretations** section.

AnalysePlus Test

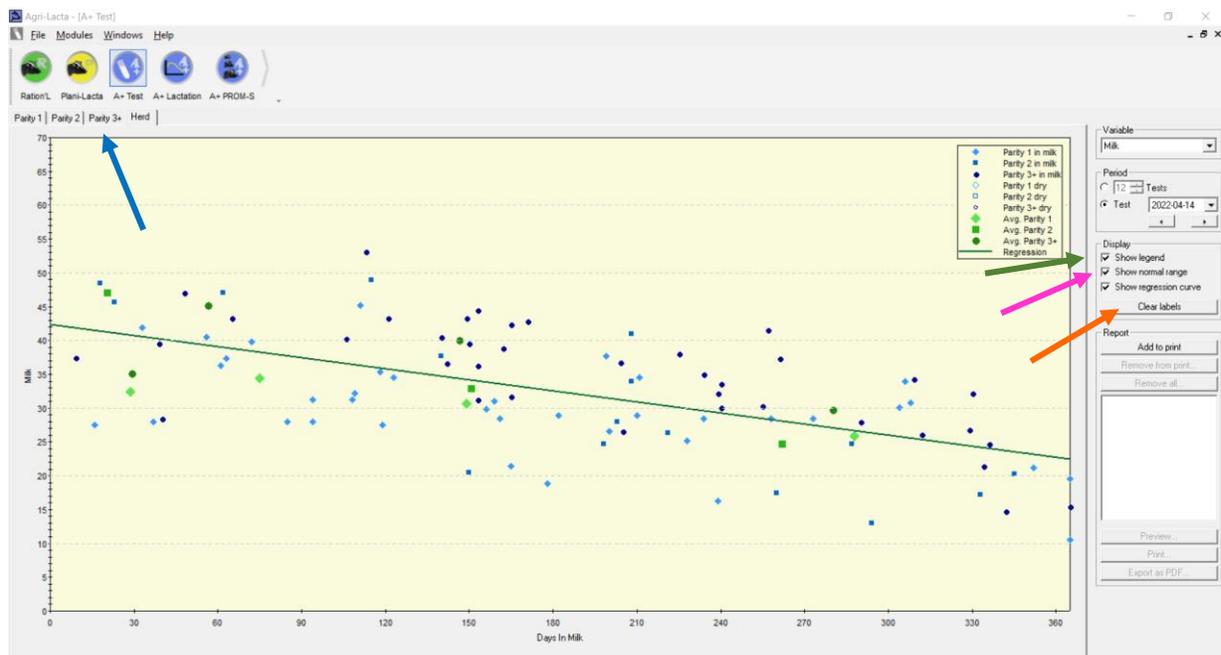


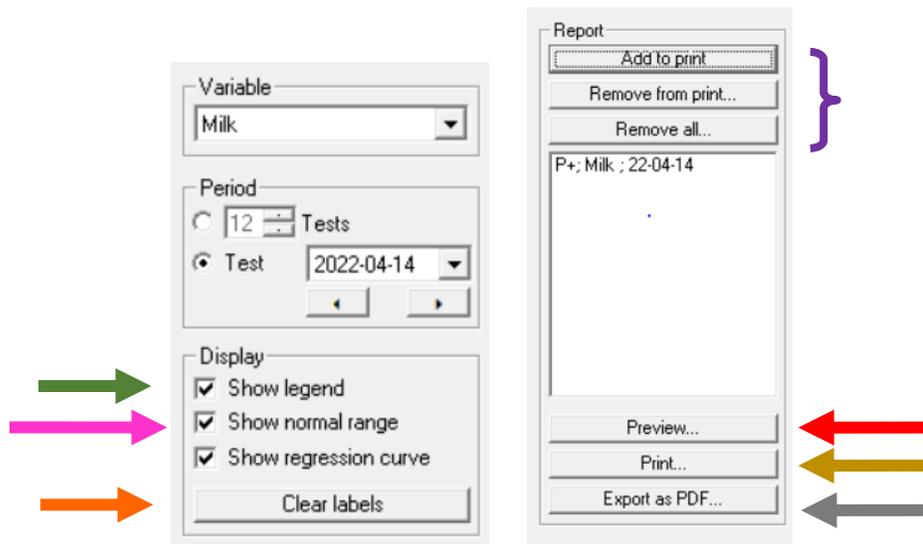
This sub-module is accessed by clicking on **AnalysePlus Test**. By default, the data used to generate the graphs are those of the last milk test. The date of the test is shown at the top right of the screen. It is possible to change this date and analyze data from previous tests by using the drop-down list or the arrows at the bottom of the test date.

The data that can be displayed are composition data (% fat, % protein, P/F ratio, F/P ratio, NFS/F, SCC, MUN) and production data (milk, persistence, body condition, B.C. differential and DIM at first breeding) on the day of the test, and can be displayed based on the number of days in milk. It is also possible to navigate from one test to another with the arrows or by selecting the desired test date.

This sub-module is relatively simple to use. At the top of the screen, on the left, tabs allow you to analyze the **data of the day of the test according to the parity (1, 2, 3 and +) or for the whole herd**. On the right side of the screen, you can activate or deactivate the legend by using the option **Show legend**. There is also the option **Show Normal Range** which highlights the desired range.

On the right side of the screen, the **Clear Labels** button allows you to clear the labels above each point on the screen. To activate a label, simply double-click on a point.

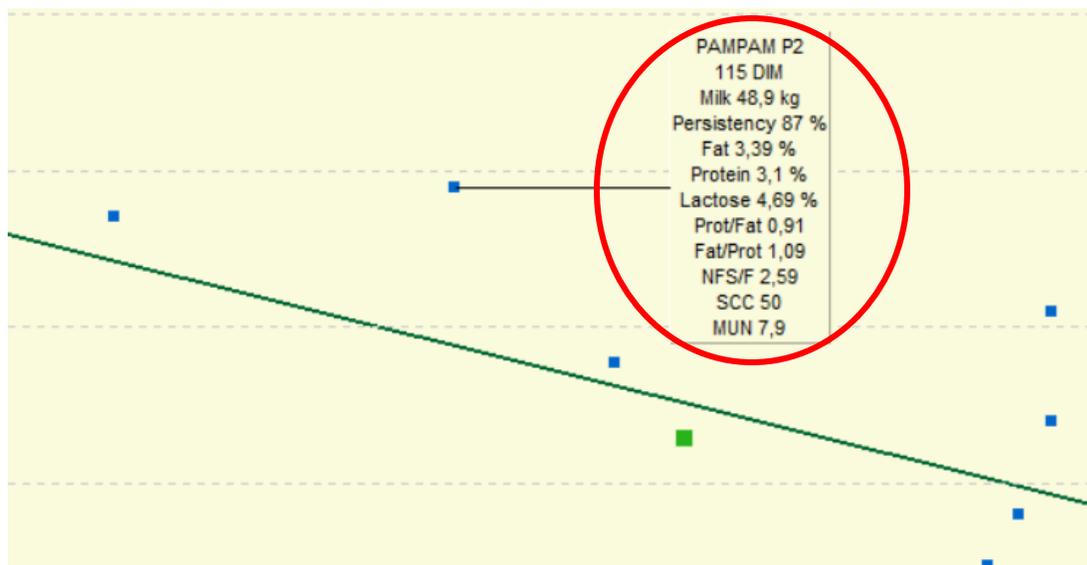




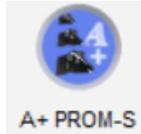
The last section on the right-hand side of the screen allows you to *add or remove data for printing*.

The bottom buttons allow you to **Preview** (display the selected data on the screen), **Print** (make a paper printout) or export as PDF.

Below is an example of an **active label** containing the test results: *cow barn ID, parity number, number of days in milk, quantity of milk, persistency, percentage of fat and protein, protein/fat ratio, NFS/F, SCC and MUN.*



AnalysePlus PROM-S



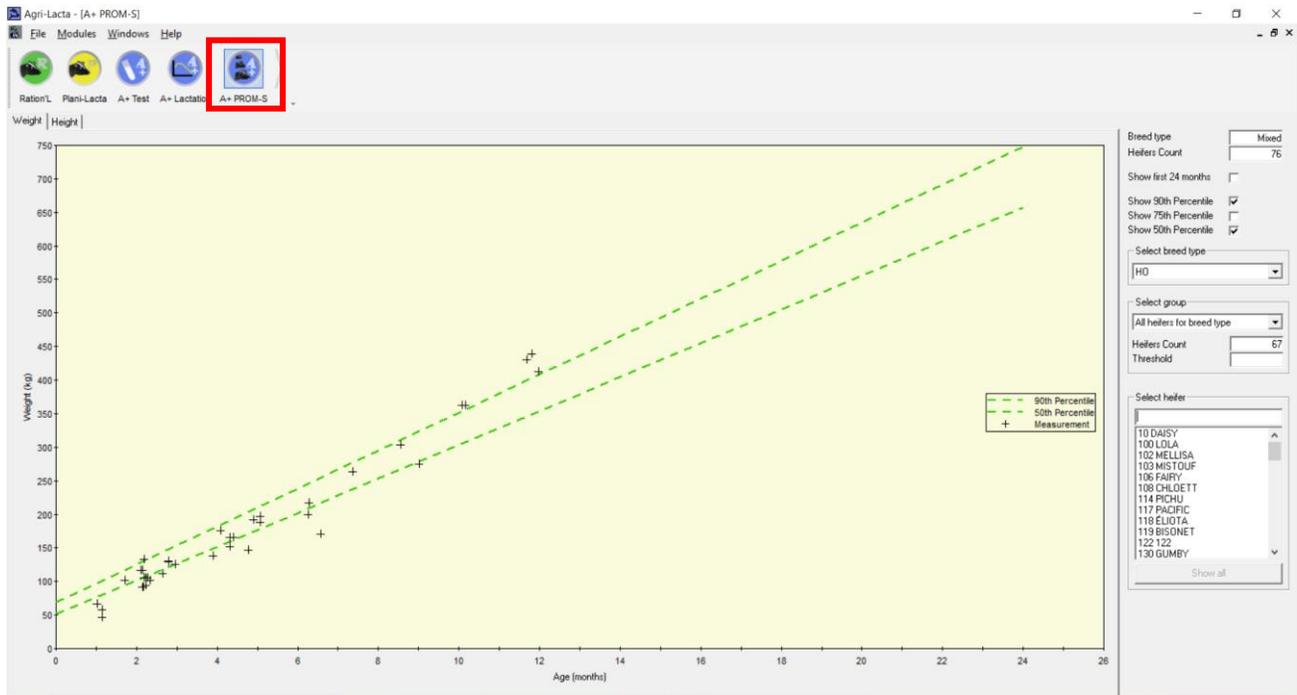
The new version of Analyse+ PROM-S includes **heifer growth prediction** based on individual heifer measurements and population growth modelling. This growth model was developed by Dr. Roger Cue of McGill University and is currently **exclusive to our Lactanet tools**.

The AnalysePlus PROM-S graph also shows **information about breeding** as well as an indication of the **age at which the heifer will reach the target weight** for the first breeding.

A minimum of 2 measurements are required for the growth model to be applied to a single heifer. If only one measurement is available, a weight corresponding to the RC 50 of the breed is used as birth weight. **The more measurements that exist for the same heifer, the more accurate the prediction.**

GENERAL NOTICE: The weight chart represents a target to maintain their current weight at first calving with the average AAFC assumed at 24 months.
The height chart represents the values actually observed in the field.

This section can be accessed by clicking on **AnalysePlus PROM-S**, at the top left of the screen:



This sub-module is relatively easy to use. At the top left, you find the **Indicators** which are the **results estimated** by the growth model.

Indicators	
Weight at 15 Mo. (kg)	<input type="text"/>
Weight at 24 Mo. (kg)	<input type="text"/>
ADG 0-15 Mo. (g/d)	<input type="text"/>
ADG 15-24 Mo. (g/d)	<input type="text"/>
Target age 1st Br. (m)	<input type="text"/>
Projected calv. age* (m)	<input type="text"/>

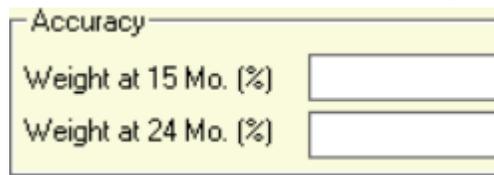
Weight at 15 and 24 Mo: Estimated **average weight** of heifers in the herd at 15 and 24 months. Shown on the graph with a vertical bar at 15 and 24 months to represent the accuracy of the prediction. The more measurements per heifer, the more accurate the model.

ADG 0-15 and 15-24 Mo.: Estimated **average daily gain** in the herd for the 0-15 and 15-24 month periods. Note that if the ADG is similar between the two, or if one of the 2 periods is lower, make note to identify and examine the problematic periods.

Target age 1st Br. (breeding): Estimated average age at which heifers in the herd reach **55% of mature weight for their breed** and are ready for first breeding (see table below). Corresponds to the solid diamond on the graph (◆).

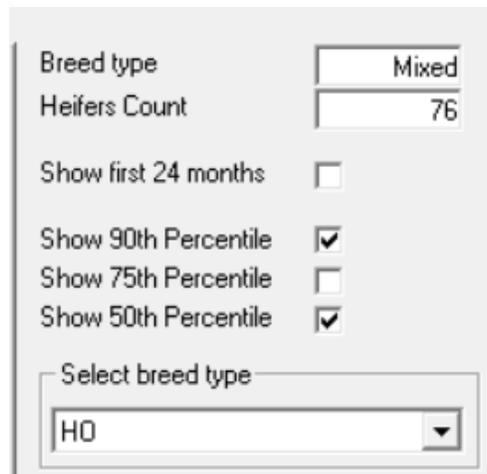
Projected calv. age: estimated **average age at first calving** in the herd if heifers were **bred at the target age** for first breeding.

Accuracy 15 and 24 Mo.: Evaluation of the **accuracy of weight predictions** in the 15 to 24 months range. Reliability increases with the number and frequency of measurements.



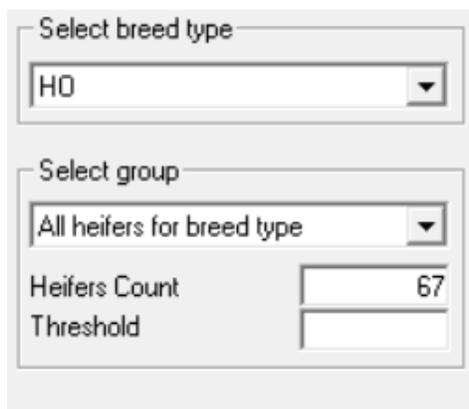
The screenshot shows a yellow-bordered box titled "Accuracy". Inside the box, there are two rows of input fields. The first row is labeled "Weight at 15 Mo. (%)" and the second row is labeled "Weight at 24 Mo. (%)". Both labels are on the left, and each has a corresponding empty rectangular input box on the right.

At the top right of the screen, tabs **allow you to analyze the weight or the height for all heifers**. On the right side of the screen, you can **activate or deactivate the 50th, 75th & 90th Percentile ranks**. The predominant breed in the herd and the number of animals are also shown.



The screenshot shows a grey-bordered box containing several controls. At the top, "Breed type" is a dropdown menu with "Mixed" selected. Below it, "Heifers Count" is a text box showing the number "76". There are three checkboxes: "Show first 24 months" (unchecked), "Show 90th Percentile" (checked), and "Show 75th Percentile" (unchecked). Below these is another checked checkbox for "Show 50th Percentile". At the bottom, there is a "Select breed type" label above a dropdown menu that currently displays "HO".

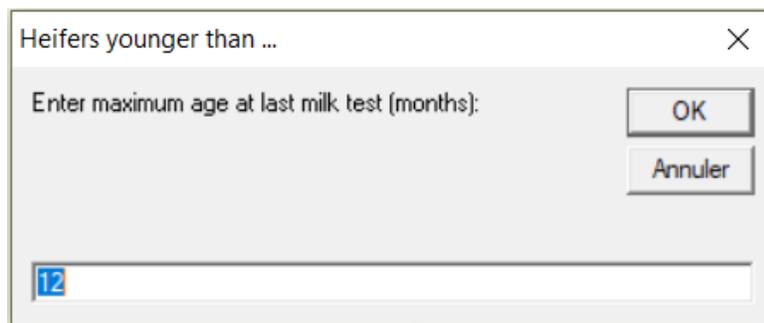
In the next box, it is possible to **select the breed to be displayed**, which is useful when several breeds are present in the same herd.



The screenshot shows a software interface with two main sections. The first section is titled "Select breed type" and contains a dropdown menu with "HO" selected. The second section is titled "Select group" and contains a dropdown menu with "All heifers for breed type" selected. Below these are two input fields: "Heifers Count" with the value "67" and "Threshold" which is currently empty.

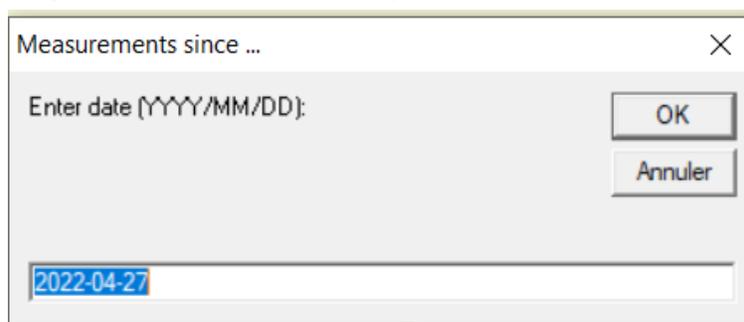
In the same box, it is also possible to **choose the group** you want to analyze: heifers bred, unbred heifers, bred since the last test, heifers younger than... and more according to your chosen parameters and measurements since.

When you select **Heifers younger than...**, the following window appears and allows you to **enter a maximum age (months)** for the data to be displayed:



The screenshot shows a dialog box titled "Heifers younger than ...". It contains a text input field with the label "Enter maximum age at last milk test (months):" and the value "12". There are two buttons: "OK" and "Annuler".

When you select **Measurements since...**, the following window appears allowing you to **enter a date (YYYY/MM/DD)** for the data to be displayed:



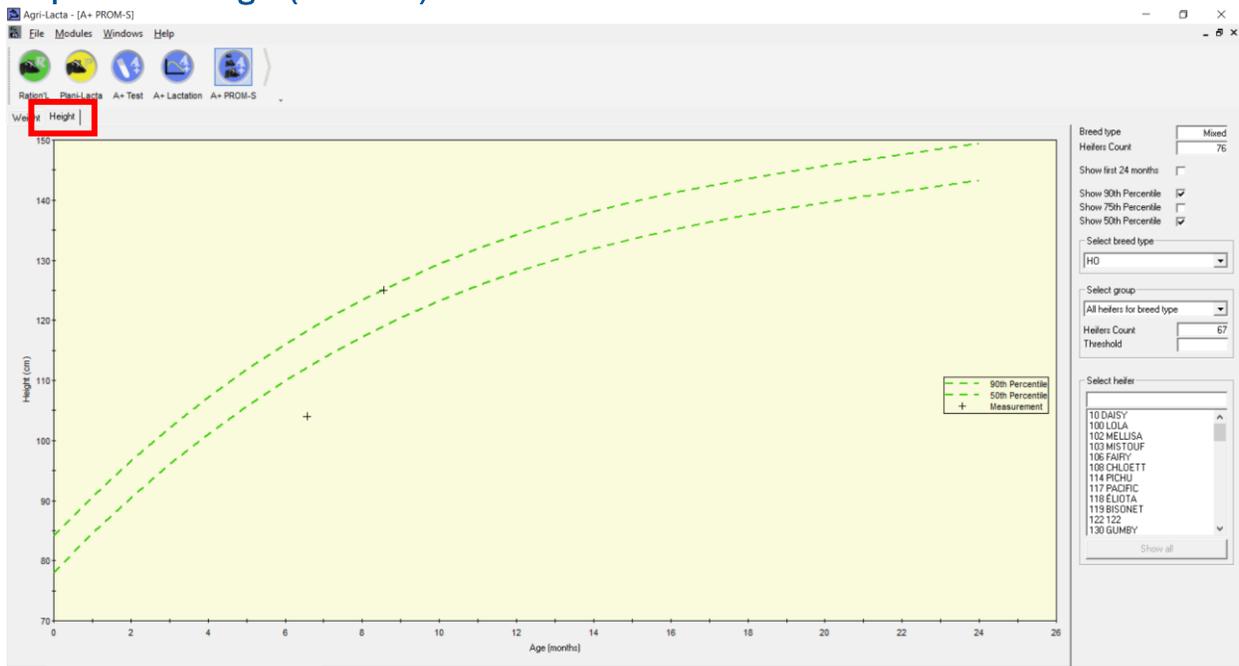
The screenshot shows a dialog box titled "Measurements since ...". It contains a text input field with the label "Enter date (YYYY/MM/DD):" and the value "2022-04-27". There are two buttons: "OK" and "Annuler".

In the last box on the right of the graph, it is possible to select one heifer at a time and evaluate her weight gain and height data:



At the bottom of the **Weight** graph, the **Empty Diamonds (◇)** represent the age of heifers at first service if those services are entered into Lac-T. The **Solid Diamonds (◆)** represent the average age at which heifers reach the target weight for the first service (defined as 55% of mature weight for the breed).

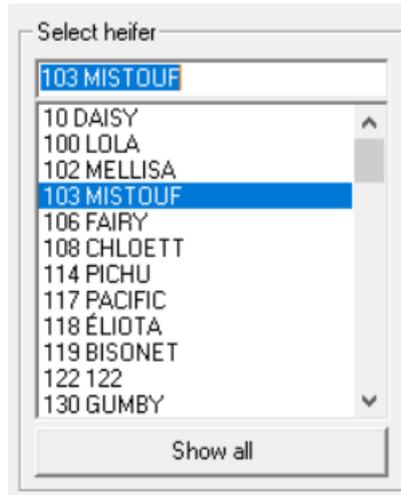
Graph of herd height (Shoulder)



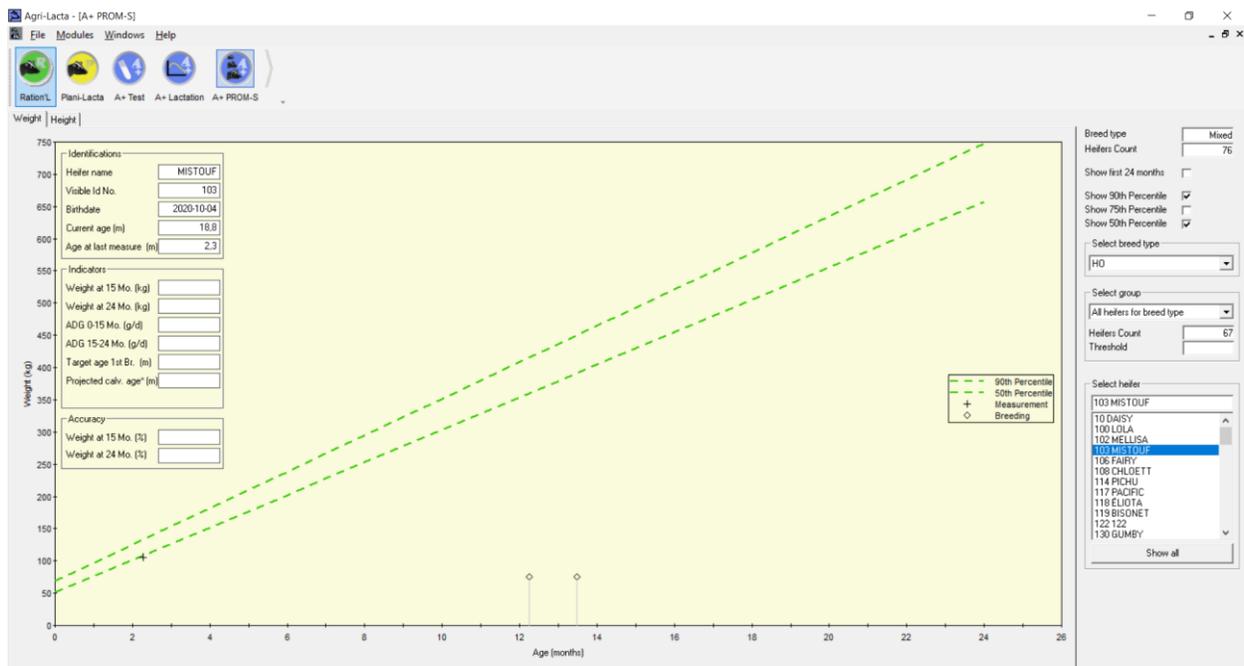
Refer to the descriptive section of the [Weight](#) chart, below, for navigation explanations.

Graph of an individual heifer

You can access the graphs for a specific heifer by **clicking on the desired ID** in the right part of the graph.



Heifer Weight Chart



In the left corner, you will find the **Identifications** of the selected individual heifer:

Identifications	
Heifer name	<input type="text"/>
Visible Id No.	<input type="text" value="136"/>
Birthdate	<input type="text" value="2021-10-24"/>
Current age (m)	<input type="text" value="6,1"/>
Age at last measure (m)	<input type="text"/>

A **major discrepancy between the Current Age and the Age at Last Measure** suggests **less accuracy** in prediction. If the heifer is close to the recommended age for the first breeding, it is **strongly suggested to take another weight measurement to validate the graph.**

In the second box, the **Indicators** are listed for the selected heifer if they are available:

Indicators	
Weight at 15 Mo. (kg)	<input type="text"/>
Weight at 24 Mo. (kg)	<input type="text"/>
ADG 0-15 Mo. (g/d)	<input type="text"/>
ADG 15-24 Mo. (g/d)	<input type="text"/>
Target age 1st Br. (m)	<input type="text"/>
Projected calv. age* (m)	<input type="text"/>

Weight 15 and 24 Mo.: Estimated **average heifer weight** at 15 and 24 months. Shown on the graph with a vertical bar at 15 and 24 months to represent the accuracy of the prediction. **The more measurements per heifer, the more accurate the model.**

ADG 0-15 and 15-24 Mo.: estimate the **average daily gain** for the 0-15 and 15-24-month-old heifers. **Check to see if the gain seems consistent** throughout the growth period or if a certain period is problematic. The goal is a consistent ADG.

Target Age 1st Br. (breeding): estimated age at which heifer reaches 55% of breed mature weight and is ready for first service. Corresponds to the solid diamond (◆) on the graph.

NOTE : It is not recommended to breed a heifer under 12 months of age. The value will be displayed in yellow if the recommended age is below 12 months. For heifers that reach the target weight for 1st service before 12 months of age, validate if the previous ADG was not too high (max 1 kg/d).

Breed	Average mature weight (kg)	Target weight 1 st breeding (kg)
AY	625	344
BS	670	369
CN	550	303
HO	710	391
JE	470	259

Projected Calv. Age: Corresponds to the age that this heifer will be at her first calving if she is bred at the target age for the 1st breeding (for unbred heifers) or according to her last breeding date (bred heifers).

Accuracy 15 and 24 months: Evaluation of the accuracy of weight predictions at 15 and 24 months. Maximum reliability exists if measurements are taken every 3 months, starting from 2 months of age.

Accuracy

Weight at 15 Mo. (%)

Weight at 24 Mo. (%)

Observations for the Height graph of an individual heifer are also possible by clicking on the tab at the top of the graph.

If you have any questions regarding the AnalysePlus module or the Lac-T software, the support team will be happy to answer your inquiries from Monday to Friday from 7:00 a.m. to 4:30 p.m. (EST) at 1-877-850-1714 and to provide answers at lac-t@lactanet.ca.