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clc
prompt1 = 'Enter the land area for plantation in acres';
land = input(prompt1);
life = input('Enter the life time of project');
cost_sticks = 4;
prompt2 = 'Enter number of sticks per acre';
cost_planting = input(prompt2)*land*cost_sticks;
cost_cap_landprep = 12000*land^0.8; %40 man days, scaled
cost_annual_landprep = 4000*land^0.8; %10 man days, scaled
biofert = 10; %cost per litre
cost_annual_biofert = 5000*biofert*land; %5000 lit per acre
elecprice = 7;
cost_irrigation = 120*5*elecprice*8*land; % 8 months for irrigation, 4mm/day and 5kwh/mm/acre
cost_cap_drainage = 10000*land^0.8;
cost_annual_drainage = 2000*land^0.8;
cost_annual_harvest = 30000*land^0.7; %fuel cost 30000 per acre
cost_annual_labor = 40000*land^0.6; %labor cost for harvest, economy of scale
cost_annual_deweeding = 6800*land^0.85; %bi-annual, 6 man days/acre, fuel=2000/acre, scaled
cost_lime = 6000*land^0.9; %every 3 years for pH balance, economy of scale
cost_cap_land = 30000*land; %25k/acre and brokerage 5k/acre
cost_annual_land = 25000*land^0.8;
%monthly climate data
monthlyRain = [11,18,25,46,131,194,238,226,186,81,17,8]*25.4*land; %inches to mm (historical)
monthlySun = [0.95,0.97,0.90,0.85,0.80,0.82,0.78,0.80,0.83,0.90,0.96,0.94]; %sunshine factor
water_req = 1440*land;
totalYield = 0;
totalCAPEX = 0;
totalOPEX = 0;
OC = 0.2;
pH = 6.0;
plantLife = 8; %8 years for Napier plant
maxYield = 800;
for year = 1:life;
    %Capital costs
    if year == 1
        totalCAPEX = totalCAPEX + cost_cap_land + cost_planting + cost_cap_landprep +
cost_cap_drainage;
    elseif mod(year-1,plantLife) == 0
        totalCAPEX = totalCAPEX + cost_planting + cost_cap_landprep;
    else
        totalCAPEX = totalCAPEX + cost_annual_land + cost_annual_landprep;
    end
    %Climate and Rainfall variations
    rainActual = sum(monthlyRain.*(1+0.2*randn(1,12))); %stochastic rainfall variations

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irriFrac = max(0,(water_req-rainActual)/water_req);
cost_annual_irri = cost_irrigation*irriFrac;
%Soil Updating and Microbial activity
OC = min(2, OC + 0.3*(OC<2) + 0.1*randn*0.1); %stochastic variations of organic carbon
pH = pH + 0.1*(year<=5) - 0.03*(rainActual/1200>1) + randn*0.05;
factor_rain = min(rainActual/1440,1);
factor_sun = mean(monthlySun);
factor_micro = (OC/2)*(1 - abs(pH-6.3)/0.3)*(1+0.1*randn); %stochastic variations of microorganisms
%Annual Yield calculation
baseYield = maxYield*min(year/5,1); %linear growth of yield till 5th year
yield_acre = baseYield*factor_rain*factor_sun*max(factor_micro,0.5);
totalYield = totalYield + yield_acre*land;
%Operational Cost Calculations
cost_annual_pack = 0.3*1000*totalYield^0.85;
totalOPEX = totalOPEX + cost_annual_irri + cost_annual_biofert + cost_annual_drainage +
cost_annual_harvest + cost_annual_labor + cost_annual_deweeding + cost_annual_pack;
if mod(year,3) == 0
    totalOPEX = totalOPEX + cost_lime;
end
end
output(1,1) = (totalCAPEX+totalOPEX)/totalYield;
output(2,1) = totalCAPEX/totalYield;
output(3,1) = totalOPEX/totalYield;
output(4,1) = totalYield;
fprintf('Napier Plantation Area %d. \n', land);
fprintf('Levelized Cost per ton %d. \n', output(1,1));
fprintf('Capital Cost per ton %d. \n', output(2,1));
fprintf('Operational Cost per lit %d. \n', output(3,1));
fprintf('Total Yield over Project life %d. \n', output(4,1));

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