

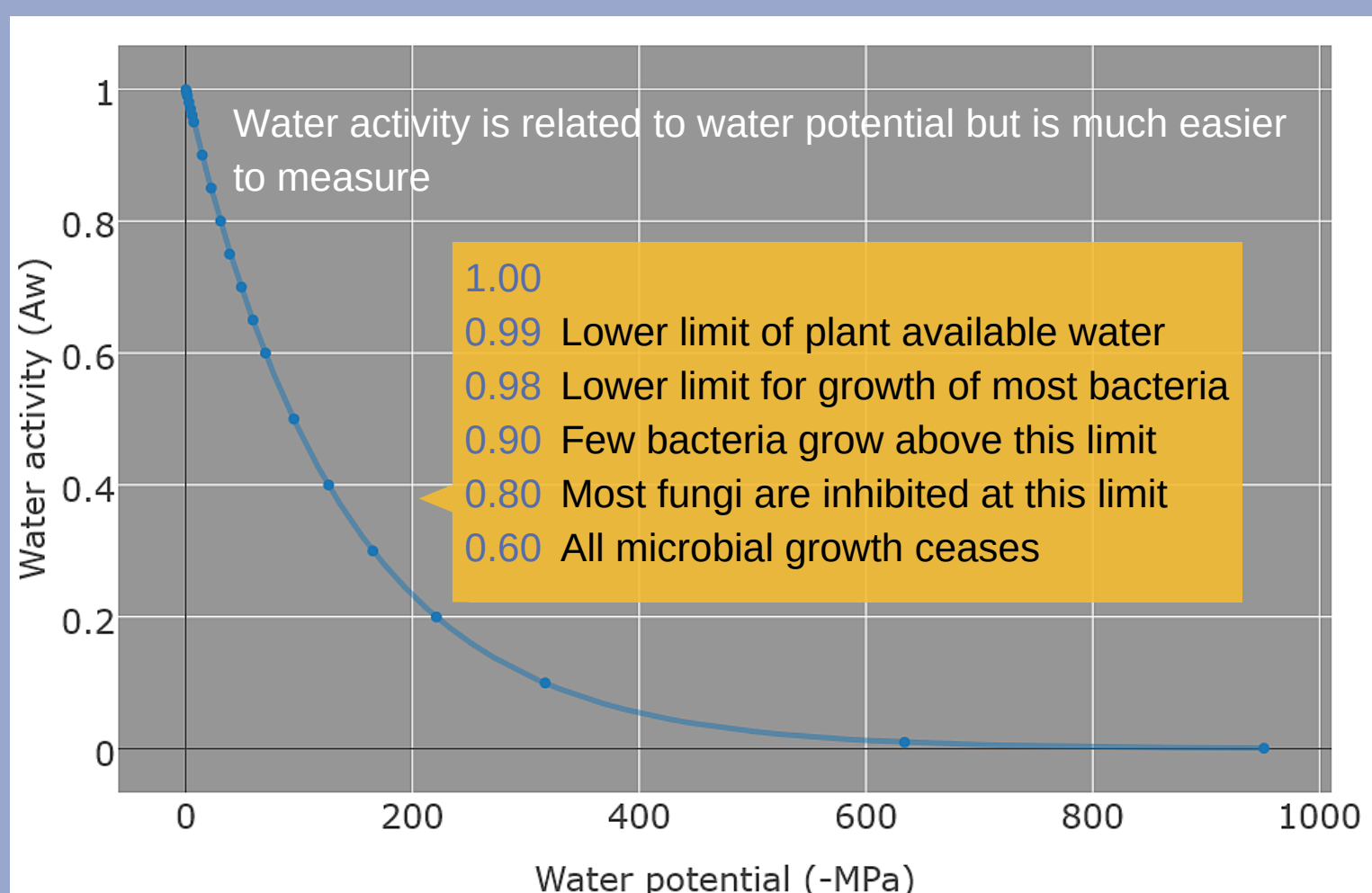
The importance of soil water activity to microorganisms

What is water activity?

Water activity (A_w) is the best determinant of the water requirements of microorganisms. It is the availability of water for reaction in a substrate.

A_w is used in food product design and safety to formulate shelf-stable food. If a product is kept below a certain A_w , then microbial growth can be inhibited, resulting in a longer shelf life.

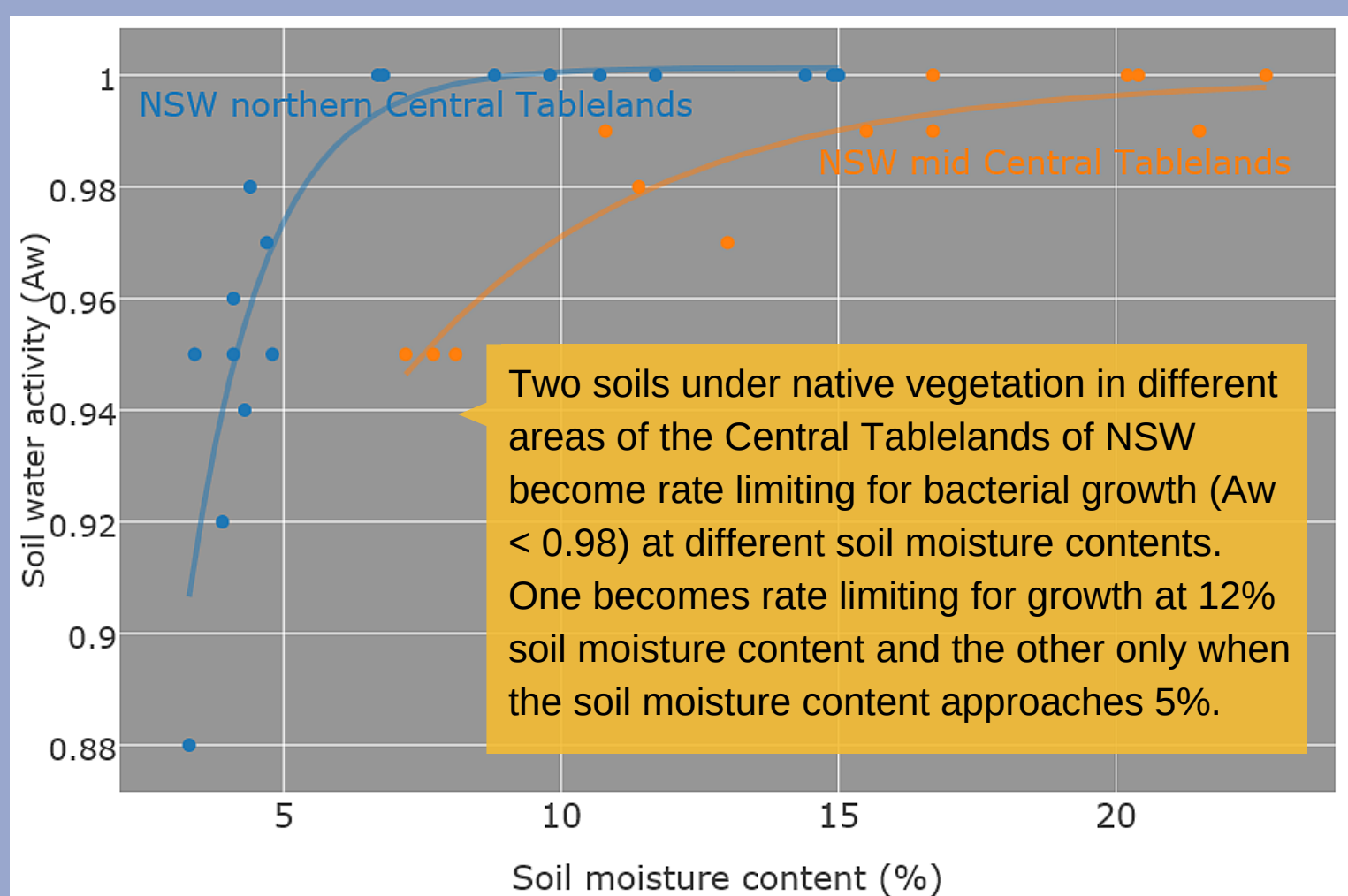
But A_w can also determine how microbial growth and activity are affected by moisture in soil.



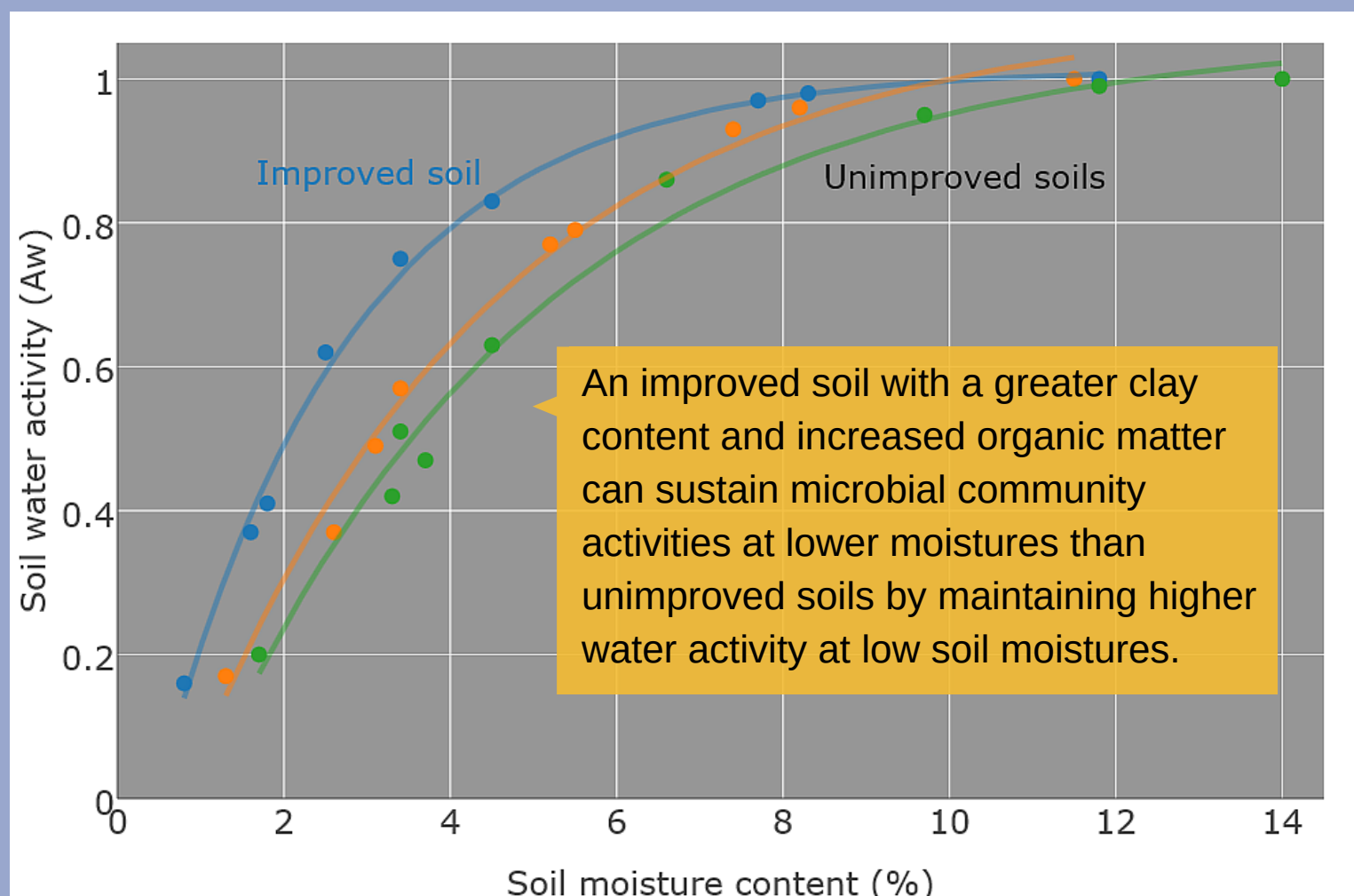
If a soil's A_w is too low for microbial activity to occur then even the most biodiverse microbial community with significant biomass will be unable to undertake any ecosystem processes.

What is the relationship of a soil's moisture content to its water activity?

The relationship between moisture content and A_w is unique to each soil due to its physical and chemical nature and its organic matter content. This can lead to the paradox of soil bacterial communities, in particular, being water limited and non-functional at higher soil moisture levels in some soils than others.



A soil's moisture characteristic (or moisture release curve) can be altered by changes in texture and/or organic matter level.



Small changes in soil moisture in the dry range can have a large impact on soil water activity and on microbial growth and activity.

The effect of soil drying on microbial communities is not a simple event

Rewetting dried soils does not necessarily return the microbial community to its previous status. Microbial activity can decline and there can be changes in community structure after soil drying and rewetting. As the effects of soil drying on microbial communities can be long-lasting it is important to avoid the stress associated with soils reaching critical A_w values.

A soil's moisture characteristic shows the level of dryness at which A_w values negatively impact upon bacterial and fungal community activities. It also provides a benchmark for the assessment of any treatments to improve the soil's moisture characteristic - such as increasing its organic matter content to improve its water holding capacity.