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Individual concentrate feeding revisited for dairy cows

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This issue examines when feeding concentrates to individual dairy cows can improve nutrient allocation and why higher milk yield alone does not justify a larger allowance.

Feeding concentrates according to individual milk production is an old practice. Before total mixed rations became widespread, adjusting grain allowances was a routine part of dairy feeding. The TMR simplified delivery and allowed forage, concentrates, and supplements to be consumed together. Individual feeding nevertheless remains familiar in component-fed herds and has returned through robotic milking and automatic out-of-parlor feeders. Recent Penn State work revisited whether better data and delivery technology could make this established idea more precise. The answer is promising, but far from automatic.

The practical opportunity lies between group feeding and a separate ration for every cow. Large dairies may already use several nutritional groups, whereas smaller herds may be unable to mix many TMRs. An individual supplement can adjust nutrient supply without creating another group. Its value, however, depends on selecting the right cows and measuring the response. A cow producing 45 kg of milk while consuming ample TMR may respond less than a cow producing 35 kg whose energy intake is inadequate. Milk yield describes present output; it does not predict the return from the next kilogram of concentrate. Six considerations determine whether individual feeding becomes precision nutrition or merely more expensive feed delivery.

Give the supplement a defined job

Begin with what the basal ration already supplies. If it adequately supports a cow, more concentrate may accomplish little. Where the mixed ration intentionally supplies only part of the daily allowance, it becomes a partial mixed ration, and the individual supplement must complete it. Nutrient profile matters as much as quantity. A starch-rich pellet and a protein-rich supplement are not equivalent simply because both are concentrates. The formulation should identify the limiting nutrient and match the supplement to it.

Feed for response, not yield alone

Traditional feed-to-yield systems assume that the highest-producing cow deserves the most concentrate. Cows, however, differ in dry matter intake, stage of lactation, body condition, maintenance needs, nutrient-use efficiency, and response to extra feed. The relevant question is how much additional milk or milk solids the next unit of concentrate is likely to produce. A calculated energy deficit signals an opportunity; it does not prove that the response will cover the feed cost. Milk, body weight, and body condition trends strengthen the decision when interpreted together. Equal milk yields can therefore justify different allowances, and different yields can justify similar allowances.

Account for feed substitution

An extra kilogram of concentrate does not necessarily add a kilogram to total dry matter intake. The cow may reduce her PMR or TMR intake. Research comparing an individual strategy with a fixed allowance found greater concentrate intake but lower PMR intake, with no improvement in total intake or energy-corrected milk. The calculation must include the feed displaced. Because substitution also changes starch, fiber, and protein intake, the adjustment must be evaluated as a complete ration.

Delivery has biological limits

A programmed allowance is not proof of consumption. Cows can leave feed in robotic units, while milking time limits how much they can eat in the parlor. Large, infrequent meals of rapidly fermentable carbohydrate can depress ruminal pH. Allowances should change gradually, and the complete diet must retain adequate effective fiber. Refusals, pellet quality, and the amount dispensed per visit require routine checks. Accurate equipment cannot correct an unsuitable meal size or feeding pattern.

Algorithms still require validation

In a 2025 Penn State trial, variable allowances were calculated from individual energy and metabolizable protein balances. The strategy reduced milk yield compared with a TMR, did not improve energy-corrected milk, and reduced feed efficiency. The authors attributed the result partly to model overfitting and limited generalization. This does not disprove individual feeding. It shows that a sophisticated calculation may still allocate feed incorrectly. A model developed from one group may not predict another accurately. On-farm allowances should start conservatively and be adjusted from measured responses.

Make the response pay

The immediate test is income over feed cost. Milk volume, milk components, concentrate cost, and the value of displaced mixed ration all belong in the calculation. Equipment and data costs matter when a new system is being considered. Establish the present margin, introduce a defined adjustment, and follow production, body condition, and feed use over a suitable period. Allow for the normal lactation curve and calculate the time needed to repay equipment. Retain the allowance when the response pays, and revise it when it does not.

In Brief, individual concentrate feeding can improve nutrient allocation, but higher milk yield alone does not identify the cow that should receive more. The result depends on the basal ration, feed substitution, delivery, and the cow's marginal response. The final test is whether added nutrients produce enough saleable milk to improve the margin. Precision begins with a better decision, not with the feeder.

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