Animal husbandry (3)  Cattle weight – Body measurements

1. Meanings of weight and body measurements of livestock
   1) Reasonable basic numerical values for calculating feeding levels

   The nutritional requirements of livestock are normally calculated based on the nutrients necessary for "maintenance," "growth," "production," and "pregnancy." The nutrients necessary for maintenance and growth are determined based on weight. Therefore, without the knowledge of animal weight, you cannot determine appropriate feed levels.

   2) Health barometers of adult cattle

   Regular (monthly) monitoring of these barometers allows early detection of abnormalities, such as diseases, in adult cattle, as well as inappropriate feeding practice.

   3) Healthy growth of breeding cows

   The weights and body measurements of breeding cows are compared with standard values for growth assessment.

   4) Basis for the calculation of selling prices

   The selling prices of livestock are mainly determined by weight. For livestock owners to obtain appropriate profits, it is advantageous to know accurate weights at the time of shipment.

2. Body weight measuring methods
   1) Body weight measurement

   ① Weighing using a cattle weight bridge

   If a large scale that can weigh cattle is available, that is the most accurate method of weighing cattle. However, if such equipment is not available, the following estimation methods can be used.

   ② Estimation by chest girth measurement

   The correlation between weight and chest girth is quite high (0.965), so chest girth can be used to estimate weight.

   As an example, the National Institute of Animal Industry of the Ministry of Agriculture, Forestry and Fisheries, and the Holstein Cattle Association of Japan, have developed the following formula based on the measurements of about 1,000 animals:

   \[ C = 1.28340 W^{0.36329} \] (where \( C \) is chest girth, \( W \) is weight and \( a \) and \( b \) are constants)

   A measuring tape has been developed with which the weight of a milking cow can be estimated using the formula. Differences from actual weights have been confirmed to be within 10% in most cases (60% or more).

   ③ Estimation using visible parameters

   If someone has observed and weighed many cattle using a cattle weight bridge, he/she can estimate cattle weights from body size, degree of fatness, etc.

3. Body measurement methods
   1) Measuring instruments

   Measuring sticks, calipers, and tapes, among other instruments, are used.
2) Measured parts

Body parts of a bull/cow have names (Fig. 1) but normally, for the assessment of a dairy cow, the body part names shown in Fig. 2 are used.

![Fig. 1. Body parts names of a bull/cow](image)

![Fig. 2. Body measurement parts of a bull/cow](image)

<table>
<thead>
<tr>
<th>1 Head</th>
<th>13 Neck</th>
<th>24 Thurl</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Horn</td>
<td>14 Shoulder</td>
<td>25 Tail head</td>
</tr>
<tr>
<td>3 Forehead</td>
<td>15 Crops</td>
<td>26 Pine bone</td>
</tr>
<tr>
<td>4 Ear</td>
<td>16 Withers</td>
<td>27 Tail</td>
</tr>
<tr>
<td>5 Eye</td>
<td>17 Back</td>
<td>28 Thigh</td>
</tr>
<tr>
<td>6 Muzzle</td>
<td>18 Loin</td>
<td>29 Tassel</td>
</tr>
<tr>
<td>7 Cheek</td>
<td>19 Ribs</td>
<td>30 Hock</td>
</tr>
<tr>
<td>8 Chin</td>
<td>20 Milk vein</td>
<td>31 Pastern</td>
</tr>
<tr>
<td>9 Throat</td>
<td></td>
<td>32 Hoof</td>
</tr>
<tr>
<td>10 Dewlap</td>
<td>21 Hip</td>
<td>33 Udder</td>
</tr>
<tr>
<td>11 Prothorax</td>
<td>22 Pelvic arch</td>
<td>34 Teat</td>
</tr>
<tr>
<td>12 Fore shank</td>
<td>23 Rump</td>
<td></td>
</tr>
</tbody>
</table>

AB: Withers height  CD: Hip height
EF: Body length (horizontal length)  GH: Body length (oblique length)
JK: Chest depth  LH: Hip length
XY: Chest width  MN: Hip width
OP: Thurl width  QR: Ischium width
W: Shin circumference

Belly girth is measured using a tape along the same line as chest depth.

3) Measurement methods and standard measurements

When a cow/bull is measured for body parts, the animal needs to be standing with the correct posture; its dorsal line and cheek must make a straight line, and its four hooves must make a rectangle. A measuring stick is used to measure withers height, hip height, thurl height, and body length, while a width measuring device is used to measure chest width, chest depth, hip width, thurl width, rump length, ischium width, and a tape is used to measure belly girth and shin circumference.

4. Growth and physique standards of cows

Table 1 shows standard weights by monthly age for breeding Holstein cows in Japan.

<table>
<thead>
<tr>
<th>Monthly age</th>
<th>At birth</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>14</th>
<th>16</th>
<th>18</th>
<th>24</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>40</td>
<td>56</td>
<td>73</td>
<td>90</td>
<td>113</td>
<td>136</td>
<td>160</td>
<td>184</td>
<td>207</td>
<td>229</td>
<td>251</td>
<td>272</td>
<td>292</td>
<td>331</td>
<td>367</td>
<td>400</td>
<td>496</td>
<td>564</td>
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