

Improving Sow Body Condition Scoring: A Comparison of Traditional Visual Method with Sow Caliper and Ultrasound Techniques

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doi.org/10.5281/ScienceWorld.21474760

Body Condition Scoring (BCS) is an essential management practice in swine production that helps producers assess and maintain optimal energy reserves in sows and gilts. Proper BCS management directly influences health, reproductive performance (including litter size and farrowing ease), lactation success, and overall herd longevity. Extreme under- or over-conditioning can lead to reduced fertility, higher culling rates, farrowing complications, and increased production costs. Traditionally, BCS in pigs is evaluated on a 1–5 scale using visual and palpation methods. However, subjectivity limits its reliability, especially in modern lean genotypes. Objective alternatives, such as the sow body condition caliper (developed by Knauer and Baitinger) and ultrasound measurement of backfat thickness (BFT) at the P2 position, have gained attention for their potential to improve accuracy and decision-making.

Importance of Body Condition Scoring in Sows

Optimal BCS ensures adequate energy reserves for:

- Successful farrowing and lactation
- Timely return to estrus post-weaning
- Reduced risk of metabolic disorders and shoulder lesions
- Improved piglet viability and growth

Target BCS at Different Production Stages:

- **At farrowing:** 3.0–3.5
- **At weaning:** 2.5–3.0 (moderate loss during lactation is normal)
- **During gestation:** ~3.0 (restore condition lost in lactation, especially in the first 40–50 days)



Methods of BCS Assessment in Pigs

Body condition score (BCS) in pigs can be assessed using three main methods, each varying in complexity, accuracy, and equipment requirements.

1. Visual and Palpation Assessment

Visual and palpation assessment is the simplest, most widely used, and cost-effective method for evaluating body condition in pigs. It requires no specialized equipment and relies on the visual examination and manual palpation of specific anatomical landmarks to estimate body fat reserves and assign a body condition score, typically on a **1–5 scale**. During the assessment, the evaluator gently applies pressure using the fingers or the palm of the hand over four key anatomical regions:

The **ribs** (on the side)

The **backbone** (along the top of her back, Figure 1)

The **hip bones** (Located on either side of the rear, Figure 1)

The **pin bones** (at the tail end)

You feel how easy or difficult it is to detect these bones under the skin and fat. Based on this, you give each sow a score from 1 to 5 (see Table 1 & Figure 1)

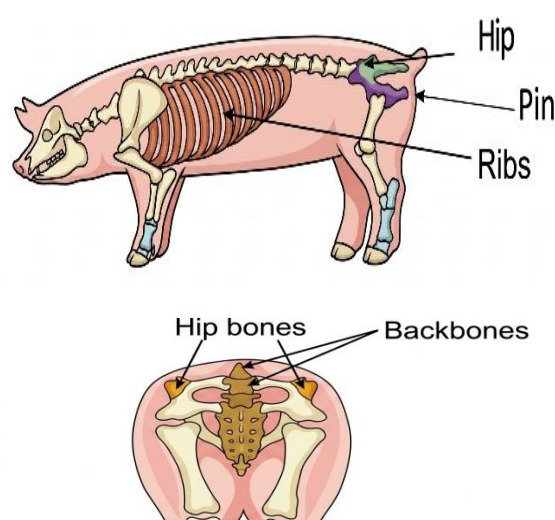


Figure 1. Observing and palpating the key anatomical sites for BCS scores in pigs

Table 1. BCS scale for pigs based on visual and palpation assessment

Sr. No.	BCS score	Condition	Observations
1	Score 1	Emaciated	Bones are clearly visible and very sharp. Almost no body fat is present.
2	Score 2	Thin	Bones can be easily felt with very light pressure. Very low body fat.
3	Score 3	Ideal	Bones can be felt only with firm pressure. Perfect balance of fat and muscle, this is the target score.
4	Score 4	Fat	Bones are difficult to feel even with firm pressure. Excess body fat.
5	Score 5	Overly Fat	Bones cannot be felt at all. Very high body fat cover.



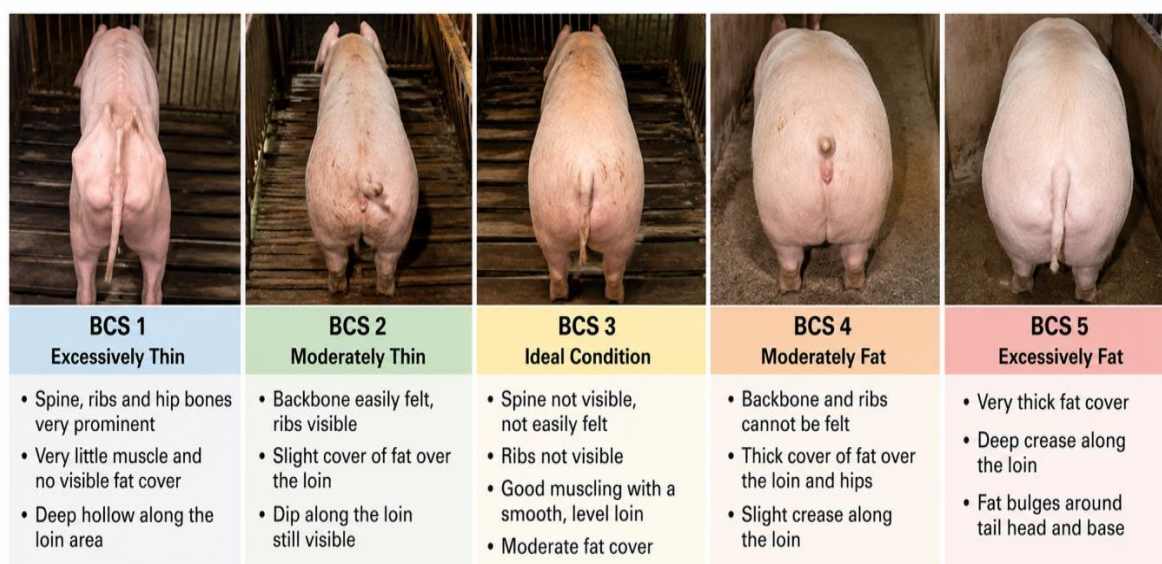


Figure 2. Body Condition Scoring (BCS) Scale in Pigs

Advantages: No equipment needed, very fast.

Limitations: High subjectivity and lower accuracy, especially in well-muscled modern breeds.

2. Sow Caliper Method

The **sow caliper** is an objective, non-invasive tool developed by **Knauer and Baitinger (2015)** to assess body condition in sows. It is placed over the loin region at the level of the last rib to measure the angle of the sow's back. As body fat and muscle increase, the back changes from a narrow, angular shape to a broader, flatter profile. Based on the measured angle, the caliper classifies sows as **Thin, Ideal, or Fat** (Figure 2). The method is rapid, easy to use under field conditions, and shows a strong correlation with ultrasound backfat thickness, making it a reliable tool for routine body condition assessment and feeding management.

Step-by-Step Procedure for Sow Caliper Scoring:

Position of the Sow: The sow must be standing in a natural position (do not measure while she is lying down).

Locate the last rib: Stand beside or slightly behind the sow. Using your fingertips, feel along her side to locate the ribcage. Gently slide your hand backward along the ribs until you detect/feel a softer area/spot. This indicates the end of the last rib. This is the exact/precise point where the measurement should be taken.

Position the Caliper: Place the arms of the sow caliper over the sows back at the level of the last rib. Position the center bolt (pivot point in the figure 3) directly on the spine at this location. Ensure



the caliper rests evenly on both sides of the back and is properly aligned, with both arms extending symmetrically down each side.

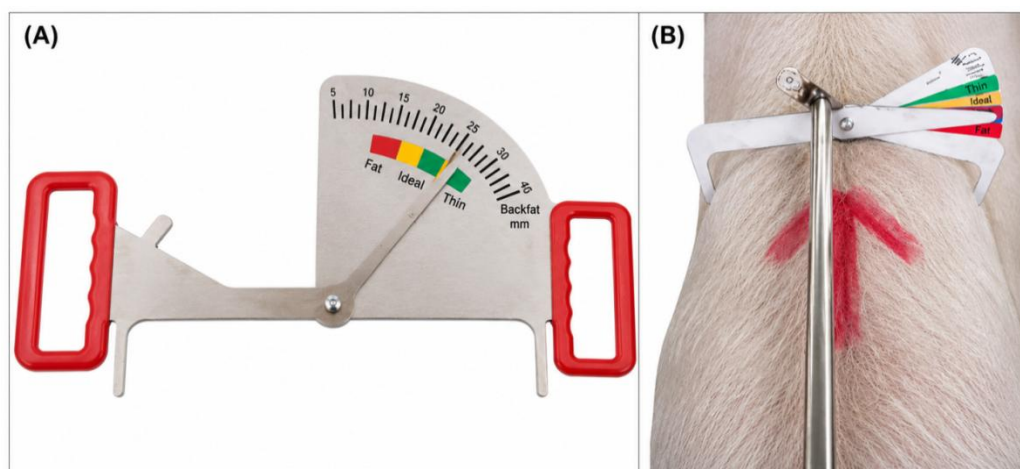


Figure 3. Sow caliper for objective body condition assessment in sows. (A) Standard sow caliper showing the calibrated body condition scale used for objective evaluation of sow body condition. **(B)** Placement of the sow caliper over the loin region to measure body condition based on the angle formed across the back.

Take the measurement: Hold the caliper with one hand around the center bolt. Allow the tips of the caliper to gently touch the skin on both sides of the sow's back. Do not apply pressure or force the tips downward; let them rest naturally using only light contact or gravity. Read the measurement at the point where the scale on the arm aligns with the reference mark (it is clearly indicated in the Figure 4).

Interpret the Score: Compare the reading with the standard caliper scale (see Table 2) to classify the sow's body condition as **Thin, Ideal, or Fat**. The reading can also be converted into the corresponding BCS value for more precise evaluation.

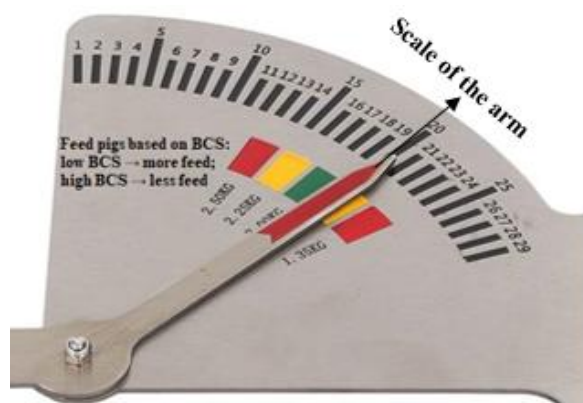


Figure 4. Calibrated Scale of the Sow Caliper for Objective Body Condition Assessment



Table 2. Body Condition Score Scale for Pigs Based on Sow Caliper Measurements

Caliper Category	Caliper Score (units)	Mean Backfat Depth (mm)	Description / Interpretation
Score 1 (Too Thin)	4.0 to 8.0	9.3 mm	Very angular, low reserves, high risk
Score 1	8.5 to 10.0	10.7 mm	Thin
Score 1	10.5 to 12.0	12.7 mm	Below ideal
Score 2 (Ideal / Recommended)	12.5 to 14.0	15.0 mm (15.6 to 18.0 mm)	Optimal for pre-farrowing sows balances reproduction, litter performance, and longevity
Score 3 (Fat/Over-conditioned)	14.5 to 18.0	About 18.1 mm	Too much fat, risk of farrowing issues & higher feed costs

3. Ultrasound score: Back fat thickness (BFT) is a more accurate and reliable method for assessing body condition in pigs than visual evaluation alone. There are two main tools used to measure BFT: Optical probes and ultrasonic probes. The ultrasonic probe works by using sound waves. The optical probe works by using light reflection between fat and muscle layers. Among these, ultrasound is the most widely used method due to its accuracy and consistency in live animals.

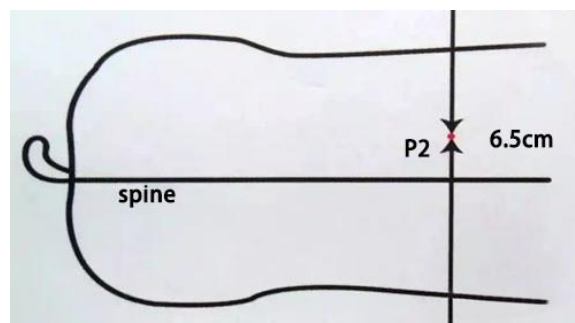


Figure 5 : Anatomical Location of the P2 Site for Ultrasound Back-fat Measurement

A 3.5 MHz probe is commonly used for this purpose. In ultrasound images, the fat layer appears as a bright (echogenic) band, allowing clear differentiation from the underlying muscle. Although BFT can be measured at various body sites, the standard and most reliable location is the **P2 position (Figure 5)**. This position is about 6–8 cm away from the backbone at the level of the last rib. Measurements are typically taken using **A-mode ultrasound**, and the final BFT value is calculated as the average of readings obtained from both sides at the P2 position. Proper control of body weight during pregnancy and lactation is important for optimizing future reproductive performance.



Advantages of Backfat Thickness (BFT) Measurement

- Considered the **gold standard** for objective assessment of body fat reserves in pigs.
- Provides highly accurate and repeatable measurements.
- Strongly correlates with total carcass fat content and body composition.
- Enables objective monitoring of changes in body condition over time.
- Particularly useful in modern lean genotypes, where distinguishing fat from muscle is essential.
- Supports precise nutritional management and feeding decisions.
- Widely used in research, breeding programs, and commercial swine production.

Limitations of Backfat Thickness (BFT) Measurement

- Requires trained personnel to obtain accurate and consistent measurements.
- Requires an ultrasound scanner, probe, and coupling gel or oil.
- More time-consuming than visual scoring or sow caliper methods.
- Higher initial equipment and maintenance costs.
- Measurement accuracy may be affected by improper probe placement or animal movement.
- Less practical for routine assessment in large commercial herds without specialized equipment.

Interpretation of BFT Values: The measured BFT should be compared with standard reference values (Table 3) to classify the sow's body condition and assign the corresponding BCS score.

Table 3. Body Condition Score (BCS) Scale for Pigs Based on Ultrasonography

Sr. No.	BCS score	Backfat Thickness (mm)	Condition
1	Score 1	< 15.24	Emaciated
2	Score 2	15.24 – 17.78	Thin
3	Score 3	17.78 – 20.32	Ideal
4	Score 4	20.32 – 22.86	Fat
5	Score 5	> 22.86	Over fat

Backfat Measurement with Sow Caliper vs. Visual Scoring: A More Accurate Approach to Pig BCS

Visual and palpation scoring have traditionally been used to assess body condition in sows; these methods are subjective and less reliable, especially in modern lean animals where



fat and muscle are difficult to distinguish. The sow caliper scoring provides a practical, low-cost, and more objective alternative by measuring the angularity of the sow's back at the last rib. Although ultrasound backfat measurement at the P2 position remains the most accurate method, the caliper serves as an effective tool for routine on-farm monitoring (see Table 4).

Table 4. Comparison of BCS Assessment Methods

Tool	Accuracy (vs. actual fat)	Speed & Ease	Cost	Best Use	Link with Performance
Visual and palpation	Low to moderate	Very fast and easy	Very low	Quick checking of many animals	Weak to moderate
Sow caliper	Moderate to good	Fast and simple	Low	Regular herd monitoring and grouping	Good
Ultrasound	Very high (Most reliable)	Slower; requires time and skill	high	Precise measurement, research, and ration adjustment	Excellent

Commercial Suppliers and Cost of the Sow Caliper: The sow caliper is commercially available through Baitinger Engineering (USA) and is distributed by several swine production and livestock equipment suppliers in North America and Europe. It has been adopted in commercial breeding herds in more than 30 countries because of its simplicity, durability, and ease of use under field conditions. Depending on the manufacturer, distributor, and country of purchase, the price typically ranges from US\$100–200 per unit (approximately ₹8,500–17,000 in India), excluding shipping and import charges. The instrument requires no power source or routine calibration, making it a cost-effective alternative to ultrasound for routine body condition assessment in commercial sow herds.

Conclusion

Visual scoring alone is no longer sufficient for modern precision swine management. The sow caliper provides a practical and valuable improvement with acceptable correlation to backfat depth, while ultrasound remains superior for accuracy. Integrating these tools enables better feed management, reduced variation in sow condition, improved reproductive performance, and economic benefits. Routine use of the sow caliper, supplemented by periodic ultrasound checks, is recommended for most commercial farms.



References

- Jian, Y., Pu, S., Zhu, J., Zhang, J., & Xing, W. (2024). Estimation of Sow Backfat Thickness Based on Machine Vision. *Animals*, 14(23), 3520.
- Knauer, M. and Baitinger, D. (2015). The sow body condition caliper. *Applied Engineering in Agriculture*.
- Li, Y., Cui, S., Baidoo, S. K., & Johnston, L. J. (2021). Evaluation of Sow caliper for body condition measurement of gestating sows. *Journal of Swine Health and Production*, 29(5), 245-252.
- Mun, H. S., Ampode, K. M. B., Lagua, E. B., Park, H. R., Kim, Y. H., Sharifuzzaman, M., ... & Yang, C. J. (2023). Backfat thickness at pre-farrowing: indicators of sow reproductive performance, milk yield, and piglet birth weight in smart farm-based systems. *Agriculture*, 14(1), 24.
- OpenAI. (2026). ChatGPT (May 1 version). <https://chat.openai.com/>
- Yukun, S., Pengju, H., Yujie, W., Ziqi, C., Yang, L., Baisheng, D., ... & Yonggen, Z. (2019). Automatic monitoring system for individual dairy cows based on a deep learning framework that provides identification via body parts and estimation of body condition score. *Journal of dairy science*, 102(11), 10140-10151.
- Knauer, M.T. (2022). *Technology to Efficiently and Effectively Evaluate Body Condition*. **Journal of Animal Science**, 100(Suppl. 2), 8–9.

