NOTATIONS

The following notations are used in this thesis, with dimensions as indicated

A	=	Inequality constraints
A_j	=	Irrigated area of j^{th} crop, ha
A_1	=	Irrigated area for sugarcane, ha
A_2	=	Irrigated area for banana, ha
A_3	=	Irrigated area for mango, ha
A_4	=	Irrigated area for cabbage, ha
A_5	=	Irrigated area for paddy, ha
A_6	=	Irrigated area for jowar, ha
A_7	=	Irrigated area for wheat, ha
A_8	=	Irrigated area for cotton, ha
A_9	=	Irrigated area for groundnut, ha
A_{10}	=	Irrigated area for grass, ha
AR_1	=	Fraction of water diverted to canal, i.e. lost as aquifer recharge, assumed as 20%
AR_2	=	Fraction of water from irrigated area i.e. lost as aquifer recharge, assumed as 20%
Aeq	=	Equality constraints
Am_j	=	Upper limit areas under various crops according to management of j^{th} crop, ha
Ase_j	=	Lower limit of area under particular crops according to Socio-Economic needs. of j^{th} crop, ha
b	=	R.H.S. values of inequality constraints
beq	=	R.H.S. values of equality constraints

DR	=	Minimum ground water quantum that be exploited to fulfill the drainage requirement, ha.m
ET_1	=	Fraction of water diverted to canal i.e. lost as non beneficial evapotranspiration, which is assumed as 10 %
ET_2	=	Fraction of water from irrigated to canal i.e. lost as non beneficial evapotranspiration, which is assumed as 10 %
Flp1	=	Optimal results of general linear programming Model
Flp2	=	Optimal results of general linear programming Model with fuzzified constraints
Flp3	=	Optimal results of fuzzy linear programming Model with aspiration level, λ of 100%
f	=	objective function in matlab
GWP	=	Total ground water potential that can be available yearly, ha.m
GW_i	=	Amount of ground water supplied to the command area, ha.m in i^{th} month
GW_1	=	Ground water pumped in command area in january, ha.m
GW_2	=	Ground water pumped in command area in february, ha.m
GW_3	=	Ground water pumped in command area in march, ha.m
GW_4	=	Ground water pumped in command area in april, ha.m
GW_5	=	Ground water pumped in command area in may ha.m
GW_6	=	Ground water pumped in command area in june ha.m
GW_7	=	Ground water pumped in command area in july ha.m
GW_8	=	Ground water pumped in command area in august, ha.m
GW_9	=	Ground water pumped in command area in september, ha.m
GW_{10}	=	Ground water pumped in command area in october, ha.m
GW_{11}	=	Ground water pumped in command area in november, ha.m
GW_{12}	=	Ground water pumped in command area in december, ha.m
Gcc	=	Annual capital cost for ground water, Rs./ha.m
Goc	=	Annual operational cost for ground water, Rs./ha.m
i	=	1, 2, 3,....., I (Number of decision period, i.e., month)

j	=	1, 2, 3,....., J (Number of crops)
K_{ij}	=	Land use coefficient for j^{th} crop in i^{th} month as per the crop calendar followed in the command area
LRg	=	Additional ground water requirement for leaching, %
LRs	=	Additional surface water requirement for leaching, %
lb	=	Lower bound
N.B.1	=	Net benefits obtained using the actual water requirement of the crops during the year 1999-2000
N.B.2	=	Net benefits obtained using the actual water requirement of the crops during the last 10 years, i.e. year 1990-1991 to1999-2000
N.B.3	=	Net benefits obtained in Chalthan branch canal using both surface and ground water.
N.B.4	=	Net benefits obtained in Chalthan using surface water restriction method.
N.B.5	=	Net benefits obtained in Umbhrat branch canal using prevailing cropping pattern.
N.B.6	=	Net benefits obtained in Umbhrat branch canal using originally practiced cropping pattern.
NR_j	=	Net returns from j^{th} crop, Rs./ha
Q_1	=	Used to take into consideration the efficiency of surface water
Q_2	=	Used to take into consideration the efficiency of ground water
Re_i	=	Effective rainfall during i^{th} month
SR_1	=	Fraction of water delivered to canals i.e. lost as surface runoff, which assumed as 10%
SR_2	=	Fraction of water from irrigated area i.e. lost as surface runoff, which assumed as 10%
SW	=	Surface water available at the head of canal under consideration for a particular year, ha.m
S.W.1	=	Unit cost of surface water charged by the N.W.R.W.S. & K. department to the farmers.

S.W.2 = Actual unit cost of surface water.

S.W.3 = Unit cost of surface water charged by the N.W.R.W.S. & K. department to the industries.

S.W.4 = Actual unit cost of surface water during the last 10 years,i.e. 1999-2000

SW_C = Discharge carrying capacity of canal in particular month, ha.m

SW_i = Surface water supplied to canal diversions for command area in i^{th} month, ha.m

SW_j = Surface water supplied to canal diversions for command area in i^{th} month, ha.m

SW_1 = Surface water supplied to canal in january, ha.m

SW_2 = Surface water supplied to canal in february, ha.m

SW_3 = Surface water supplied to canal in march, ha.m

SW_4 = Surface water supplied to canal in april, ha.m

SW_5 = Surface water supplied to canal in may ha.m

SW_6 = Surface water supplied to canal in june ha.m

SW_7 = Surface water supplied to canal in july ha.m

SW_8 = Surface water supplied to canal in august, ha.m

SW_9 = Surface water supplied to canal in september, ha.m

SW_{10} = Surface water supplied to canal in october, ha.m

SW_{11} = Surface water supplied to canal in november, ha.m

SW_{12} = Surface water supplied to canal in december, ha.m

Scc = Annual capital cost for surface water, Rs./ha.m

Soc = Annual operational, maintenance and repairs cost for surface water,Rs./ha.m

TA = Total available cultivation area, ha

WP_i = Ground water pumping capacity of the wells located in command area for i^{th} month

WR_{ij} = Irrigation water requirement of j^{th} crop in i^{th} month

X = Optimal Values

Z = Objective function

λ = Aspiration level