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| **Paper** | **Journal** | **Studied**  **Crops** | **Time Period** | **Region** | **Estimation Method**  **& Functional Form** | **weather** | **Price** | **Technology** | **Land Quality** | **Ground Water Level** |  |
| Qui et al (2015) | Nature | Corn, Soybeans | 1950-2013 | Ontario,  Canada | Ordinary Least Squares (OLS)  Method; Quadratic functional form | Precipitation before GS, precipitation after GS, GDD | Lag Output price, Fertilizer price index | Trend term |  |  |  |
| Houck &  Gallagher (1976) |  | Corn | 1951-1971 | US | OLS method , Quadratic functional  form for weather |  |  |  |  |  |  |
| Kaufmann &  Snell (1997) |  | Corn | 1889-1995 | Ontario,  Canada | OLS method Log-linear functional,  form Quadratic functional form |  |  |  |  |  |  |
| Schlenker &  Roberts (2009) |  | Corn | 1950-2005 | US | Nonparametric method  Step functional form for heat  8th degree Polynomial for heat  Piecewise linear functional form  for heat  Quadratic functional form for time  trend |  |  |  |  |  |  |
| Cabas et al.  (2010) |  | Corn, Soybeans | 1981-2006 | Ontario,  Canada | Feasible Generalize Least Square  method Just and Pope production  function |  |  |  |  |  |  |
| Tolhurst & Alan  (2015) |  | Corn, Soybeans | 1955-2011 | US | Nonparametric method, Quadratic  functional form for precipitation |  |  |  |  |  |  |
| Miao et al. (2016) |  | Corn, Soybeans | 1977-2007 | US | nstrumental Variable method,  Quadratic functional form |  |  |  |  |  |  |
| Cortus et al (2015) | Canadian Journal of Ag Econs |  |  | Saskatchewan | Systems of equations, quadratic functional form | GS precipitation, GDD |  |  |  |  |  |
| Cabas et al (2009) |  |  |  |  | Just and Post production function |  |  | Trend term |  |  |  |
| Jiangui et al (2020) |  |  |  |  | Ordinary least squares, linear functional form | MODIS metrics |  | Trend term |  |  |  |

**Applied Crop Production Functions Yield in Canada**

Crop yield production functions establish technical relationships between crop inputs and outputs. These functions must satisfy some minimum assumptions:

Cortus et al. (2015)

GS : Growing season (May 15 to August 13) precipitation

GDD : Growing degree days in growing season

Qui et al (2020)

PBGS : precipitation before growing season

PRECI : precipitation after growing season

DD : growing degree days

: output price last year

: fertilizer price index

T : trend term

: mean of PRECI for all the data subgroups

: mean of DD for all data subgroups

Cabas et al (2009)

Based on Just and Post (1978, 1979) production function: Production is decomposed into a deterministic part related to production inputs and stochastic part related to output.

The mathematics of input variables in applied production function based on Kaufmann and Snell (1997):

Profit maximization posits that the value of marginal product of an input must be equal price of the input:

: Crop output price

index of crop input prices paid by farmers

Model:

Jiangui et al (2020)

Utility of Terra/MODIS derived crop metrics for yield estimation. The idea behind this is that, the factors such as soil condition, temperature, soil moisture could be obtained from Satellite data such as crop vegetation cover fraction, green leaf area index and fraction of absorbed cover. Such metrics are then used to predict yield:

X: MODIS metrics, T: trend term