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Assessing the ventilation effectiveness of naturally ventilated livestock buildings under wind dominated conditions using computational fluid dynamics

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A computational fluid dynamics (CFD) model was developed to investigate the natural ventilation of a climatic livestock building under different wind incidences for three different inlet opening areas. A ½ scale experimental building was employed to validate, both qualitatively and quantitatively, the CFD predictions of airflow distribution. To improve the applicability of CFD to building design, a thermal comfort index called the "minimum comfort temperature" was used in this study. Results showed that ventilation rates were not at their highest when wind was blowing normal to the building because a considerable quantity of the flow exited the building *via* short-circuiting. However, the greatest ventilation homogeneity was experienced when the wind was blowing normal to the building, because of the formation of two wind-driven vortices within the building.

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Recognition and classification of external skin damage in citrus fruits using multispectral data and morphological features

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The computer vision systems currently used for the automatic inspection of citrus fruits are normally based on supervised methods that are capable of detecting defects on the surface of the fruit but are unable to discriminate between different types of defects. Identifying the type of the defect affecting each fruit is very important in order to optimise the marketing profit. A system was developed for the recognition and classification of the most common external defects in citrus. In order to discriminate between 11 types of defects, images of the defects were acquired in five spectral areas, including the study of near infrared reflectance and ultraviolet induced fluorescence. The system combines spectral information about the defects with morphological estimations of them in order to classify the fruits in categories. The fruit-sorting algorithm proposed here was tested by using it to identify the defects in more than 2000 citrus fruits, including mandarins and oranges. The overall success rate reached 86%.

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A screening life cycle assessment of short rotation coppice willow feedstock production system for small-scale electricity generation

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Technical viability of two small-scale electricity generation pathways based on willow short rotation coppice biomass was evaluated using a Screening Life Cycle Assessment (LCA) procedure. The system inputs included fuel and oil consumption in machine operations, fertilizer and herbicide production, transportation of willow chips biomass, and biomass-to-energy conversion. The analysis was based on net energy production, energy output–input ratio, and the related CO_2 emission. The results showed that key energy efficiency and environmental compatibility factors include: the choice of drying technique; fertiliser type and application technique, and; the type of biomass-to-energy conversion plant, which had up to 36.4% variation in net energy production, and 96.4% reduction in CO_2 emission. Willow chips transported up to distances of 38 km did not have significant impact on the net energy production and CO_2 emission. Over distances in excess of 38 km there was a 25.9% reduction in energy efficiency which underlines the importance of transportation in the overall system productivity.