

CE-718 WATER RESOURCES SYSTEMS ANALYSIS

COURSE PROJECT REPORT

PROBLEM STATEMENT

The Cauvery River Basin, which is of great importance to both Karnataka and Tamil Nadu, sustains agriculture, hydropower, and socio-industrial activities, experiences water disputes in drought conditions. An advanced approach of a particular type (simplified) for optimization problem dealing with water allocation inequality has been formulated by combining four reservoirs of Karnataka (Hemavathy, Harangi, Kabini, Hopper) and two reservoirs of Tamil Nadu (Mettur, Lower Bhavani) into a single system. The model makes it possible to swap water between the two states monthly, considering the various regional requirements (industrial, domestic, and irrigation) with the goal of achieving relatively equitable water apportionment in the region with sharpest contention of water use.

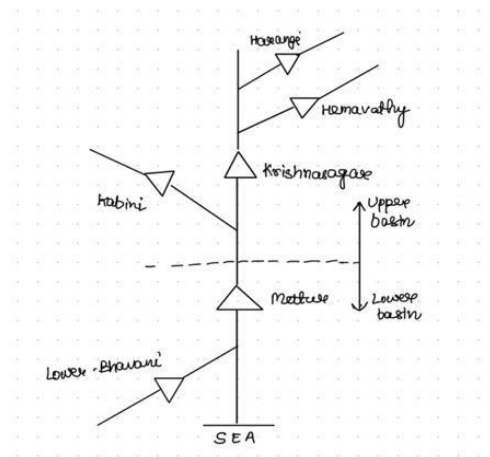


Figure 1: The six-reservoir system of the river basin under study.

NETWORK DIAGRAM

The network diagram above (Figure 1) shows, in a stage mark manner, the hydrological links between the reservoirs of the Cauvery River Basin, with the flow from the reservoirs in Karnataka (Harangi, Hemavathy, Krishnarajasagar and Kabini) to the reservoirs in Tamil Nadu (Mettur and Bhavani) and further to the ocean. For this study, and to concentrate on interstate water division, we have chosen to combine the four reservoirs from Karnataka into one and the two from Tamil Nadu into one as well. This aggregation still captures the important hydrological relationships, while providing a reasonable representation of the dynamics of water flow between the two states. The following diagram (Figure 2) depicts this consolidated network which was used in our optimization model

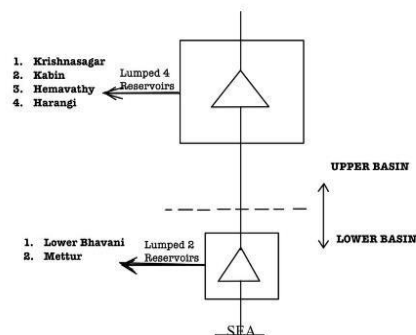


Figure 2 : Final Lumped Network Diagram

MODEL EQUATIONS

The model on the optimization on the Cauvery River Basin is done as a linear programming problem with an objective to increase net profit which is the economic benefit of water allocation.

Decision Variables

For each month ($t = 1, 2, \dots, 12$):

$K_{\{ag,t\}}$: Water allocated to agriculture in Karnataka

$K_{\{in,t\}}$: Water allocated to industry in Karnataka (BCM)

$K_{\{hh,t\}}$: Water allocated to households in Karnataka (BCM)

$T_{\{ag,t\}}$: Water allocated to agriculture in Tamil Nadu (BCM)

$T_{\{in,t\}}$: Water allocated to industry in Tamil Nadu (BCM)

$T_{\{hh,t\}}$: Water allocated to households in Karnataka (BCM)

R_t : Water transferred from Karnataka to Tamil Nadu (BCM)

$S_{\{K,t\}}$: Storage in Karnataka's reservoir at the end of month t (BCM)

$S_{\{T,t\}}$: Storage in Tamil Nadu's reservoir at the end of month t (BCM)

$S_{\{K,t\}}$: Agricultural shortage in Karnataka (BCM)

$S_{\{T,t\}}$: Agricultural shortage in Tamil Nadu (BCM)

$S_{\{Ki,t\}}$: Industrial shortage in Karnataka (BCM)

$S_{\{Ti,t\}}$: Industrial shortage in Tamil Nadu (BCM)

Objective Function

Maximize total net benefit:

$$\max \sum_{t=1}^{12} \left[w_K \cdot agri_{K,t} \cdot K_{ag,t} + w_T \cdot agri_{T,t} \cdot T_{ag,t} + w_K \cdot ind_K \cdot K_{in,t} + w_T \cdot ind_T \cdot T_{in,t} - transfer \cdot R_t \right. \\ \left. + w_K \cdot storage_K \cdot S_{K,t} + w_T \cdot storage_T \cdot S_{T,t} - penalty_{agri} \cdot (s_{K,t} + s_{T,t}) - penalty_{ind} \cdot (s_{Ki,t} + s_{Ti,t}) \right]$$

Where:

w_K, w_T : Weights for Karnataka and Tamil Nadu

$agri_{\{K,t\}}, agri_{\{T,t\}}$: Agricultural benefits per BCM ind_K ,

ind_T : Industrial benefits per BCM

$transfer$: Cost per BCM of water transferred

$storage_K, storage_T$: Storage benefits per BCM

$penalty_{\{agri\}}$: Penalty per BCM for agricultural shortage

$penalty_{\{ind\}}$: Penalty per BCM for industrial shortage

Constraints

Mass Balance Constraints

$$S_{\{K,t\}} = S_{\{K,t-1\}} + Inflow_{\{K,t\}} - Evap_{\{K,t\}} - K_{\{ag,t\}} - K_{\{hh,t\}} - K_{\{in,t\}} - R_t S_{\{K,0\}} = InitStorage_K$$

$$S_{\{T,t\}} = S_{\{T,t-1\}} + Inflow_{\{T,t\}} - Evap_{\{T,t\}} + R_t - T_{\{ag,t\}} - T_{\{hh,t\}} - T_{\{in,t\}} - 0.28317$$

$$S_{\{T,0\}} = InitStorage_T$$

Demand and Shortage Constraints

$$K_{\{ag,t\}} + s_{\{K,t\}} = DemandAgri_{\{K,t\}}$$

$$T_{\{ag,t\}} + s_{\{T,t\}} = DemandAgri_{\{T,t\}}$$

$$K_{\{in,t\}} + s_{\{K,i,t\}} = DemandInd_{\{K,t\}}$$

$$T_{\{in,t\}} + s_{\{T,i,t\}} = DemandInd_{\{T,t\}}$$

Service Level Agreements (SLA)

$$K_{\{in,t\}} \geq sla_{\{ind_min\}} \cdot DemandInd_{\{K,t\}}$$

$$T_{\{in,t\}} \geq sla_{\{ind_min\}} \cdot DemandInd_{\{T,t\}}$$

$$K_{\{ag,t\}} \geq sla_{\{agri_min\}} \cdot DemandAgri_{\{K,t\}}$$

$$T_{\{ag,t\}} \geq sla_{\{agri_min\}} \cdot DemandAgri_{\{T,t\}}$$

Environmental Flow

$$R_t \geq env_flow$$

Where:

env_flow : Minimum environmental flow requirement

Household Water Supply

$$K_{\{hh,t\}} \geq hh_min_{\{K,t\}}$$

$$T_{\{hh,t\}} \geq hh_min_{\{T,t\}}$$

Where: $hh_min_{\{K,t\}}$: Minimum household water demand in Karnataka at time t

$hh_min_{\{T,t\}}$: Minimum household water demand in Tamil Nadu at time t

Reservoir Storage Capacity

$$S_{\{K,t\}} \leq Capacity_K$$

$$S_{\{T,t\}} \leq Capacity_T$$

Where:

$Capacity_K$: Maximum storage capacity of Karnataka reservoirs

$Capacity_T$: Maximum storage capacity of Tamil Nadu reservoirs

Bounds on Allocations

$$0 \leq K_{\{ag,t\}} \leq DemandAgri_{\{K,t\}}$$

$$0 \leq T_{\{ag,t\}} \leq DemandAgri_{\{T,t\}}$$

$$0 \leq K_{\{in,t\}} \leq DemandInd_{\{K,t\}}$$

$$0 \leq T_{\{in,t\}} \leq DemandInd_{\{T,t\}}$$

Where:

$DemandAgri_{\{K,t\}}$: Agricultural water demand in Karnataka at time t

$DemandAgri_{\{T,t\}}$: Agricultural water demand in Tamil Nadu at time t

$DemandInd_{\{K,t\}}$: Industrial water demand in Karnataka at time t

$DemandInd_{\{T,t\}}$: Industrial water demand in Tamil Nadu at time t

Non-negativity Constraints

$$K_{\{hh,t\}}, T_{\{hh,t\}}, R_t, S_{\{K,t\}}, S_{\{T,t\}}, S_{\{K,t\}}, S_{\{T,t\}}, S_{\{Ki,t\}}, S_{\{Ti,t\}} \geq 0$$

DATA SOURCES

Duration of Data Used:

The model is based on 12-month data of the year 2018 (Jan-Dec). This is accounted for in the $n_months = 12$ parameter and the monthly charts (e.g., "Monthly Allocations & Transfer" and "Storage vs Capacity" graphs), which display results for a month marked from Jan to Dec. The data contains normal seasonality variations and hence is appropriate for a yearly water allocation policy.

Variables provided as data:

The following variables in the optimization model were supplied as pre-defined data inputs rather than being optimized:

Agricultural Demand (DemandAgri_K, DemandAgri_T):

- **Description:** Monthly water demand for agriculture in Karnataka and Tamil Nadu (BCM).
- **Source:** <https://pmksy.gov.in/mis/Uploads/2016/20161219122752097-1.pdf>
https://www.niti.gov.in/sites/default/files/2019-01/Report%20Assessment%20of%20Water%20Foot%20Prints%20of%20India%27s%20Long%20Term%20Energy%20Scenarios_TERI%202017.pdf
- **Duration:** 12 months (January to December), for the year 2018.

Industrial Demand (DemandInd_K, DemandInd_T):

- **Description:** Monthly water demand for industry in Karnataka and Tamil Nadu (BCM).
- **Source:** <https://pmksy.gov.in/mis/Uploads/2016/20161219122752097-1.pdf>
https://www.niti.gov.in/sites/default/files/2019-01/Report%20Assessment%20of%20Water%20Foot%20Prints%20of%20India%27s%20Long%20Term%20Energy%20Scenarios_TERI%202017.pdf
- **Duration:** 12 months (January to December), for the year 2018.

Inflow (Inflow_K, Inflow_T):

- **Description:** Monthly water inflow into the reservoirs of Karnataka and Tamil Nadu (BCM).
- **Source:** <https://tnagriculture.in/ARS/home/reservoir>
- **Duration:** 12 months (January to December), for the year 2018.

Evaporation (Evap_K, Evap_T):

- **Description:** Monthly water loss due to evaporation from Karnataka and Tamil Nadu reservoirs (BCM).
- **Source:** <https://indiawris.gov.in/wris/#/evapotranspiration>
- **Duration:** 12 months (January to December), for the year 2018.

Initial Storage (InitStorage_K, InitStorage_T):

- **Description:** Starting water volume in Karnataka and Tamil Nadu reservoirs at the beginning of the year (BCM).
- **Source:** <https://tnagriculture.in/ARS/home/reservoir>
- **Duration:** Single initial value applied at the start of the 12-month period.

Household Minimum Releases (hh_min_K, hh_min_T):

- **Description:** Minimum monthly water required for households in Karnataka and Tamil Nadu (BCM).
- **Source:** Defined as constant values (0.12 BCM for Karnataka and 0.10 BCM for Tamil Nadu) in the main code, based on domestic water supply standards.
- **Duration:** 12 months (January to December).

Reservoir Capacity (Capacity_K, Capacity_T):

- **Description:** Maximum storage capacity of Karnataka and Tamil Nadu reservoirs (BCM).
- **Source:** <https://tnagriculture.in/ARS/home/reservoir>
- **Duration:** Applies throughout the 12-month period as a static limit.

Economic Parameters (agri_USD_K, agri_USD_T, ind_USD, transfer_USD, storage_USD, penalty_agri, penalty_ind):

- **Description:** Monetary benefits and costs associated with agriculture, industry, water transfer, storage, and penalties for shortages (in ₹).
- **Source:** <https://www.mdpi.com/2073-4441/1/1/5>
- **Duration:** Applies across the 12-month period, with agricultural benefits varying monthly.

Environmental Flow (env_flow):

- **Description:** Minimum water flow required for environmental purposes (BCM/month).
- **Source:** Set as 0.05 BCM in the main code, based on ecological standards for the Cauvery River- <https://www.mdpi.com/2073-4441/1/1/5>
- **Duration:** Applies each month over the 12-month period.

RESULTS AND DISCUSSION

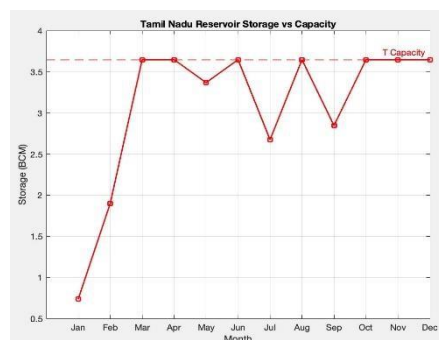


Figure 3: Tamil Nadu Reservoir Storage vs Capacity

Tamil Nadu Reservoir Storage vs Capacity:

- Monsoon fill: Storage rises from ~0.75 BCM in January to full capacity (≈3.65 BCM) by March– April due to northeast-monsoon inflows.
- Drawdowns during the dry season: Storage declines to ~3.35 BCM in May and goes as low as ~2.65 BCM in July before being refilled in August.
- Post-monsoon stability: A lesser drawdown in September (~2.85 BCM) is succeeded by consistent refilling to capacity during October to December, keeping buffers complete in anticipation of the winter cropping season.

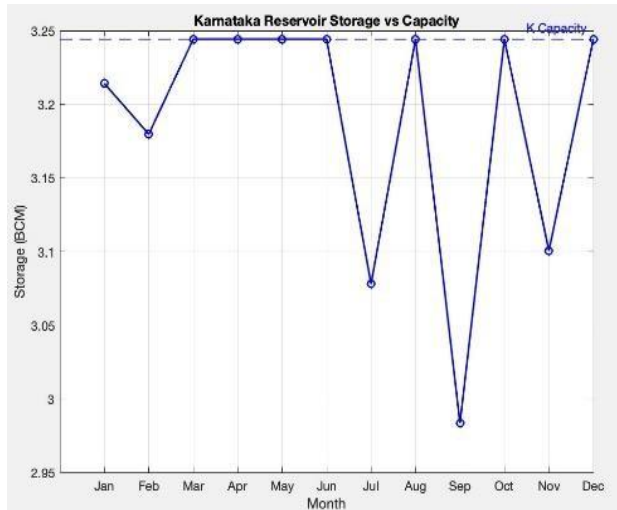


Figure 4: Karnataka Reservoir Storage vs Capacity

Karnataka Reservoir Storage vs Capacity:

- Early-year near-capacity: Reservoir begins at ≈ 3.22 BCM in January, reduces slightly in February (~ 3.18 BCM), then refills to its 3.245 BCM capacity by March–June.
- Monsoon fluctuation: A summer drawdown lowers storage to ~ 3.08 BCM in July (lower inflows + increased releases), but the southwest monsoon in August restores it to capacity.
- September trough & recovery: The lowest September drawdown (~ 2.98 BCM) is due to maximum agricultural releases; subsequently, inflows and prudent releases fill the reservoir to capacity in October, with small fluctuation in November before topping up in December.

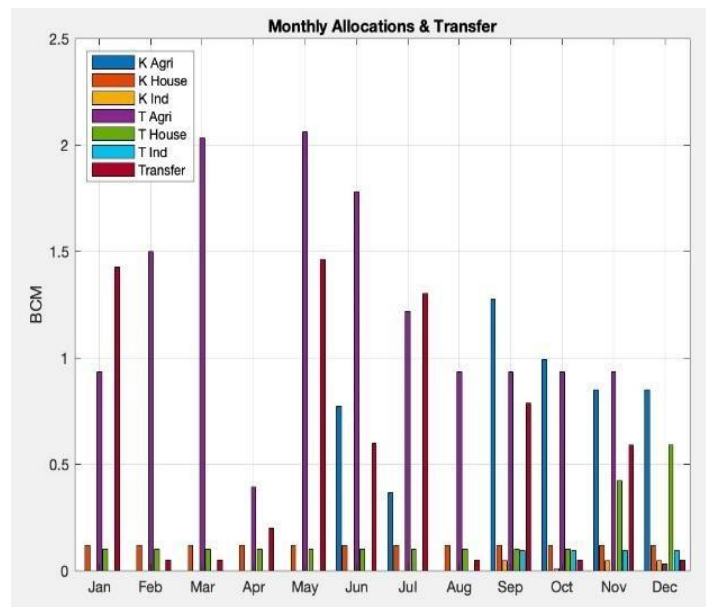


Figure 5: Monthly Allocations & Transfers

Monthly Allocations & Transfers:

- Transfers first: Tall red bars in Jan–Mar & May–Jul indicate that transferring water from Karnataka to Tamil Nadu is highest economic priority whenever K's inflow + storage permits.
- TN Agriculture second: Purple bars dominate early-year allocations (Mar–Jun), keeping pace with TN's cropping calendar.

- K Agriculture third: Blue bars come up Sep–Dec, after monsoon has replenished Karnataka's reservoirs.
- Household & Industry: Fixed minima thin orange/green/cyan bars every month—always exceeded, but never "compete" for additional water.

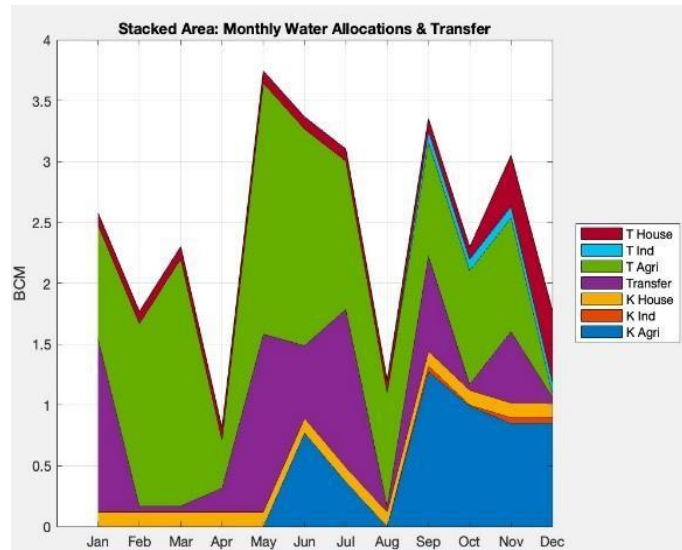


Figure 6: Total Monthly Releases (Stacked Area)

Total Monthly Releases (Stacked Area)

- Two peaks: May (~3.7 BCM) (TN agriculture + transfers) and September (~3.3 BCM) (K agriculture + TN agriculture) crest Releases.
- Lean months: April (~0.7 BCM) and August (~1.1 BCM) record only required household/industry flows - no transfers or additional cropping.
- Layer order = value order: Top → Transfers; followed by TN Agri (green); then K Agri (blue); with industry/household at the bottom.

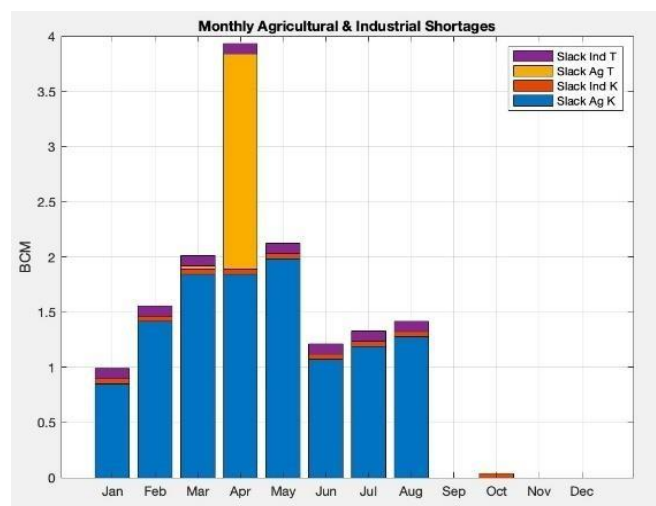


Figure 7: Monthly Agricultural and Industrial Shortages

A cursory look at monthly slack (unfulfilled) demand shows how the optimizer distributes limited water under competing crop, industrial and environmental demands: Jan–Feb (Pre-monsoon Rabi):

- Agriculture in Karnataka suffers the most (blue bars), as limited reservoir storage necessitates cuts to rabi irrigation.

- Industrial slack in both states is negligible, as agri penalties prevail.

Mar–Apr (Samba Peak & Kharif Prep):

- Two agricultural shortages appear: Tamil Nadu's samba (yellow) and Karnataka's kharif buildup (blue) cannot be met in full
- April indicates the greatest combined slack (~4 BCM), an indication of the conflict between high-value crop periods prior to monsoon inflows.

May–Aug (Monsoon Onset & Kharif):

- Inflows rise, Karnataka's Agri slack gradually reduces and is gone by July.
- Tamil Nadu no longer has any Agri shortfall, since its second crop window is lower-priority. Sep–Dec (Post-monsoon & Rabi Closure):
- No slack in September and Nov–Dec, which means all demands are coverable once peak agricultural windows shut.
- A small industry shortage is visible in October (Karnataka) when remaining water prefers household and storage needs.
- This trend emphasizes the urgent need for pre-monsoon allocation and the high price of unsatisfied crop demand, steering monthly release tactics to reduce farming shortages.

Figure 8: Monthly Industrial Profit

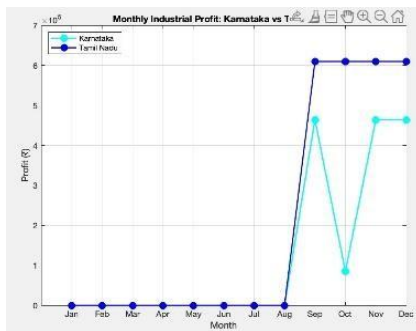


Figure 9: Monthly Agricultural

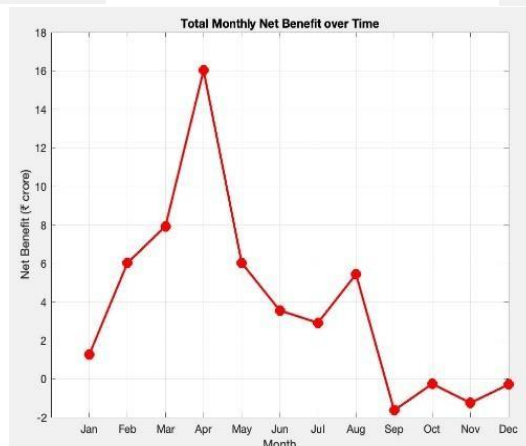
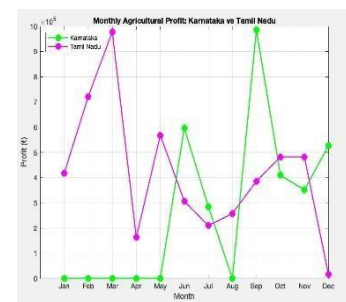


Figure 10: Monthly Net Benefit Net

Benefit Profile

- April Peak (₹16 cr): Triggers by Tamil Nadu irrigation with high-value crops at close of its samba season; surplus inflows are profitably diverted.
- March & August Bumps (₹8 cr, ₹5.5 cr): Align with critical planting windows in TN (Mar) and combined crop windows in both states (Aug).
- Mid-Year Trough (May–Jul, ₹6 → 2.8 cr): Storage and environmental minimums constrain releases.
- Negative Trough (Sep, Nov): Off-season agriculture still commands heavy slack-penalties, overshadowing modest industrial/transfer gains. Sectoral Insights **Agriculture:**

- Tamil Nadu dominates Jan–Apr (highest samba yields).
- Karnataka dominates Jun–Sep (kharif cropping); shoulder months witness shared allocations.

Industry:

- Zero profit until the post-monsoon, since unmet-Agri penalties compel complete agricultural servicing.
- Sep–Dec profits when agri windows finish; Tamil Nadu beats Karnataka because of model weights.

Principal Trade-offs

- Seasonal Coefficients: Large crop-season-benefit coefficients steer water to agriculture ahead of industry.
- Slack Penalties: Huge penalties for unmet crop demand almost withdraw industrial allocations during peak seasons.
- Reservoir & Flow Constraints: Environmental flow requirements and storage targets moderate mid-year allocations.

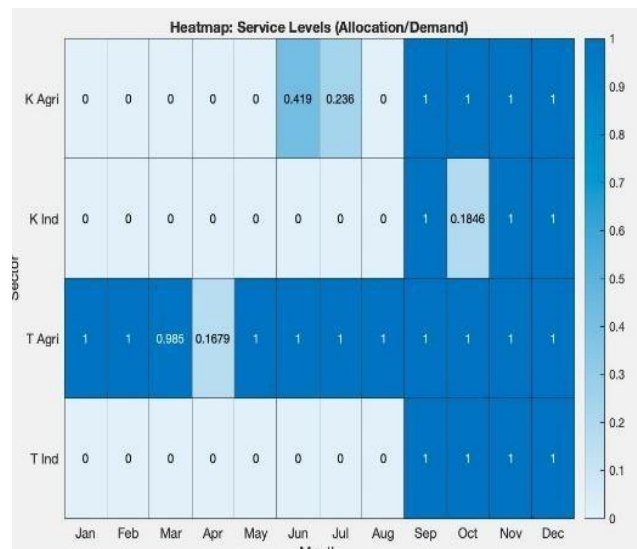


Figure 11: Heatmap of Service Levels (Allocation/Demand) Across Sectors and Months

- Tamil Nadu agriculture is mostly fulfilled year-round, with a dip in April; Karnataka agri gets full supply post-monsoon.
- Industry in both states is deprioritized until surplus water is available.
- The model favors penalties over low-profit allocations in off-season.

Sector	Jan–Apr	May–Aug	Sep–Dec
K Agri	0 % service	42 % (Jun), 24 % (Jul), 0 % (Aug)	100 %
K Ind	0 %	0 %	100 % (Sep), 18 % (Oct), 100 % (Nov–Dec)
T Agri	100 % (Jan–Mar), 99 % (Mar), 17 % (Apr)	100 %	100 %
T Ind	0 %	0 %	100 %

Table 1: Heatmap interpretation table of different sectors

CONCLUSION

The tailored linear-programming model of the Karnataka–Tamil Nadu basin has illustrated the following capabilities:

Maximized Economic Return

- Generates an overall annual net benefit of ₹ 45.6 crore by distributing water optimally between agriculture, industry, households and inter-basin transfers.

Integrated Hydrologic–Economic Framework

- Applies simultaneously mass-balance (inflow–evaporation–storage), capacity constraints, environmental-flow minima and service-level agreements ($\geq 80\%$ industrial, $\geq 70\%$ agricultural).

Seasonal Insight

- Represents intra-annual variations in inflows and demands, identifying high-value months (April peak) and low-benefit times (September).

Penalty-Based Shortage Management

- Inserts economically weighted slack variables to measure and deter unserved demands in a transparent way.

Decision-Support Visualization

- Uses group bars, stack plots, heatmaps and storage-vs-capacity plots to report allocations, shortages, service levels and reservoir behavior in an easy-to-see manner.

Scalable & Transparent

- Constructed from standard LP code, the model is quickly re scalable to different sets of parameters, different scenarios or additional sub-basins.

Overall, the optimization framework consistently reconciles competing uses, optimizes basin-wide benefits, and provides transparent, data-driven advice for water-resource planning.

FINAL CODE:

```

1  clc; clear; close all;
2
3  % Simplified Water Resource Optimization for Karnataka-Tamil Nadu Basin
4
5  % System Parameters
6  n_months = 12;
7  months = 1:n_months;
8  months_lbl = {'Jan','Feb','Mar','Apr','May','Jun','Jul','Aug','Sep','Oct','Nov','Dec'};
9
10 % Seasonal Agri values (crores per MCM)
11 agri_USD_K = [12,17,8,6,5,15,15,15,8,8,12]; % K harvest pattern
12 agri_USD_T = [12,14,14,12,8,5,5,8,12,15,15,12]; % T harvest pattern
13
14 % Industrial and transfer profits
15 ind_USD = [1000,1000] * 86; % IN, TN
16 transfer_USD = 50000 * 86;
17 storage_USD = [243,243] * 86;
18 penalty_agri = 50000 * 86;
19 penalty_ind = 10000 * 86;
20
21 economic_params = struct('agri_USD_K','agri_USD_T',...
22 'ind_USD','transfer_USD',...
23 'storage_USD','penalty_agri','penalty_ind','penalty_ind ...
24 'region_weights',[8,6,4,4],... % weights for (K, TN,
25 'env_flow',[0,85],... % SDH/month
26 'sla' = struct('ind_sla',[0,8], 'agri_sla',[0,7]);
27
28 % Household minimum releases (BCM/month)
29 h_min_K = 4.12 * ones(1,n_months);
30 h_min_T = 4.18 * ones(1,n_months);
31
32 % Reservoir parameters
33 reservoirs_K = init_reservoir_params('Karnataka', 3.244283, 2.894003);
34 reservoirs_T = init_reservoir_params('Tamil Nadu', 3.646771, 1.544253);
35
36 % Decision variables
37 var_names = {'K_agr','K_ind','K_hm','T_agr','T_ind','T_hm','K','S','K','ST','UK','STU'};
38 effort = struct();
39 for i = 1:numel(var_names)
40     offset = ceil(n_months/2);
41     and_offset(var_names(i)) = (i-1)*n_months;
42 end
43 n_vars = numel(var_names)*n_months;
44
45 % Objective
46 f = create_objective_vars, offset, economic_params, region_weights, n_months;
47
48 % Constraints
49 [Aineq, bineq, Aeq, beq] = build_constraints(reservoirs, offset, n_months, sla);
50
51 % Bounds
52 [lb, ub] = set_bounds(reservoirs, offset, n_months, n_vars, env_flow, sla, h_min_K, h_min_T);
53
54 % Solve
55 [x, fval] = fmincon(f,Aineq,bineq,Aeq,beq,lb,ub,opts);
56
57 % Results
58 res = process_results(x, offset, n_months);
59 fprintf('Total annual net benefit: %0.2f crore/yr', fval/1e7);
60
61 % Post-Processing & Visualization
62
63 % 1) Hourly Data, Line, area, heatmap, bar, etc.
64 % =====
65 % 1.1 Monthly Allocations & Transfer (grouped bar)
66 figure;
67 bar(months, [res_K_agr, res_K_hm, res_K_ind, res_T_agr, res_T_ind, res_T_hm], 'grouped');
68 legend('K Agri','K Ind','K Hm','T Agri','T Ind','T Hm','Transfer','Location','NorthWest');
69
70 % 1.2 Storage vs Capacity (Karnataka)
71 plot(months, [res_K_agr, res_K_hm, res_K_ind, res_T_agr, res_T_ind, res_T_hm], 'hold on');
72 plot(months, [res_K_agr, res_K_hm, res_K_ind, res_T_agr, res_T_ind, res_T_hm], 'hold on');
73
74 % 1.3 Storage vs Capacity (Tamil Nadu)
75 plot(months, [res_T_agr, res_T_ind, res_T_hm], 'hold on');
76 plot(months, [res_T_agr, res_T_ind, res_T_hm], 'hold on');
77
78 % 1.4 Monthly Profit (Karnataka vs Tamil Nadu)
79 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
80 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
81
82 % 1.5 Monthly Profit (Karnataka vs Tamil Nadu)
83 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
84 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
85
86 % 1.6 Monthly Profit (Karnataka vs Tamil Nadu)
87 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
88 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
89
90 % 1.7 Monthly Profit (Karnataka vs Tamil Nadu)
91 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
92 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
93
94 % 1.8 Monthly Profit (Karnataka vs Tamil Nadu)
95 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
96 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
97
98 % 1.9 Monthly Profit (Karnataka vs Tamil Nadu)
99 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
100 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
101
102 % 1.10 Monthly Profit (Karnataka vs Tamil Nadu)
103 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
104 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
105
106 % 1.11 Monthly Profit (Karnataka vs Tamil Nadu)
107 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
108 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
109
110 % 1.12 Monthly Profit (Karnataka vs Tamil Nadu)
111 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
112 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
113
114 % 1.13 Monthly Profit (Karnataka vs Tamil Nadu)
115 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
116 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
117
118 % 1.14 Monthly Profit (Karnataka vs Tamil Nadu)
119 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
120 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
121
122 % 1.15 Monthly Profit (Karnataka vs Tamil Nadu)
123 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
124 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
125
126 % 1.16 Monthly Profit (Karnataka vs Tamil Nadu)
127 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
128 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
129
130 % 1.17 Monthly Profit (Karnataka vs Tamil Nadu)
131 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
132 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
133
134 % 1.18 Monthly Profit (Karnataka vs Tamil Nadu)
135 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
136 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
137
138 % 1.19 Monthly Profit (Karnataka vs Tamil Nadu)
139 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
140 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
141
142 % 1.20 Monthly Profit (Karnataka vs Tamil Nadu)
143 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
144 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
145
146 % 1.21 Monthly Profit (Karnataka vs Tamil Nadu)
147 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
148 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
149
150 % 1.22 Monthly Profit (Karnataka vs Tamil Nadu)
151 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
152 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
153
154 % 1.23 Monthly Profit (Karnataka vs Tamil Nadu)
155 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
156 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
157
158 % 1.24 Monthly Profit (Karnataka vs Tamil Nadu)
159 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
160 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
161
162 % 1.25 Monthly Profit (Karnataka vs Tamil Nadu)
163 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
164 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
165
166 % 1.26 Monthly Profit (Karnataka vs Tamil Nadu)
167 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
168 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
169
170 % 1.27 Monthly Profit (Karnataka vs Tamil Nadu)
171 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
172 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
173
174 % 1.28 Monthly Profit (Karnataka vs Tamil Nadu)
175 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
176 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
177
178 % 1.29 Monthly Profit (Karnataka vs Tamil Nadu)
179 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
180 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
181
182 % 1.30 Monthly Profit (Karnataka vs Tamil Nadu)
183 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
184 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
185
186 % 1.31 Monthly Profit (Karnataka vs Tamil Nadu)
187 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
188 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
189
190 % 1.32 Monthly Profit (Karnataka vs Tamil Nadu)
191 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
192 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
193
194 % 1.33 Monthly Profit (Karnataka vs Tamil Nadu)
195 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
196 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
197
198 % 1.34 Monthly Profit (Karnataka vs Tamil Nadu)
199 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
200 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
201
202 % 1.35 Monthly Profit (Karnataka vs Tamil Nadu)
203 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
204 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
205
206 % 1.36 Monthly Profit (Karnataka vs Tamil Nadu)
207 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
208 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
209
210 % 1.37 Monthly Profit (Karnataka vs Tamil Nadu)
211 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
212 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
213
214 % 1.38 Monthly Profit (Karnataka vs Tamil Nadu)
215 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
216 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
217
218 % 1.39 Monthly Profit (Karnataka vs Tamil Nadu)
219 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
220 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
221
222 % 1.40 Monthly Profit (Karnataka vs Tamil Nadu)
223 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
224 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
225
226 % 1.41 Monthly Profit (Karnataka vs Tamil Nadu)
227 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
228 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
229
230 % 1.42 Monthly Profit (Karnataka vs Tamil Nadu)
231 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
232 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
233
234 % 1.43 Monthly Profit (Karnataka vs Tamil Nadu)
235 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
236 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
237
238 % 1.44 Monthly Profit (Karnataka vs Tamil Nadu)
239 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
240 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
241
242 % 1.45 Monthly Profit (Karnataka vs Tamil Nadu)
243 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
244 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
245
246 % 1.46 Monthly Profit (Karnataka vs Tamil Nadu)
247 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
248 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
249
250 % 1.47 Monthly Profit (Karnataka vs Tamil Nadu)
251 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
252 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
253
254 % 1.48 Monthly Profit (Karnataka vs Tamil Nadu)
255 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
256 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
257
258 % 1.49 Monthly Profit (Karnataka vs Tamil Nadu)
259 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
260 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
261
262 % 1.50 Monthly Profit (Karnataka vs Tamil Nadu)
263 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
264 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
265
266 % 1.51 Monthly Profit (Karnataka vs Tamil Nadu)
267 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
268 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
269
270 % 1.52 Monthly Profit (Karnataka vs Tamil Nadu)
271 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
272 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
273
274 % 1.53 Monthly Profit (Karnataka vs Tamil Nadu)
275 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
276 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
277
278 % 1.54 Monthly Profit (Karnataka vs Tamil Nadu)
279 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
280 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
281
282 % 1.55 Monthly Profit (Karnataka vs Tamil Nadu)
283 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
284 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
285
286 % 1.56 Monthly Profit (Karnataka vs Tamil Nadu)
287 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
288 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
289
290 % 1.57 Monthly Profit (Karnataka vs Tamil Nadu)
291 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
292 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
293
294 % 1.58 Monthly Profit (Karnataka vs Tamil Nadu)
295 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
296 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
297
298 % 1.59 Monthly Profit (Karnataka vs Tamil Nadu)
299 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
300 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
301
302 % 1.60 Monthly Profit (Karnataka vs Tamil Nadu)
303 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
304 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
305
306 % 1.61 Monthly Profit (Karnataka vs Tamil Nadu)
307 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
308 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
309
310 % 1.62 Monthly Profit (Karnataka vs Tamil Nadu)
311 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
312 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
313
314 % 1.63 Monthly Profit (Karnataka vs Tamil Nadu)
315 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
316 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
317
318 % 1.64 Monthly Profit (Karnataka vs Tamil Nadu)
319 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
320 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
321
322 % 1.65 Monthly Profit (Karnataka vs Tamil Nadu)
323 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
324 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
325
326 % 1.66 Monthly Profit (Karnataka vs Tamil Nadu)
327 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
328 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
329
330 % 1.67 Monthly Profit (Karnataka vs Tamil Nadu)
331 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
332 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
333
334 % 1.68 Monthly Profit (Karnataka vs Tamil Nadu)
335 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
336 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
337
338 % 1.69 Monthly Profit (Karnataka vs Tamil Nadu)
339 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
340 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
341
342 % 1.70 Monthly Profit (Karnataka vs Tamil Nadu)
343 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
344 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
345
346 % 1.71 Monthly Profit (Karnataka vs Tamil Nadu)
347 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
348 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
349
350 % 1.72 Monthly Profit (Karnataka vs Tamil Nadu)
351 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
352 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
353
354 % 1.73 Monthly Profit (Karnataka vs Tamil Nadu)
355 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
356 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
357
358 % 1.74 Monthly Profit (Karnataka vs Tamil Nadu)
359 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
360 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
361
362 % 1.75 Monthly Profit (Karnataka vs Tamil Nadu)
363 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
364 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
365
366 % 1.76 Monthly Profit (Karnataka vs Tamil Nadu)
367 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
368 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
369
370 % 1.77 Monthly Profit (Karnataka vs Tamil Nadu)
371 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
372 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
373
374 % 1.78 Monthly Profit (Karnataka vs Tamil Nadu)
375 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
376 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
377
378 % 1.79 Monthly Profit (Karnataka vs Tamil Nadu)
379 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
380 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
381
382 % 1.80 Monthly Profit (Karnataka vs Tamil Nadu)
383 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
384 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
385
386 % 1.81 Monthly Profit (Karnataka vs Tamil Nadu)
387 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
388 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
389
390 % 1.82 Monthly Profit (Karnataka vs Tamil Nadu)
391 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
392 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
393
394 % 1.83 Monthly Profit (Karnataka vs Tamil Nadu)
395 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
396 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
397
398 % 1.84 Monthly Profit (Karnataka vs Tamil Nadu)
399 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
400 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
401
402 % 1.85 Monthly Profit (Karnataka vs Tamil Nadu)
403 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
404 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
405
406 % 1.86 Monthly Profit (Karnataka vs Tamil Nadu)
407 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
408 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
409
410 % 1.87 Monthly Profit (Karnataka vs Tamil Nadu)
411 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
412 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
413
414 % 1.88 Monthly Profit (Karnataka vs Tamil Nadu)
415 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
416 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
417
418 % 1.89 Monthly Profit (Karnataka vs Tamil Nadu)
419 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
420 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
421
422 % 1.90 Monthly Profit (Karnataka vs Tamil Nadu)
423 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
424 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
425
426 % 1.91 Monthly Profit (Karnataka vs Tamil Nadu)
427 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
428 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
429
430 % 1.92 Monthly Profit (Karnataka vs Tamil Nadu)
431 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
432 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
433
434 % 1.93 Monthly Profit (Karnataka vs Tamil Nadu)
435 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
436 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
437
438 % 1.94 Monthly Profit (Karnataka vs Tamil Nadu)
439 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
440 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
441
442 % 1.95 Monthly Profit (Karnataka vs Tamil Nadu)
443 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
444 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
445
446 % 1.96 Monthly Profit (Karnataka vs Tamil Nadu)
447 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
448 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
449
450 % 1.97 Monthly Profit (Karnataka vs Tamil Nadu)
451 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
452 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
453
454 % 1.98 Monthly Profit (Karnataka vs Tamil Nadu)
455 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
456 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
457
458 % 1.99 Monthly Profit (Karnataka vs Tamil Nadu)
459 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
460 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
461
462 % 2.00 Monthly Profit (Karnataka vs Tamil Nadu)
463 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
464 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
465
466 % 2.01 Monthly Profit (Karnataka vs Tamil Nadu)
467 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
468 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
469
470 % 2.02 Monthly Profit (Karnataka vs Tamil Nadu)
471 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
472 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
473
474 % 2.03 Monthly Profit (Karnataka vs Tamil Nadu)
475 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
476 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
477
478 % 2.04 Monthly Profit (Karnataka vs Tamil Nadu)
479 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
480 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
481
482 % 2.05 Monthly Profit (Karnataka vs Tamil Nadu)
483 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
484 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
485
486 % 2.06 Monthly Profit (Karnataka vs Tamil Nadu)
487 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
488 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
489
490 % 2.07 Monthly Profit (Karnataka vs Tamil Nadu)
491 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
492 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
493
494 % 2.08 Monthly Profit (Karnataka vs Tamil Nadu)
495 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
496 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
497
498 % 2.09 Monthly Profit (Karnataka vs Tamil Nadu)
499 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
500 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
501
502 % 2.10 Monthly Profit (Karnataka vs Tamil Nadu)
503 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
504 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
505
506 % 2.11 Monthly Profit (Karnataka vs Tamil Nadu)
507 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
508 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
509
510 % 2.12 Monthly Profit (Karnataka vs Tamil Nadu)
511 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
512 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
513
514 % 2.13 Monthly Profit (Karnataka vs Tamil Nadu)
515 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
516 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
517
518 % 2.14 Monthly Profit (Karnataka vs Tamil Nadu)
519 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
520 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
521
522 % 2.15 Monthly Profit (Karnataka vs Tamil Nadu)
523 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
524 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
525
526 % 2.16 Monthly Profit (Karnataka vs Tamil Nadu)
527 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
528 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
529
530 % 2.17 Monthly Profit (Karnataka vs Tamil Nadu)
531 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
532 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
533
534 % 2.18 Monthly Profit (Karnataka vs Tamil Nadu)
535 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
536 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
537
538 % 2.19 Monthly Profit (Karnataka vs Tamil Nadu)
539 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
540 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
541
542 % 2.20 Monthly Profit (Karnataka vs Tamil Nadu)
543 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
544 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
545
546 % 2.21 Monthly Profit (Karnataka vs Tamil Nadu)
547 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
548 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
549
550 % 2.22 Monthly Profit (Karnataka vs Tamil Nadu)
551 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
552 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
553
554 % 2.23 Monthly Profit (Karnataka vs Tamil Nadu)
555 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
556 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
557
558 % 2.24 Monthly Profit (Karnataka vs Tamil Nadu)
559 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
560 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
561
562 % 2.25 Monthly Profit (Karnataka vs Tamil Nadu)
563 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
564 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
565
566 % 2.26 Monthly Profit (Karnataka vs Tamil Nadu)
567 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
568 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
569
570 % 2.27 Monthly Profit (Karnataka vs Tamil Nadu)
571 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
572 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
573
574 % 2.28 Monthly Profit (Karnataka vs Tamil Nadu)
575 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
576 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
577
578 % 2.29 Monthly Profit (Karnataka vs Tamil Nadu)
579 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
580 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
581
582 % 2.30 Monthly Profit (Karnataka vs Tamil Nadu)
583 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
584 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
585
586 % 2.31 Monthly Profit (Karnataka vs Tamil Nadu)
587 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
588 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
589
590 % 2.32 Monthly Profit (Karnataka vs Tamil Nadu)
591 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
592 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
593
594 % 2.33 Monthly Profit (Karnataka vs Tamil Nadu)
595 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
596 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
597
598 % 2.34 Monthly Profit (Karnataka vs Tamil Nadu)
599 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
600 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
601
602 % 2.35 Monthly Profit (Karnataka vs Tamil Nadu)
603 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
604 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
605
606 % 2.36 Monthly Profit (Karnataka vs Tamil Nadu)
607 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
608 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
609
610 % 2.37 Monthly Profit (Karnataka vs Tamil Nadu)
611 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
612 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
613
614 % 2.38 Monthly Profit (Karnataka vs Tamil Nadu)
615 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
616 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
617
618 % 2.39 Monthly Profit (Karnataka vs Tamil Nadu)
619 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
620 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
621
622 % 2.40 Monthly Profit (Karnataka vs Tamil Nadu)
623 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
624 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
625
626 % 2.41 Monthly Profit (Karnataka vs Tamil Nadu)
627 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
628 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
629
630 % 2.42 Monthly Profit (Karnataka vs Tamil Nadu)
631 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
632 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
633
634 % 2.43 Monthly Profit (Karnataka vs Tamil Nadu)
635 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
636 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
637
638 % 2.44 Monthly Profit (Karnataka vs Tamil Nadu)
639 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
640 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
641
642 % 2.45 Monthly Profit (Karnataka vs Tamil Nadu)
643 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
644 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
645
646 % 2.46 Monthly Profit (Karnataka vs Tamil Nadu)
647 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
648 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
649
650 % 2.47 Monthly Profit (Karnataka vs Tamil Nadu)
651 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
652 plot(months, [agri_USD_K, agri_USD_T], 'hold on');
653
654 % 2.48 Monthly Profit (Karnataka
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```

256 lb = zeros(nv,1);
257 ub = inf(nv,1);
258 for m = 1:nn
259     ub(off_S_K,m) = res.K.Capacity;
260     ub(off_S_T,m) = res.T.Capacity;
261     ub(off_K_ag,m) = res.K.Demandgr(m);
262     ub(off_T_ag,m) = res.T.Demandgr(m);
263     ub(off_K_in,m) = res.K.DemandInd(m);
264     ub(off_T_in,m) = res.T.DemandInd(m);
265     lb(off_R,m) = env_flow;
266     lb(off_K_hh,m) = hh_min_K(m);
267     lb(off_T_hh,m) = hh_min_T(m);
268 end
269 end
270 function res = process_results(x, off, nn)
271     idx = 1:nn;
272     res_K_ag = x(off_K_ag + idx);
273     res_K_hh = x(off_K_hh + idx);
274     res_K_in = x(off_K_in + idx);
275     res_T_ag = x(off_T_ag + idx);
276     res_T_hh = x(off_T_hh + idx);
277     res_T_in = x(off_T_in + idx);
278     res_R = x(off_R + idx);
279     res_S_K = x(off_S_K + idx);
280     res_S_T = x(off_S_T + idx);
281     res_sK = x(off_sK + idx);
282     res_sT = x(off_sT + idx);
283     res_sKl = x(off_sKl + idx);
284     res_sTl = x(off_sTl + idx);
285 end
286
287

```

CODE FILE LINK: - [CE718 project code.m](#)

DATASET FILE LINK: - [Datasets](#)