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Dripping Rainfall Simulators Design for Soil Research

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INTRODUCTION

Dripping rainfall simulators (DRS) are important instruments in soil research. However, a large number of non-standardized simulators have been developed, making it difficult to combine and compare the results of different studies in which they were used. To overcome such a problem, it is necessary to become familiar with the design and performances of the current rainfall simulators applied.

METHODS AND MATERIALS

It has been conducted a search for scientific papers describing dripping rainfall simulators and papers that are thematically related to the soil research using DRS. Simulator design analysis was performed integrally, for simulators with more than one dripper (DRS>1) and with one dripper (DRS=1). Descriptive and numerical data were separated from the papers and sorted by proposed categories, according to which the types and subtypes of used simulators are determined.

RESULTS AND DISCUSSION

The six groups of elements that simulators could consist of have been determined, as well their characteristics, representation and statistical analyses of their available numerical parameters. The characteristics of simulators are analyzed and presented, thus is facilitated the selection of simulators for future research. Description of future simulators in accordance to the basic groups of simulator elements should provide all data necessary for their easier replication and provide a step closer to the reduction of design diversification and standardization of rain simulators intended for soil research.

188 Analyzed papers

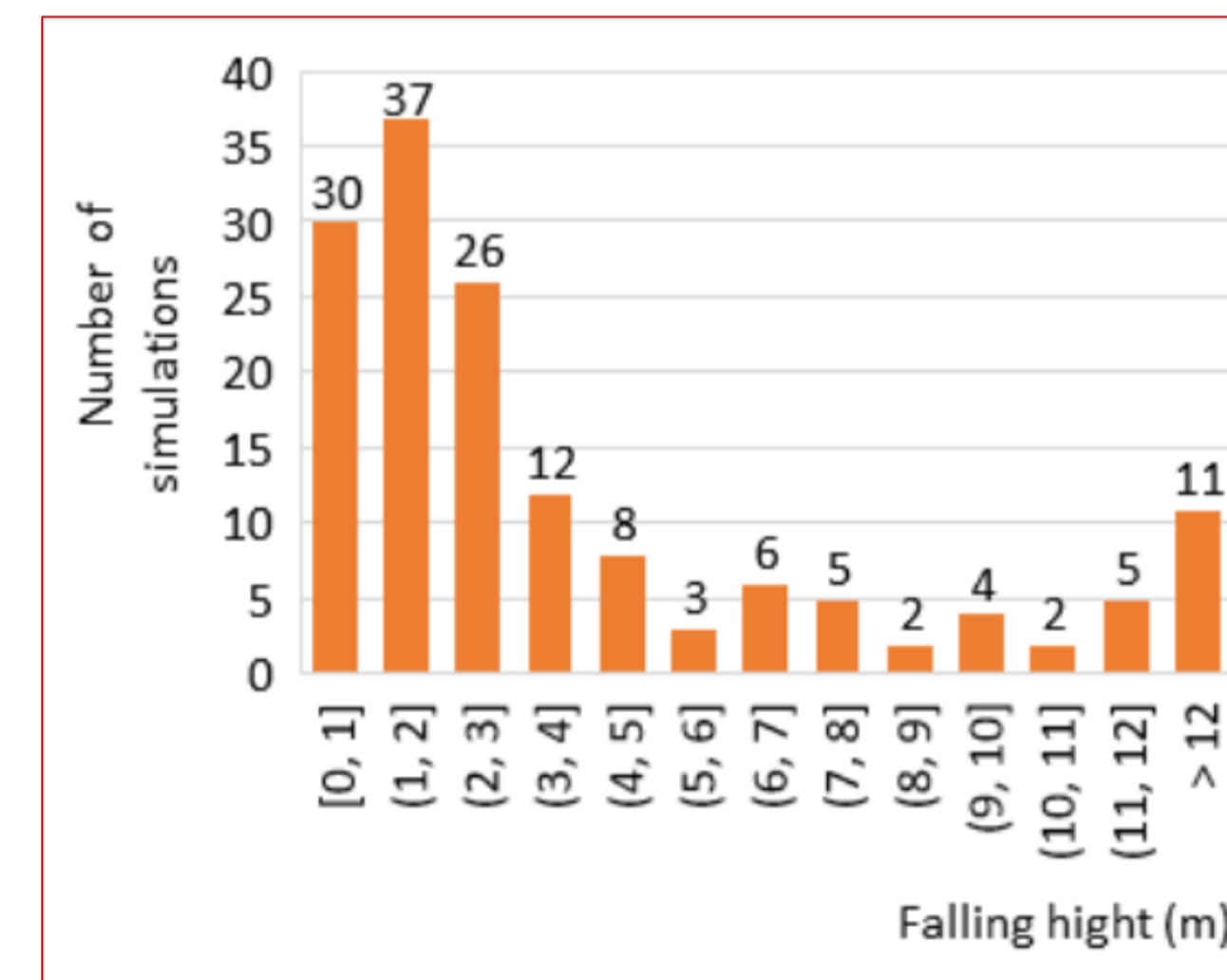
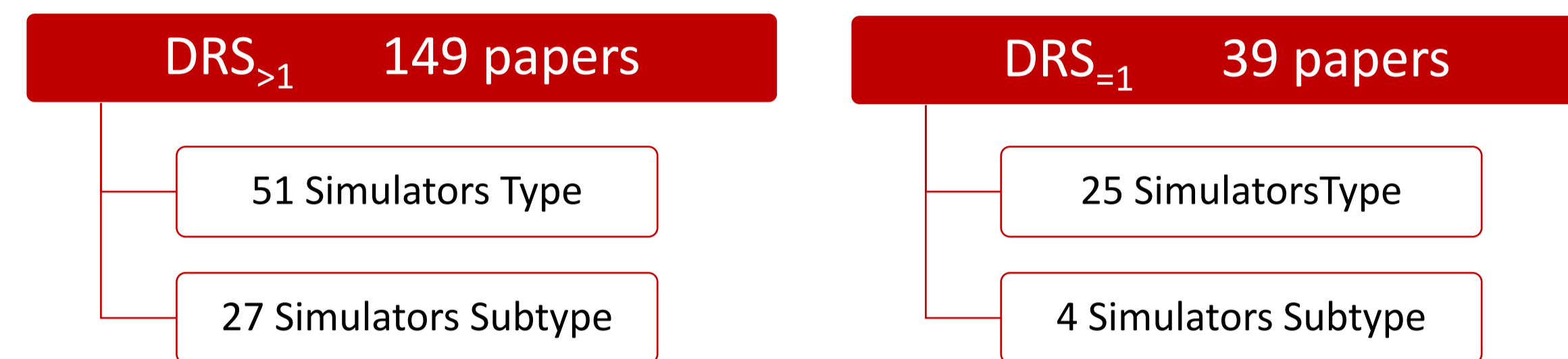


Figure 2. Number of conducted simulations at different drops falling heights.

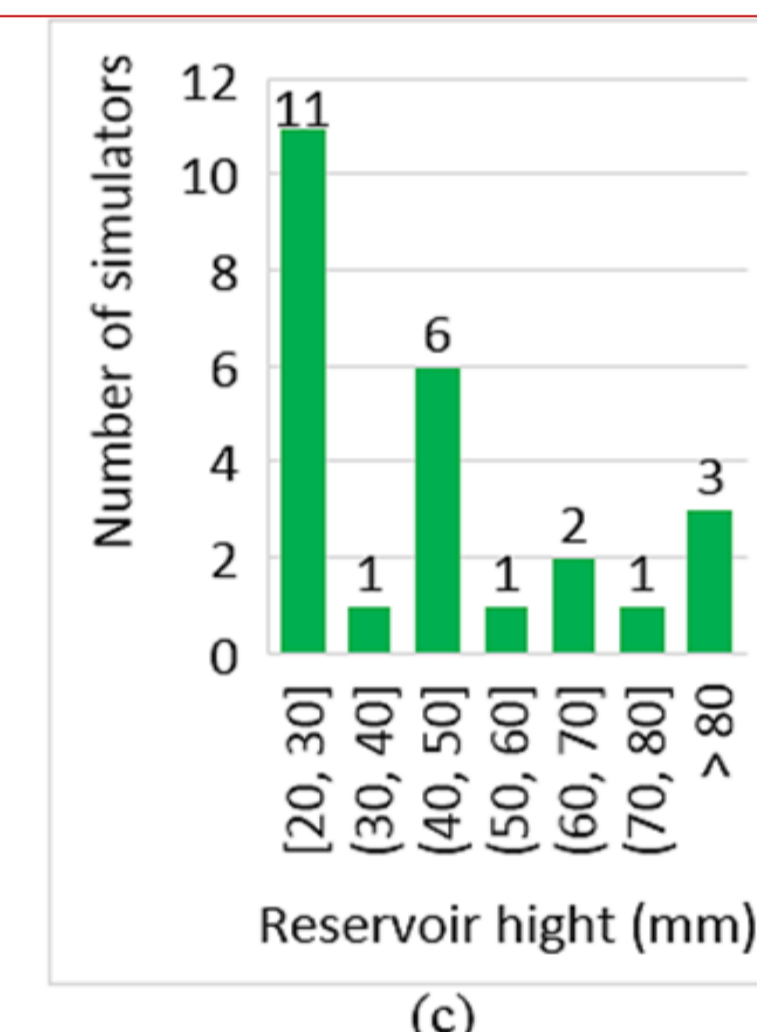
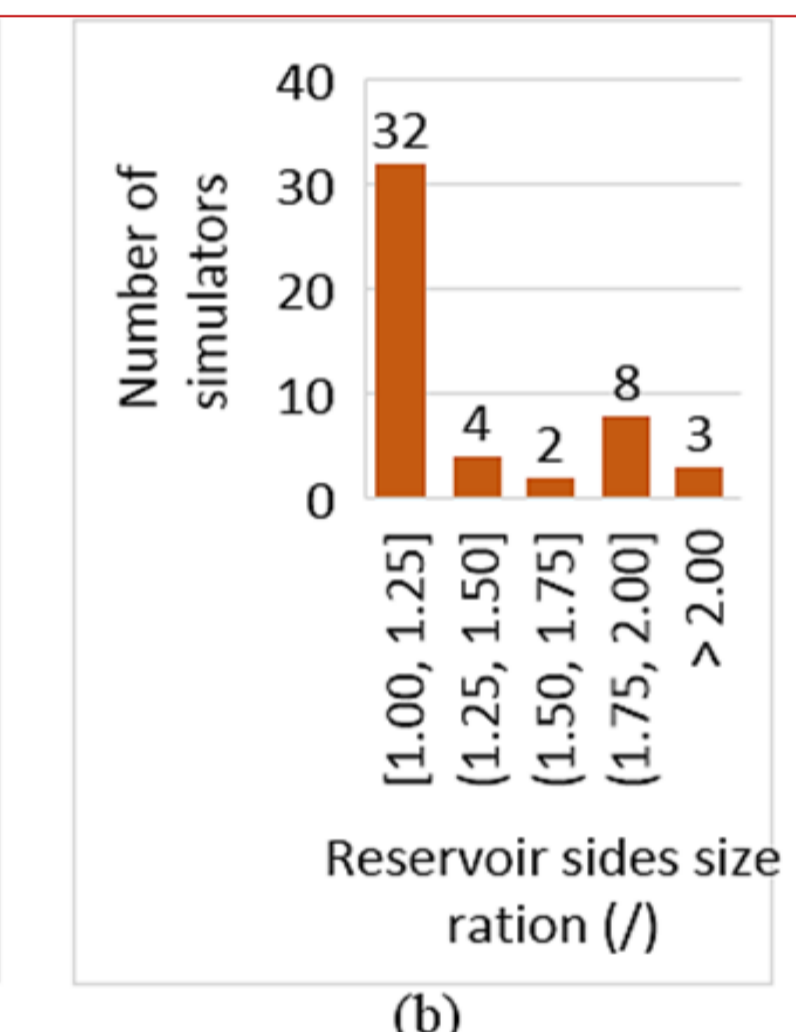
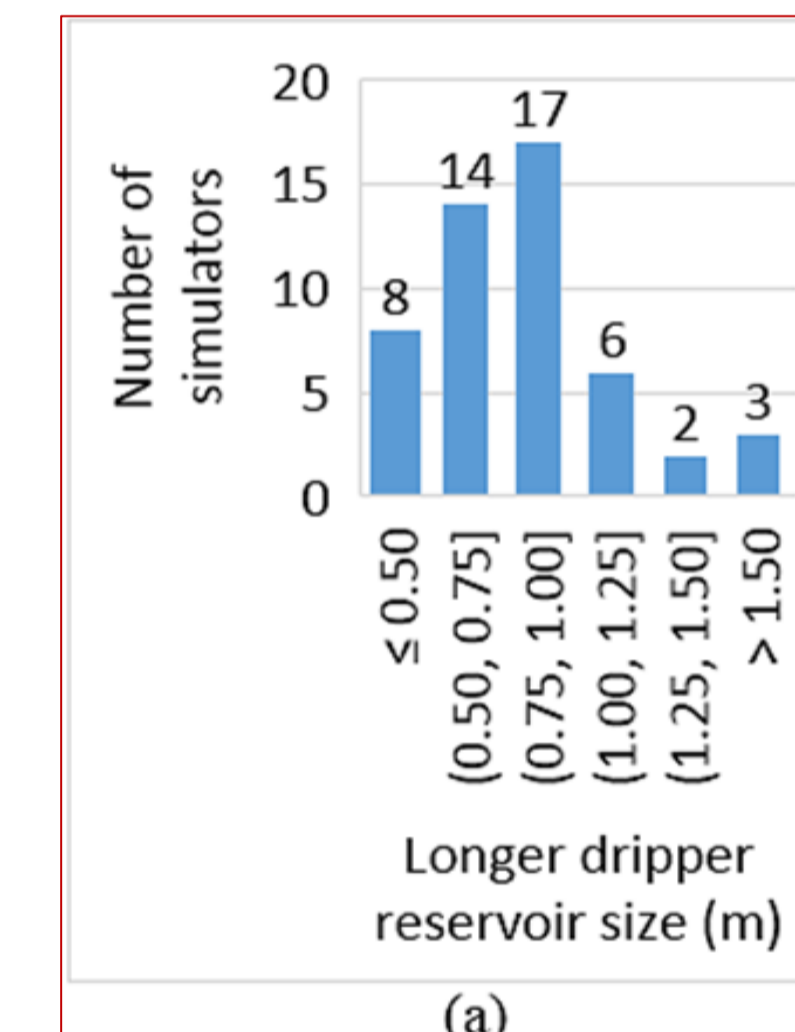


Figure 6. Rectangular box water tank size: (a) Number of different simulators of a certain size of the long side of a rectangular box water tank with drippers; (b) Number of different simulators of certain values of the ratio of the long and short; (c) Number of different simulators of certain height.

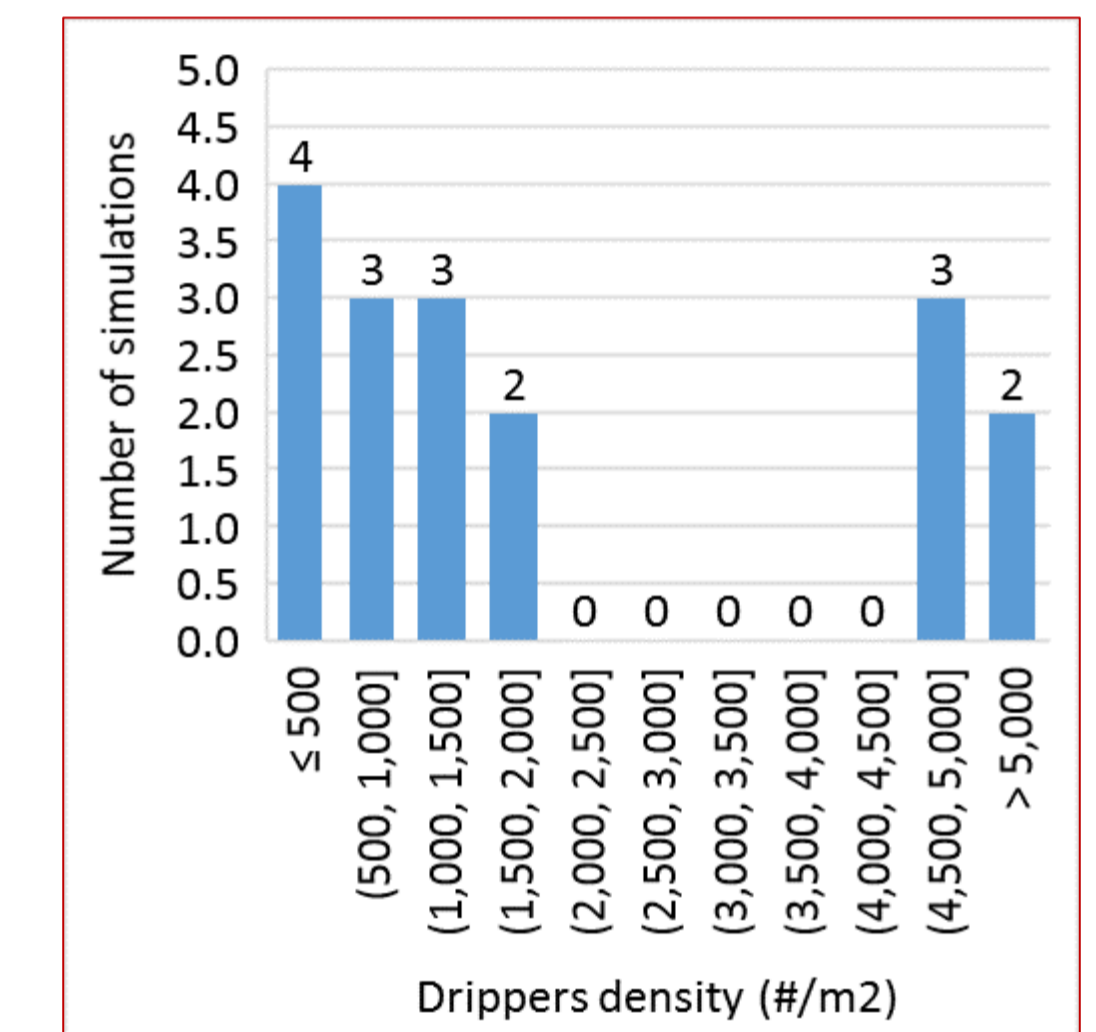


Figure 11. Number of different simulators of a certain value of the density of the drippers arrangement.

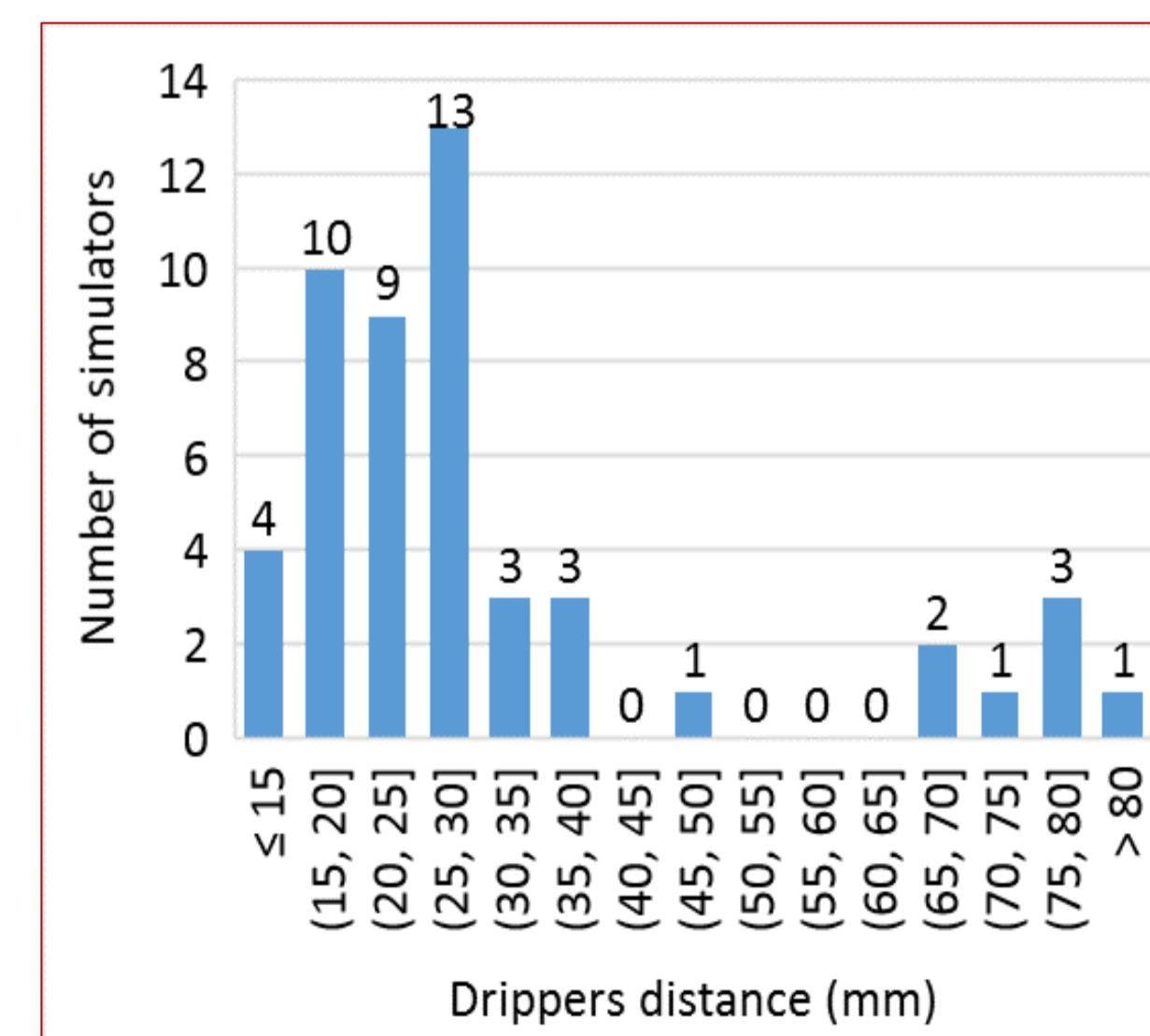


Figure 10. Number of different simulators of a certain value of the mutual spacing of the drippers.

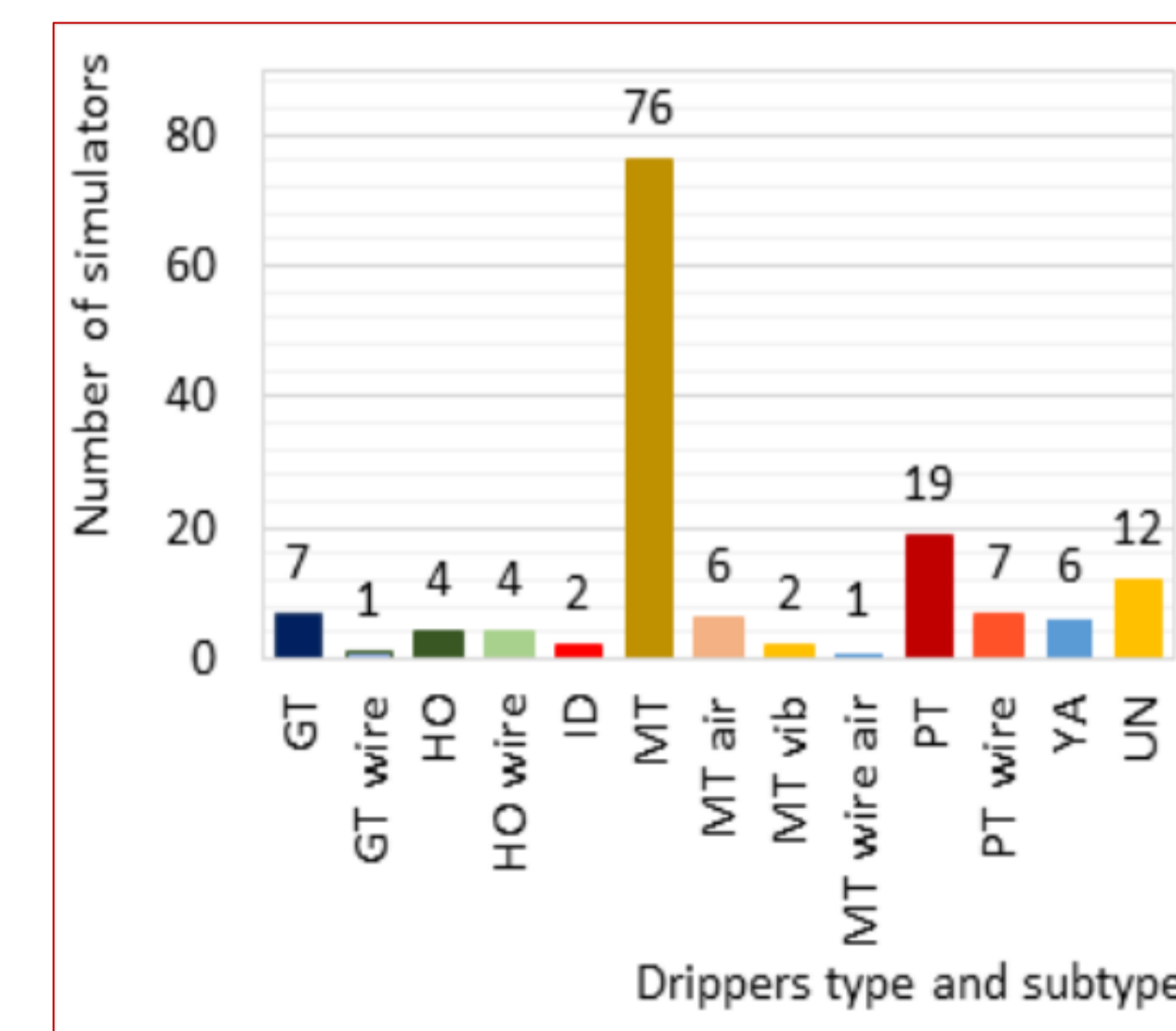


Figure 13. Number of different simulators with drippers of a certain type and subtype.

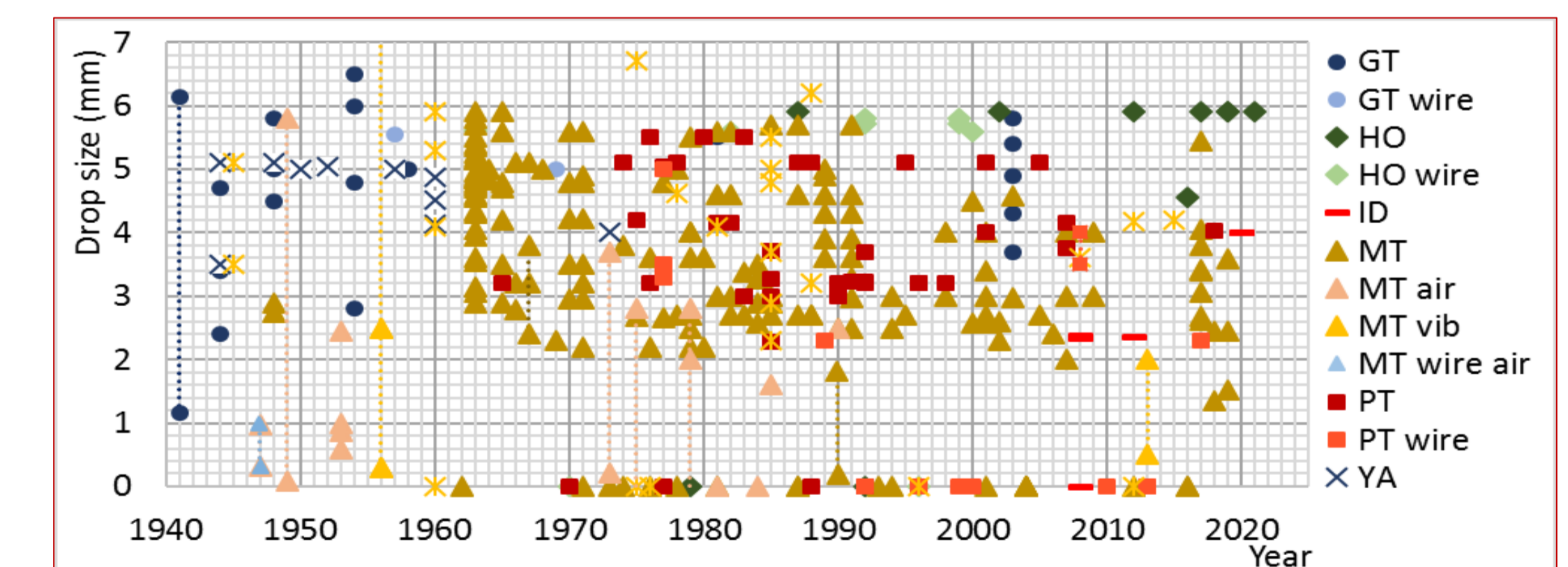


Figure 12. Type and subtype (modified performance drippers) of drippers and corresponding sizes of generated drops applied in previous rainfall simulations (GT - Glass tubes, GT wire - Glas tubes with threads, HO - Holes in dripper reservoir, HO wire - Holes in dripper reservoir with threads, ID - Irrigation drippers, MT - Metal tubes, MT air - Metal tubes under influence of air flow, MT vib - Metal tubes under influence of vibration, MT wire air - Metal tubes with threads under influence of air flow, PT - Plastic tubes, PT wire - Plastic tubes with threads, YA - Hanging yarn and UN - unspecified drippers type).