

# Application of animal-based welfare quality assessment protocol to growing pig farms in South Korea in comparison with the European nations

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## Abstract

The aim of our study was to evaluate the welfare quality status in nine conventional pig farms in the Republic of Korea (South Korea) using the Welfare Quality® (WQ®) assessment protocol from January to February in 2013, and to compare the criteria assessment level of the WQ® protocol in South Korea with that of European nations for the potential risk of their welfare. The WQ® protocol consists of assessment using 12 criteria within four principles: 'Good feeding', 'good housing', 'good health' and 'appropriate behaviours'. Four criteria are combined into an overall assessment to indicate the level of welfare on pig farms. The WQ® protocol classifies farms into four categories ranging from 'excellent' to 'not classified' which means it falls below an acceptable level. Overall assessments found that five out of nine farms were 'acceptable', four farms were 'enhanced', and no farm was 'not classified' in South Korea. According to the overall assessment result by the WQ® protocol, the situation of South Korea and European nations do not differ greatly except there was no farm classified as 'excellent' in South Korea. The assessment result of principle 'good feeding' and 'good housing' of South Korean farms are similar to those of farms in European nations, but the result of principle 'good health' and 'appropriate behaviours' of South Korean farms are much lower than those of farms in European nations. This might be because the assessment of welfare quality in South Korea would have just started so they focused on 'good feeding' and 'good housing' aspects. With more research and public concern, the interest in welfare quality would focus on 'good health' and 'appropriate behaviours'.

**Keywords:** Swine welfare, Multi-criteria evaluation, Welfare Quality® protocol, Animal-based parameters

## INTRODUCTION

To increase the welfare quality for farm animals, evaluation of the welfare quality on farms is essential. However, welfare is multidisciplinary [1], which cannot be measured directly by a single measure. The Welfare Quality® (WQ®) protocol is a standardized on-farm assessment protocol which provides reliable information about how animals are raised based on the multidimensional concept of welfare. This method consists of an animal-based on-farm welfare

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### Availability of data and material

Upon reasonable request, the datasets of this study can be available from the corresponding author.

### Authors' contributions

The article is prepared by a single author.

### Ethics approval and consent to participate

This article does not require IRB/IACUC approval because there are no human and animal participants.

assessment protocol designed for intensive farms [2].

In South Korea (Korea), although the economy and livestock industry have developed rapidly over the last few decades, public awareness of farm animal welfare has only recently begun. Animal welfare issues are receiving public attention in Korea due to public campaigns by non-governmental organizations. However, few researches have assessed the welfare of farm animals in Korea. On the other hand, in the European nations, the research about assessment of cattle and poultry farms, as well as pigs using animal-based parameters, has been conducted for a long time, and interest in farm animal welfare has been formed earlier than in Korea, so welfare-related policies have been established around the European nations.

The purpose of this study was to evaluate the welfare quality of growing pigs in Korea using animal-based parameters and compare the welfare quality of Korea with that of the European nations to aid in developing a strategy for improving the growing pig farm welfare quality in Korea.

### Animal care and use

This study was exempted from animal care and use approval because the assessment protocol for the pigs was performed only by observing the animals. The handling procedures ensured proper management and treatment of all animals according to the Korean Animal Protection Act.

## MATERIALS AND METHODS

### Study farm

The WQ<sup>®</sup> protocol for growing pigs was assessed in nine intensive pig farms in Korea during winter in 2013. Prior access permissions were obtained from farm owners. Four of nine pig farms had a mechanical ventilation system and five had a natural ventilation system. During assessment, because of the cold weather there were no fan operated in pig house with mechanical ventilation system and it was covered with thick and heavy curtain over the pig house in natural ventilation system. The age of pigs in a pen ranged from 42 to 81 days old (mean  $\pm$  SD = 65.44  $\pm$  10.74) and the range of body weight in a pen was from 25 to 60 kg (mean  $\pm$  SD = 45.56  $\pm$  19.97). The range of average space allowance in a pen was from 0.7 to 4 m<sup>2</sup>/100 kg (mean  $\pm$  SD = 1.82  $\pm$  0.95) and from 0.42 to 1.8 m<sup>2</sup>/individual (mean  $\pm$  SD = 0.81  $\pm$  0.44). Pigs were kept in a pen with an average of 30.13  $\pm$  16.62 animals except one farm which contained 150 pigs in a pen.

### Farm assessment

The WQ<sup>®</sup> protocol consists of assessment using 12 criteria within four main principles: "good feeding," "good housing," "good health," and "appropriate behaviors." Each of these criteria has specific measures for calculating scores. It assesses the welfare status of animals by directly observing animals except for "absence of prolonged thirst" and "ease of movement." Four criteria are combined into an overall assessment to indicate the level of welfare on pig farms. Overall assessment of WQ<sup>®</sup> protocol can be defined as four categories based on the final score, as follows; "excellent" was 80.1–100: the welfare of animals is of the highest level, "enhanced" was 60.1–80:

the welfare of animals is good, “acceptable” was 20.1–60: the welfare of animals is above or meets minimal requirements and “not classified” was 0–20: the welfare of animals is low and considered unacceptable. The WQ<sup>®</sup> protocol was assessed by two observers. To minimize differences between observers, two observers were given identical training with WQ<sup>®</sup> assessment protocol for growing pigs [2] before the assessment. For the first step of the farm assessment, general information of the pig farm was recorded by the farmer. The information recorded by the farmer included the mortality rate, total number of pig houses on the farm, pen size, ventilation system, average weight of observed pigs, number of pigs per pen and the age of observed pigs. After collecting general farm information, the WQ<sup>®</sup> protocol assessment was carried out.

### Calculations and comparison

Calculations for the scores of WQ<sup>®</sup> protocol were carried out online using the calculation model in the WQ<sup>®</sup> Network [3]. The final scores of each criterion and principle were represented from 0 to 100. Finally, the farms were classified into four categories based on the overall assessment scores [3]. The results of assessment in Korea using the WQ<sup>®</sup> protocol were compared with those the results of the European nations calculated by WQ<sup>®</sup> Network [3]. A total of 207 growing pig farms were assessed using WQ<sup>®</sup> protocol over three years from 2009 to 2011 in EU: Finland, France, Germany, Spain, and the United Kingdom.

## RESULTS

Four out of nine farms in Korea were “enhanced” categories and five were “acceptable” categories in the overall assessment of WQ<sup>®</sup> protocol. Fig. 1 and Table 1 show the distributions (%) of the welfare quality of growing pig houses in Korea and European nations. The distribution of “overall assessment” score of the WQ<sup>®</sup> protocol in the European nations was 22% for “excellent,” 46% for “enhanced,” 33% for “acceptable,” 0% for “not classified,” respectively. The distribution in Korea were 0% for “excellent,” 44.4% for “enhanced,” 55.6% for “acceptable,” 0% for “not classified,” respectively. None of the growing pig farms in Korea and European nations were classified as “not classified,” but 22% of the growing pig farms in the European nations were classified as “excellent,” which is much higher than 0% in Korea. The distribution of principle “good feeding” and “good housing” in Korea and European nations was similar. However, in the principles “good health” and “appropriate behaviors” aspects, “excellent” and “enhanced” levels were shown at 0% in Korea, while those in the European nations were 35% and 29%, respectively.

In the criteria “comfort around resting” aspect, the distribution of Korea was 22.2% for “excellent,” 22.2% for “enhanced,” 44.4% for “acceptable” and 11.1% for “not classified,” while the distribution of European nations was 36% for “excellent,” 24% for “enhanced,” 39% for “acceptable” and 0% for “not classified,” respectively. The distribution of the criterion “absence of pain induced by management procedures” in Korea and the European nations showed the lowest score, with 20% in European nations and 88.9% in Korea. The distribution of the criterion “expression of social behaviors” between Korea and European nation was similar, but there was

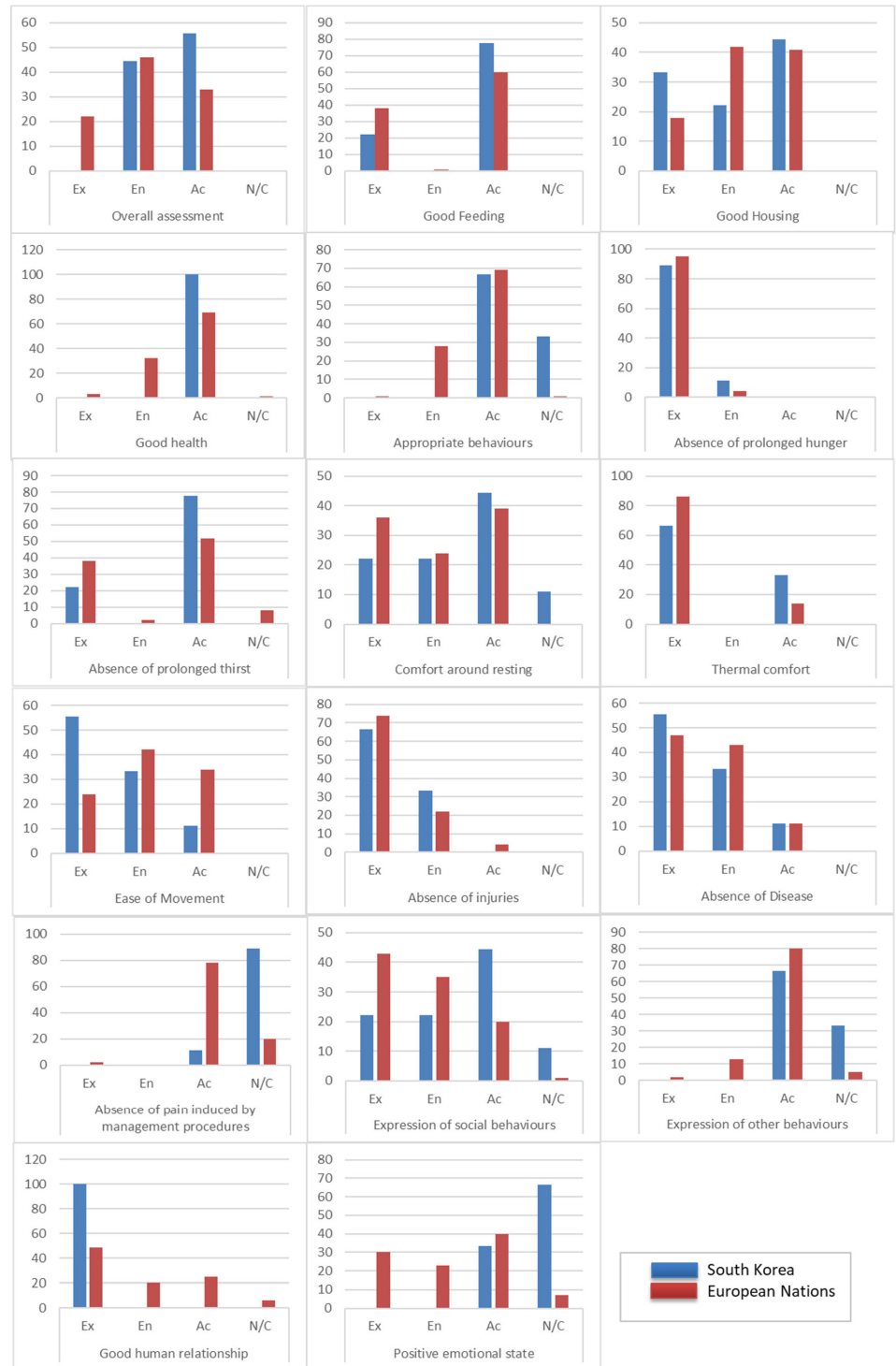


Fig. 1. The distribution (%) of the welfare quality of growing pig houses in South Korea and European nations.

a big difference in criterion “expression of other behaviors.” The distribution of “expression of other behaviors” was 0% for “excellent,” 0% for “enhanced,” 66.7% for “acceptable” and 33.3% for “not classified” in Korea, and the distribution in the European nations was 2% for “excellent,” 13% for “enhanced,” 80% for “acceptable” and 5% for “not classified,” respectively. In the

**Table 1.** The distribution (%) of the welfare quality of growing pig houses in Korea and European nations

Welfare Quality® protocol	South Korea (n = 9)						European nations (n = 207)					
	Ex	E	A	N/C	Mean	SD	Ex	E	A	N/C	Mean	SD
Overall												
Overall assessment	0	44.4	55.6	0			22	46	33	0		
Principles												
Good feeding	0	22.2	77.8	0	63.1	17.2	38	1	60	0	64.1	27.8
Good housing	33.3	22.2	44.4	0	59.3	22.5	18	42	41	0	65.3	15.3
Good health	0	0	100	0	33.4	9.5	3	32	65	1	50.3	16.4
Appropriate behaviours	0	0	66.7	33.3	25.4	7.6	1	28	69	1	50.5	15
Criteria												
Absence of prolonged hunger	88.9	11.1	0	0	96.2	8.4	95	4	0	0	96.8	6.9
Absence of prolonged thirst	22.2	55.6	22.2	0	63.3	21.4	38	2	52	8	63.3	30.2
Comfort around resting	22.2	22.2	44.4	11.1	53.0	26.5	36	24	39	0	67.7	19.6
Thermal comfort	66.7	0	33.3	0	77.6	34.2	86	0	14	0	92.8	18.4
Ease of movement	66.7	22.2	11.1	0	78.9	16.6	24	42	34	0	67.4	16
Absence of injuries	66.7	33.3	0	0	86.6	14.1	74	22	4	0	86.5	13
Absence of disease	55.6	33.3	11.1	0	79.5	18.7	47	43	11	0	75.4	18.8
Absence of pain induced by management procedures	0	0	11.1	88.9	12.3	13	2	0	78	20	39.2	18.1
Expression of social behaviors	22.2	33.3	33.3	11.1	59.2	32	43	35	20	1	73.9	19.4
Expression of other behaviors	0	0	66.7	33.3	19	8.7	2	13	80	5	43.1	15.9
Good human relationship	100	0	0	0	100	0	49	20	25	6	70.3	30
Positive emotional state	0	0	33.3	66.7	18.9	2.3	30	23	40	7	61.2	24.5

Ex, excellent; E, enhanced; A, acceptable; N/C, not classified.

criterion “good human relationship” aspect, while the distribution of Korea was 100% for “excellent”, that of the European nations was 49% for “excellent,” 20% for “enhanced,” 25% for “acceptable” and 6% for “not classified,” respectively. The criterion “positive emotional state”, which was second weakness of welfare quality in Korea, showed the distribution with 0% for “excellent” and “enhanced,” while the distribution of the European nations was 30% for “excellent,” 23% for “enhanced,” respectively.

## DISCUSSION

The purpose of the WQ® protocol at the beginning of the assessment development is to identify “not classified” farms considered unacceptable. The welfare levels of all nine farms assessed in this study were found to be above “acceptable” levels. The result Korea had no farms while the European nations had 22% of farms in “excellent” category in the distribution of overall assessment (Fig. 1) reflects that public concern on animal welfare in the European nations was raised earlier and along with that concern, regulations, and policy development to improve farm

animal welfare have been widely conducted in the last decade [4-7]. Although all farms assessed in this present study were above the minimum level of welfare “not classified” as in the European nations, this may be because the minimum welfare standard of the initial WQ<sup>®</sup> protocol was too low or the opinions of various stakeholders were reflected in the protocol [8]. In fact, there are many studies that support stakeholders have different views about animal welfare, and consumers have higher welfare expectations than farmers and suppliers [9-11].

The average score of principle “good feeding” in Korea and the European nations was similar (the differences of the criteria “absence of prolonged hunger” and “absence of prolonged thirst” are 0.61 and 0.05, respectively), but the average score was not very high (Table 1). It is because the criterion “absence of prolonged hunger” scored very high, while the criterion “absence of thirst” scored lower.

In the section of principle “good housing,” the score of the criterion “ease of movement” in Korea was higher than that of the European nations while criteria “thermal comfort” and “comfort around resting” were lower. The score of the criterion “ease of movement” measured by space allowance in Korea was higher than that of the European nations (Table 1). The space allowance on six farms was above the minimum standards in Korea, because they are usually raised in the same pen from growing to fattening stage (all-in-all-out). Since this study was conducted during the winter and there were not adequate heating systems in most of the pig houses in this study, the score of “thermal comfort” was lower in Korea than that of the European nations.

There were 3 criteria in the section on “good health”: “absence of injuries,” “absence of disease,” and “absence of pain induced by management procedures.” The distribution of the criteria “absence of injuries” and “absence of disease” is generally similar between Korea and the European nations (Fig. 1). In relation to criterion “absence of pain induced by management procedures,” pigs in eight of the nine farms had tail docking and castration performed without anaesthetics in the current study. In addition, it should be mentioned that the farmers in Korea do not train proper tail docking or castration. In the section of the “absence of pain induced by management procedures,” the distribution of the European nations is 26.86 points higher than those of Korea (Table 1), but the European nations also have much lower distributions in this criterion than any other criterion in the principle “absence of health.” Farmers do not use anaesthetics for castration surgery because of cost restraints and lack of knowledge in Korea. On the other hand, there have been actions to reduce “pain induced by management procedure” in the European nations. In the Declaration of European Commission [12], it is recommended that the surgical castration of piglets be performed with pain relief from 2012, and surgical castration be phased out completely by 2018. In the European Commission (2016) Council Directive [13], it is recommended that Member States ensure tail docking is not carried out routinely except in case where there is evidence that injuries to sows' teats or to other pigs' ears or tails have occurred. With these recommendations, tail docking and surgical castration that cause unnecessary pain to pigs are banned in the European Community. These moves are believed to have increased the use of anaesthetics in European pig farms.

There were 4 criteria in the section on principle “appropriate behaviors”: “expression of social behaviors,” “expression of other behaviors,” “good human relationship,” and “positive emotional

state.” In the European nations, as in Korea, the distribution of the criterion “expression of social behaviors” was much higher than that of the criterion “expression of other behaviors.” However, for these two criteria, the average scores of the European nations were 14.67 and 24.07 points higher than those of Korea, respectively. It seems to have originated from a long-standing study of animal welfare in the European nations. This would be because citizens consider behavioral expressions caused by animals' suffering when they form opinions about farm animal welfare [14].

The distribution of the criterion “good human relationship” for growing pig farms evaluated in this study was higher than that of the European nations. In addition, all farms were categorized as “excellent.” According to Hemsworth et al. [15], pigs associate a satisfying experience of feeding with humans, and this results in pigs being less fearful of humans. Visual contact with humans may occur when farmers are in the same place as their animals [13]. Since the size of the farms assessed in the present study was relatively small and the facilities were not automated, farmers had to enter the pig house frequently. In the section of criterion “positive emotional state,” there was the biggest difference between Korea and European nations. We found the reason for this situation is that the concern about farm animal welfare by the public has just begun in Korea.

## CONCLUSION

There may be some possible limitations in this study. Firstly, Korea has a continental, temperate climate with four distinct seasons and is affected by the East Asian monsoon. Winter temperatures are higher along the southern coast and considerably lower in the mountainous interior. Summer is hot and humid, with temperatures exceeding 30°C throughout the country. Because of the climate difference between summer and winter in Korea, the welfare of pigs should be evaluated in both seasons. However, since farmers did not allow visits during the summer due to the farms' poor environments and concerns about disease outbreaks, this study was only conducted in the winter. Secondly, at the time of the study, it was very difficult to acquire permission to assess pig farms because of a foot-and-mouth disease outbreak. Therefore, we were only able to assess nine pig farms. The nine farms involved in this study do not necessarily represent the situation across all regions of Korea, but this study may still provide useful insight into the welfare on pig farms in Korea and can serve as a foundation for future welfare studies to improve farm animal welfare; these farms constitute the first pig farms to participate in an independently observed, animal-based welfare assessment study in Korea. Thirdly, raw data on each of the 207 pig farms calculated in the WQ<sup>®</sup> Network were not shown in the report from the WQ<sup>®</sup> Network. And all the raw data in the related papers were not assessed under a climate similar to that of Korea. Therefore, the accurate comparison between two regions was difficult because we had to only use the distributions of the farms and average scores in each stage of the assessment protocol of the European nations on the present study.

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