**Application**

Recently, the focus on sustainability of livestock production shifted almost exclusively to the environment which may take precedence over practices associated with good animal welfare (AW) (Boyle and Stevenson, 2024). One Welfare recognises the interconnectedness of humans, animals and the environment they share (Pinillos et al., 2016). Hence, it provides a useful framework to ensure the development of fair and resilient livestock production systems in which animals do not fall further out of consideration in the future.

**Introduction**

There is increasing societal concern about AW in intensive systems, growing interest in pigmeat produced from alternative systems and awareness of their value in terms of ecosystem services. However, while outdoor farming is perceived as ‘AW friendly’ as it allows pigs to perform natural behaviours, they can adversely affect the environment, particularly soil health. Furthermore, there are potentially greater challenges to humans due to lack of policy supports and insecure income. The aim of this study was to use the One Welfare framework to evaluate outdoor pig farming.

**Materials and Me**t**hods**

Animal, environment and farmer data were collected on 17 outdoor farms between July and October 2023. Pigs (n=223) in 29 paddocks were observed for body condition, lameness, lesions, tear staining and the presence of external parasites. Paddocks were divided into foraging and defecation areas. Soil shear strength was measured three times/area and averaged and a control measurement was taken outside the paddock. The shear strength of each area was subtracted from the control value to obtain a delta value. All plant species were counted in the same areas and the delta value obtained in the same way as for shear strength. AW and environmental measures were averaged across paddocks. Farmers completed a Quality of Life (QoL) questionnaire (WHO, 2012) producing scores based on four sub-sections (0-100) and an overall health and QoL score (0 – 5). Principal Component Analysis (PCA) was conducted using Rstudio software (R version 4.3.1, R core team, 2022) using the FActMineR and missMDA packages. Data were scaled before PCA analysis. Biplot was obtained and clusters were created to explain the analysis. Means of each variable was calculated for each cluster and an ANOVA was performed between each cluster. A Tukey’s test was performed post hoc.

**Results**

Bi-plots captured 13.7% from dimension 1 and 34.5% from dimension 2 revealing three distinctive clusters which were named according to characteristics shown by each of the mean scores in the cluster (Table 1). Cluster 1 represented paddocks where sows were kept (sows were only on 3 farms) and with the highest (i.e. worst) average scores for all AW measurements. This cluster also had the highest number of plants in both areas in the paddock. The majority of QoL sub-section (>80%) and overall scores were higher than in the other 2 clusters. Cluster 2 represented 5 paddocks in three farms which had the lowest (i.e. best) scores for AW and for soil compaction. However, this cluster also had the lowest QoL scores in the sub-sections (av. 43.75%) and overall. Cluster 3 contained 20 paddocks and it generally fell between Cluster 1 and 2 for AW. The farmers also had generally higher average QoL scores than Cluster 2 but lower than Cluster 1 in every sub-section.

There were differences (P < 0.05) between the three clusters in lameness, skin lesion counts, ear lesion and tear scores. The soil shear strength differed across the three clusters in the foraging area and plant species diversity differed across the clusters in the defecation area. All of the QoL measurements differed significantly (P < 0.001) across all the clusters.

**Table 1 – Mean values for animal, environment and human Quality of Life (QoL) measurements in three clusters**

|  |  |  |
| --- | --- | --- |
|   | Cluster | P- value |
| Low AW | Low QoL | Average |
| **Animal welfare** |
| Body condition score | 3.2 | 3.16 | 3.3 | NS |
| Lameness | 0.1 | 0 | 0 | <0.01 |
| Ecto – parasites | 0.2 | 0.18 | 0.13 | NS |
| Skin lesion count | 3 | 0.3 | 1.1 | <0.01 |
| Tail lesion score | 0.3 | 0 | 0.1 | NS |
| Ear lesion score | 0.9 | 0.3 | 0.5 | <0.01 |
| Tear stain score | 2.4 | 1.3 | 1.7 | 0.039 |
| **Environment** |  |  |  |  |
| Soil shear strength  |  |
| Foraging area | -17.7 | -82 | -46.3 | 0.03 |
| Defecation area | 29.6 | -37.2 | -11.6 | NS |
| Plant species diversity |  |
| Foraging area | -0.3 | -2.86 | -2.3 | 0.05 |
| Defecation area | 1.2 | -1.6 | -1.1 | 0.04 |
| **QoL** |
| Physical | 87.3 | 45.8 | 90.1 | <0.001 |
| Psychological | 94 | 52.6 | 83.8 | <0.001 |
| Social relationships | 95.8 | 36.6 | 83.0 | <0.001 |
| Environmental | 81.3 | 40.0 | 81.0 | <0.001 |
| Overall health | 4.6 | 2.6 | 4.6 | <0.001 |
| Overall QoL | 5 | 4 | 4.5 | <0.01 |

**Conclusions**

Using One Welfare measures (animal, environmental and human) within one analysis, we identified three clusters of paddock ‘type’. When comparing clusters, most differences were between the AW and human QoL measures. The environmental parameters were less specific, possibly because there were only two measurements. Poor welfare of sows in Cluster 1 could be related to their age compared to the fattening pigs but may also reflect poorer levels of care directed towards lower value animals. The lower QoL scores in Cluster 2 could be because these three farmers were certified organic or providing GMO free feed which is difficult to source and expensive (Brajon et al., 2024). The generally better AW in this cluster could reflect stricter standards for organic farms. In general this exercise reflects the value of a more holistic approach to the evaluation of farming systems.

**References**

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