Hybrid Model

Area Equation for Crop

$$A_t = a_0 + a_1 A_{t-1} + a_2 P^C{}_t + a_3 \sum\sum R_{tMm} + a_4 \sum_s IRG_{ts} + a_5 \sum RV_{t0} + a_6 \sum GD_{tM0} + a_7 \sum Z_{tz} \quad \ldots\ldots (1)$$

Yield Equation for Crop

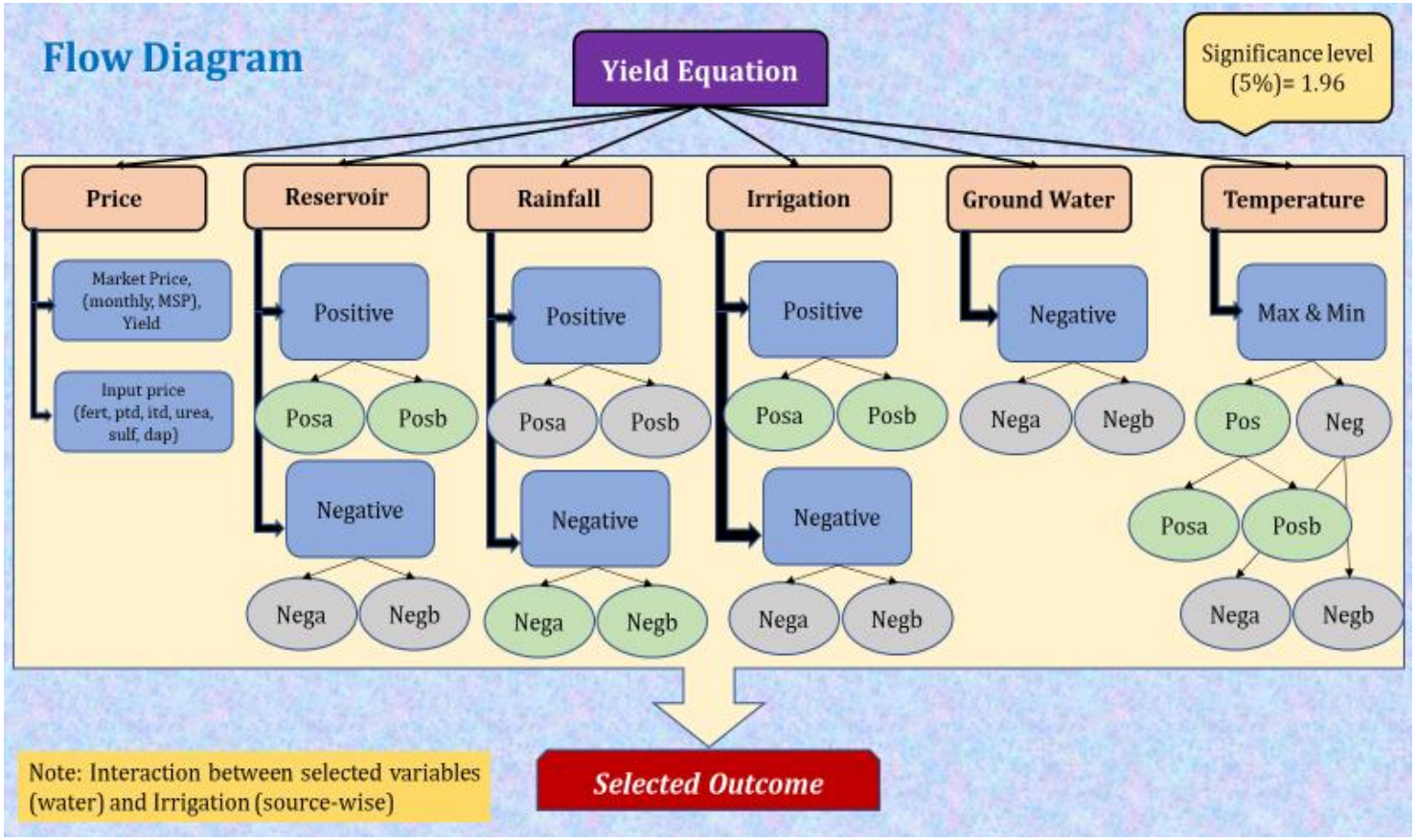
$$Y_t = b_0 + b_1 t + b_2 p_t^C + b_3 p_t^S + b_4 \sum\sum R_{tMm} + b_5 \sum I_{ts} + b_6 \sum\sum TX_{tMf} + b_7 \sum\sum TN_{tMf} + b_8 \sum RV_{t0} + b_9 \sum GD_{tM0} + b_{10} D_{tk} + b_{11} \sum Z_{tz} \quad \ldots\ldots (2)$$

Production of a Crop

$$P_t = A_t \times Y_t \quad \ldots\ldots (3)$$

A_t = area in ('000) hectares under study crop, Y_t = Yield (Kg) per hectare of study crop, $P_t = P_{t1}$ or P_{t2} (equation 1) and $p_t = p_{t1}$ or p_{t2} (Equation 2) in alternate specifications where $P_{t1} = (EP^C_{tm})/(EP^S_{tm})$, $P_{t2} = (EP^C_{tm} * Y^C_{t-1})/(EP^S_{tm} * Y^S_{t-1})$, $p^C_{t1} = (EP^C_{tm})/(EP^F_t)$, $p^C_{t2} = (EP^C_{tm} * Y^C_{t-1})/(EP^F_t)$, $p^S_{t1} = (EP^S_{tm})/(EP^F_t)$, $p^S_{t2} = (EP^S_{tm} * Y^S_{t-1})/(EP^F_t)$, EP_t (Expected Price) is the corresponding wholesale price (WSP) of crop in previous year, or latest MSP or the average of both, $I_{ts} = IRG_{ts} / \text{Exp}(A_t)$. Where R_{tMm}= rainfall averaged across over different alternate sets of M and m, IRG_{ts} is command area under any irrigation sources, TX_{tmMf}= maximum of daily temperatures or their average across M, m and f of growing season, TN_{tmMf} = minimum of daily temperatures or their average across M, m and f of growing season, RVt0 = Reservoir Volume for benchmark month (m=0) , GDtM0= Ground Water level for benchmark months (m=0) of met-regions of the study state, Interactions of rainfall (R_{tMm}) with irrigation ($R_{tMm} * I_{ts}$), and of irrigation and rainfall with reservoir ($RV_{t0} * I_{ts}$ and $R_{tMm} * RV_{t0}$) and ground water levels ($R_{tMm} * GD_{tMo} * I_{ts}$ and $R_{tMm} * GD_{tMo}$) are also allowed as variables. D_k = kth dummy variable for any known change in technology or policy, Z_{tz} = any other relevant z^{th} variable

Subscripts: t is year (2000-01 onwards), M=met region (1, 2…34), m= months (April-March), f= fortnight (1, 2,..24), s= source of irrigation (Canal, well and tank and others). 0 = Benchmark month, Superscripts: C= Study crops, S= Substitute or competing crop (1, 2, . .n), F= input fertilizer etc., exp = expected value of crop area = area estimated in equation (1).


Flow Diagram
Yield Equation
Significance level (5%)= 1.96
Price
Reservoir
Rainfall
Irrigation
Ground Water
Temperature
Market Price, (monthly, MSP), Yield
Input price (fert, ptd, itd, urea, sulf, dap)
Positive
Negative
Posa
Posb
Nega
Negb
Max & Min
Pos
Neg
Note: Interaction between selected variables (water) and Irrigation (source-wise)
Selected Outcome