



## Natural Farming: Diluted Seawater

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**S**alt, sodium chloride, is in small amounts a necessary component of all life. Salt has been produced from the evaporation of seawater since prehistoric times. Seawater also contains most of the essential macro- and microminerals essential for healthy plant growth (Turekian 1968, DOE 1997, Motavalli and Marler 1998). Table 1 shows essential plant nutrients found in seawater and their functions within plants. Investigation into the use of seawater for irrigation in agriculture has been ongoing for decades (Mount and Schuppan 1978, Feign 1985, Glenn et al. 1998, Sgherri et al. 2008). More recently sea salt was applied as a source of sea mineral solids for foliar and soil treatments (Heckman and Orton 2010).

Diluted seawater (DSW) is a simple yet vital input used in Natural Farming as a source of mineral nutrition for the production of a variety of fruit and vegetable crops, as well as for lawns, pastures, and flowers (Mount et al. 1978, Sgherri et al. 2008). This factsheet explains the preparation and use of DSW.



Collect seawater near the shoreline.

### How Is DSW Prepared?

Collect seawater at a depth of no more than 1 to 2 inches below the surface near sea shorelines. Brackish water may also be collected where fresh water mixes with seawater. Pour the collected water into a large bowl and allow it to sit, uncovered, for 24 hours. This allows evaporation, aeration, concentration of solids, and the inoculation of airborne microorganisms to occur.

DSW is prepared by mixing the seawater with fresh water at a 1:30 dilution or as a component of a “cocktail” with other Natural Farming inputs. Keep seawater in a clean glass jar with a lid out of direct sunlight. DSW does not have a long shelf life and should

be used soon after preparation. If DSW takes on a foul odor or if a white haze or white mold resembling cotton balls forms in the jar, discard it and make a new batch.

### How Is DSW Used?

Apply DSW onto plants with a watering can, sprayer, or irrigation system to encourage ripening, ideally early in the morning or, if that is not possible, in the evening.

For soil treatments, moisten the soil prior to applying DSW, then lightly water again after DSW application. DSW can be applied monthly or as little as once a year, depending on weather conditions.

Seawater combined with other inputs stimulates the growth of beneficial microorganisms that can help to suppress disease. DSW is used along with IMO4 (Park and DuPonte 2008) and BRV, FPJ, LAB, FAA, OHN, WCP and MA as a soil treatment drench prior to planting the field. It is also used in Natural Farming's type III foliar spray during the reproductive stages or fruiting period of a plant's life cycle (Cho 2010), applied on a set schedule once every three weeks. On fruiting trees DSW is used as a light spray two weeks prior to ripening to increase sweetness or brix within fruit.

Always make sure that the dilution (1:30) of DSW is made properly (see Table 2). If plants start to show signs of yellowing a few days after spraying with DSW, lightly water plants and broaden DSW dilution for next applications. If problem persists, DSW should be tested for cation-exchange capacity and salt content at a water quality laboratory with your county extension agent. Tables 3 and 4 show the composite nutrient makeup of seawater and the salinity of water from different seas.

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**Table 1: Some essential plant nutrients found in seawater and their functions in plants.**

Name	Chemical symbol	Relative % in plant	Function in plant	Nutrient category
Nitrogen	N	100	Proteins, amino acids	Primary macronutrients
Phosphorus	P	6	Nucleic acids, ATP	
Potassium	K	25	Catalyst, ion transport	
Calcium	Ca	12.5	Cell wall component	Secondary macronutrients
Magnesium	Mg	8	Part of chlorophyll	
Sulfur	S	3	Amino acids	
Iron	Fe	0.2	Chlorophyll synthesis	Micronutrients
Copper	Cu	0.01	Component of enzymes	
Manganese	Mn	0.1	Activates enzymes	
Zinc	Zn	0.03	Activates enzymes	
Boron	B	0.2	Cell wall component	
Molybdenum	Mo	0.0001	Involved in N fixation	
Chlorine	Cl	0.3	Photosynthesis reactions	

Source: Motavalli and T. Marler 1998.

**Table 2: Preparation of 1:30 DSW Dilutions**

Volume Needed	Seawater	Fresh Water
24-oz trigger bottle	¾ fl oz	24 fl oz
1 qt	1 fl oz	32 fl oz
1 gal	4 fl oz	4 qt or 128 fl oz
5 gal	20 fl oz	20 qt or 640 fl oz

**Table 3: Salinity of seawater in various seas\***

Sea	% Salinity
Baltic Sea (least saline)	0.5%
Caspian Sea	1.2%
Caribbean Sea	3.6%
Mediterranean Sea	3.8%
Red Sea	4%
Dead Sea	24–33%

\*The ocean's salinity varies slightly, from about 3.2% to 4%, with an average of 3.5%. However, salinity in isolated bodies of seawater is higher than in the open sea (Turekian 1968).

Table 4: Salt composition and salinity of seawater in parts per million\*

Most common elements	Parts per million
Hydrogen H (in H <sub>2</sub> O)	110,000
Oxygen O (in H <sub>2</sub> O)	883,000
Sodium Na (in NaCl)	10,800
Chlorine Cl (in NaCl)	19,400
Magnesium Mg	1,290
Sulfur S	904
Potassium K	392
Calcium Ca	411
Bromine Br	67.3

\*parts per million = mg/litre  
= 0.001g/kg.

Source: Turekian 1968.

Element	Parts per million
Helium He	0.0000072
Lithium Li	0.170
Beryllium Be	0.0000006
Boron B	4.450
Carbon C	28.0
Nitrogen ion	15.5
Fluorine F	13
Neon Ne	0.00012
Aluminium Al	0.001
Silicon Si	2.9
Phosphorus P	0.088
Argon Ar	0.450
Scandium Sc	<0.000004
Titanium Ti	0.001
Vanadium V	0.0019
Chromium Cr	0.0002
Manganese Mn	0.0004
Ferrum Fe	0.0034
Cobalt Co	0.00039
Nickel Ni	0.0066
Copper Cu	0.0009
Zinc Zn	0.005
Gallium Ga	0.00003
Germanium Ge	0.00006
Arsenic As	0.0026

Element	Parts per million
Selenium Se	0.0009
Krypton Kr	0.00021
Rubidium Rb	0.120
Strontium Sr	8.1
Yttrium Y	0.000013
Zirconium Zr	0.000026
Niobium Nb	0.000015
Molybdenum Mo	0.01
Ruthenium Ru	0.0000007
Rhodium Rh	.
Palladium Pd	.
Argentum (silver) Ag	0.00028
Cadmium Cd	0.00011
Indium In	.
Stannum (tin) Sn	0.00081
Antimony Sb	0.0
Tellurium Te	.
Iodine I	0.064
Xenon Xe	0.000047
Cesium Cs	0.0003
Barium Ba	0.021
Lanthanum La	0.0000029
Cerium Ce	0.0000012
Praesodymium Pr	0.00000064
Neodymium Nd	0.0000028

Element	Parts per million
Samarium Sm	0.00000045
Europium Eu	0.0000013
Gadolinium Gd	0.0000007
Terbium Tb	0.00000014
Dysprosium Dy	0.00000091
Holmium Ho	0.00000022
Erbium Er	0.00000087
Thulium Tm	0.00000017
Ytterbium Yb	0.00000082
Lutetium Lu	0.00000015
Hafnium Hf	<0.000008
Tantalum Ta	<0.0000025
Tungsten W	<0.000001
Rhenium Re	0.0000084
Osmium Os	.
Iridium Ir	.
Platinum Pt	.
Aurum (gold) Au	0.000011
Mercury Hg	0.00015
Thallium Tl	.
Lead Pb	0.00003
Bismuth Bi	0.00002
Thorium Th	0.0000004
Uranium U	0.0033
Plutonium Pu	.