

# **WATER PERFORMANCE INDEX FOR DAIRY FARMS IN THREE DIMENSIONS: WATER QUANTITY AND QUALITY AND MANURE MANAGEMENT**

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## **INTRODUCTION**

This study proposes a water performance index for dairy farms (WPI-dairy). The WPI-dairy is an indicator-based tool for diagnosing and monitoring the water condition at the dairy farm level in the dimensions of water quantity and quality and manure management. The specific objectives of the study are as follows: a) select and weight indicators in the dimensions of water quantity and quality and manure management, and b) validate the WPI-dairy.

The application of the WPI-dairy could provide the following advantages to the dairy farm: identify environmental management weaknesses and indicate best environmental practices, compare the value of the WPI-dairy over time, allowing the identification of the environmental evolution of the farm and, demonstrate environmental responsibility in milk production to society.

## **MATERIAL AND METHODS**

The main users of the WPI-dairy are technical and advisory workers who provide assistance to dairy farmers. The WPI-dairy is to be applied at a farm level.

The first stage of the process was setting up a tree-structure evaluation based on the literature review about indicators to assess sustainability in dairy production. A broad range of existing livestock sustainability tools was analyzed in terms of water and manure topics.

In the second stage, 15 professionals from Argentina (2), Brazil (11), Chile (1), and Uruguay (1) were invited to define indicator weight structures, using the analytic hierarchy process (AHP) method.

The WPI-dairy calculation involves the characterization of a one-dimensional index, and its value varies from 0 to 1. The closer the value is to 1, the more the farmer is conserving the water in quantity and quality and correctly using manure.

The third stage was the validation of the WPI-dairy. Eleven professionals who worked in technical assistance to milk producers were invited to evaluate the WPI-dairy application spreadsheet.

During October 2023 and January 2024, 47 farms participated in the WPI-dairy validation process and were randomly selected by professionals. Each professional apply the electronic spreadsheet to different farm types.

## **RESULTS AND DISCUSSION**

Of the 47 farms that participated in the WPI-dairy validation process, 21 (44.7%) operated on a pasture system with supplementation, 18 (38.3%) kept lactating cows confined and the remaining

categories on pasture, 6 (12.8%) kept all animals in confinement, and 2 (4.3%) operated on a pasture system without supplementation.

The minimum value that the WPI-dairy should be is 0.64 to consider that the dairy farmer satisfactorily manages water and manure. The minimum values in each dimension should be 0.62 for quantity, 0.61 for quality, and 0.71 for manure. The satisfactory value was determined by considering the standards of Brazilian environmental legislation and best dairy water and manure practices recommendations.

Figure 1 presents the WPI-dairy and the index values in the quantity, quality, and manure dimensions by production system.

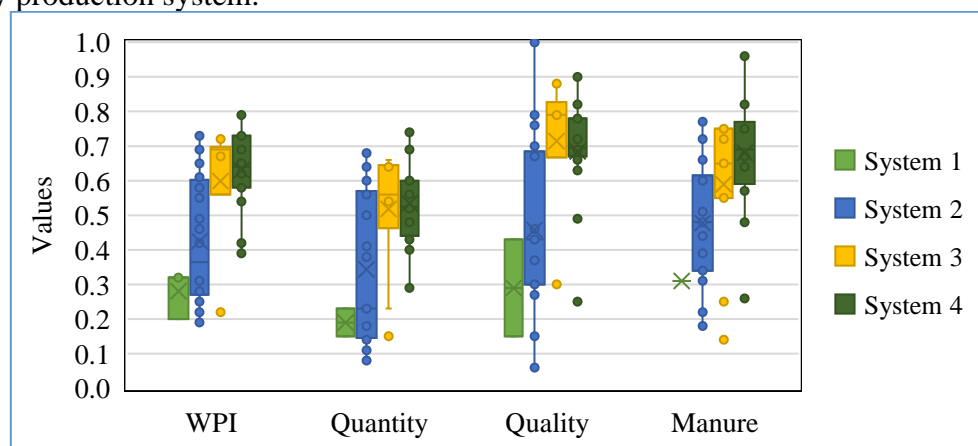


Figure 1. WPI-dairy and the index values in the quantity, quality, and manure dimensions by production system. System 1- Pasture, System 2- Semi-Confined, System 3- Total Confined, System 4- Confined Lactating cows and semi-confined the other animals.

## CONCLUSIONS

According to the results, the WPI-dairy seems useful in assessing and classifying the water performance of dairy farms. The tool can improve assessments of dairy water management at the farm level and support farmer's decision-making by taking into account the important but largely overlooked interactions between water quantity, water quality, and manure management.

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