



Software and Systems Integration for Ultrasound Applications

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Abstract for Swine IMF Model (2021, version 2) for Exapad (Mini) ultrasound scans

1. Biotronics developed a new Pig IMF Model (2020, version 1) from ultrasound scans done using Exapad (Mini) scanner and a 13 cm linear probe (L3130B or L3130XL). The dataset included ultrasound scans and chemical IMF data from four (4) scan sessions (yyyymmdd): 20200528, 20200529, 20200629 and 20200630.
2. A fifth scan session was done on 20210405 on a group of pigs with potentially higher IMF. These scans were added to the dataset for developing a new IMF model (2021, version 2). A report on the preliminary model was communicated with a limited number of visitors at the Pork World Expo 2021. This model was further revised after further field testing with the scans outside the brightness, contrast and visible texture range available in the research scans. Further research and analysis lead to a more robust model. This report describes the final Model 2 that is marketed with the new version of BioSoft Toolbox 4.
3. Using the Biotronics Research software, all scans were reviewed to assign image and animal quality scores (acceptable or reject) and place two region-of-interest (ROI) boxes of size 80x80 pixels on each acceptable image, in the desirable anatomical locations with consistent muscle texture. The same highly experienced technician (DM) scanned all five scan sessions, extracted the images, assigned animal quality scores and set the ROI boxes. All acceptable images (8) from all acceptable animals were then processed in the Biotronics Research software to calculate about 50 texture parameters from the ROI box areas.
4. All five scan sessions were combined and randomized for the selection of the development and the validation datasets. Simple statistics of chemical IMF for the full, development and testing datasets are shown below.

| Dataset | Obs | Mean | Std.Dev | Min | Max |
|-------------|-----|------|---------|------|------|
| Full | 353 | 2.97 | 1.12 | 0.90 | 7.71 |
| Development | 267 | 2.99 | 1.15 | 0.90 | 7.71 |
| Testing | 86 | 3.01 | 1.14 | 0.97 | 6.81 |

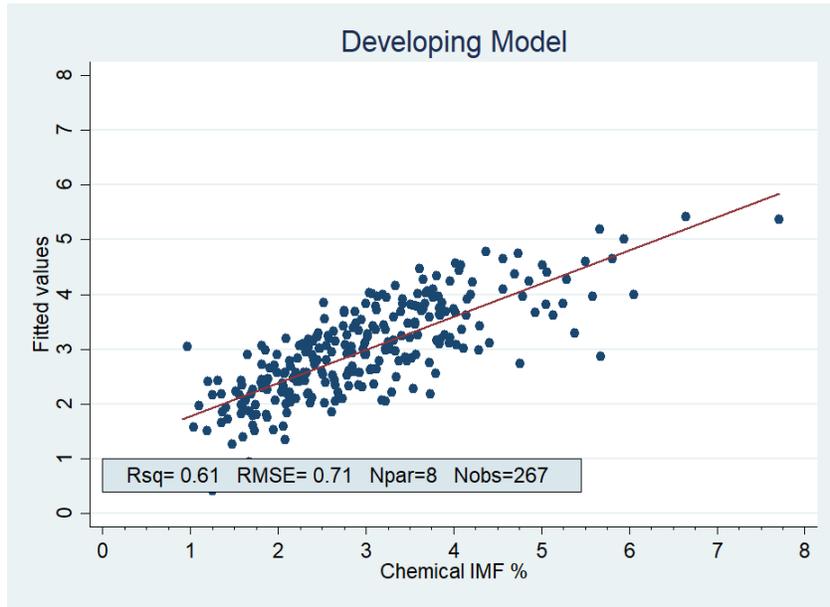
5. **The model development statistics** are as follows:

The total number of animals = 267

R-square = 0.61 ($r=0.78$)

RMSE = +/- 0.71 (% IMF)

Distribution of the predicated versus chemical IMF is shown in the plot below.



6. **The model validation testing statistics** are as follows:

The total number of animals = 86

R-square = 0.70 ($r=0.84$)

RMSE = +/- 0.63 (%IMF)

Distribution of the predicated versus chemical IMF is shown in the plot below.

