

## PMP Derived Crop Water Demand for Irrigation

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We are given the first order conditions for crop irrigation water depletions (Dagnino and Ward, International Journal of Water Resources Development, December 2012. See [www.tandfonline.com/doi/full/10.1080/07900627.2012.665801](http://www.tandfonline.com/doi/full/10.1080/07900627.2012.665801))

$$\pi = \frac{\left[ P * \left( B_0 + \frac{B_1 * Water}{B_w} \right) - C \right] * Water}{B_w} - (P_w * Water)$$

Maximizing this equation with respect to additional total water for a given crop produces the following first order conditions for profit maximization:

$$\frac{\partial \pi}{\partial Water} = \frac{2 * (P * B_1 * Water) + (B_w * B_0 * P) - (B_w * C)}{B_w^2} - P_w = 0$$

That is, the value of water's marginal production should equal its price:

Solving for the total demand for water requires some messy algebra, but produces the following demand for water as a function of all its right hand side parameters:

$$Water = \frac{B_w * (*P_w * B_w - B_0 P + C)}{2 * P * B_1}$$