Initialisation code

Choose a and b as per choice

```
a = 1;
b = 1;
length = 10;
```

In[ ]:=
```
getM[n_, gm_, a_, b_] := Module[{M, i, j}, M = Table[0, {n}, {n}];
  For[i = 1, i ≤ n, i++,
       {

    If[i == 1 , For[j = 2, j ≤ b + 1, j++, M[[i, j]] = 1 - gm], Unevaluated[Sequence[]]];

    If[i == n , For[j = n - a, j ≤ n - 1, j++, M[[i, j]] = gm], Unevaluated[Sequence[]]];
       If[2 ≤ i ≤ n - b, M[[i, i + b]] = 1 - gm, Unevaluated[Sequence[]]];
       If[a + 1 ≤ i ≤ n, M[[i, i - a]] = gm, Unevaluated[Sequence[]]];
     }
    ];
  {M[[1, 1]] = 1 - gm, M[[n, n]] = gm};
  M]
```

In[ ]:=
```
getM[length + 1, γ, a, b] // Transpose // MatrixForm
```

Out[ ]//MatrixForm=

$$\begin{pmatrix} 1-\gamma & \gamma & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1-\gamma & 0 & \gamma & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1-\gamma & 0 & \gamma & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1-\gamma & 0 & \gamma & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1-\gamma & 0 & \gamma & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1-\gamma & 0 & \gamma & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1-\gamma & 0 & \gamma & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1-\gamma & 0 & \gamma & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1-\gamma & 0 & \gamma & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1-\gamma & 0 & \gamma \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1-\gamma & \gamma \end{pmatrix}$$

In[ ]:=
```
𝒫[γ_] := DiscreteMarkovProcess[ReplacePart[ConstantArray[0, length + 1], 2 → 1],
    getM[length + 1, γ, a, b] // Transpose];
𝒟 =.;
𝒟[γ_] := StationaryDistribution[𝒫[γ]]
```

In[ ]:=
```
K = length;
p = 0.4;
p1 = 0;
p2 = 0.8;
simply = Table[Simplify[PDF[𝒟[γ], i + 1]], {i, 0, length, 1}];
th = .;
q[i_, γ_] := γ p + (1 - γ) pi;
sols = Table[qs = Table[If[i ≤ th, q[1, γ], q[2, γ]], {i, 0, K, 1}] /. th → j;
   temp = simply.qs;
   {j , γ /. Solve[temp == 0.5 && γ > 0 && γ < 1, γ] // Quiet} // Flatten,
   {j , Range[0, K]}];
```

In[ ]:=
```
toplone = Select[sols, Length[#] == 3 &];
```

```
{covercol, cashcol} = ColorData[97, "ColorList"][[{1, 2}]];
col[x_] := Blend[{covercol, cashcol}, x]
gammastopl = Table[i, {i, 0, 1, 0.1}];
coltopl = Table[col[1 - gammastopl[[i]]], {i, Length[gammastopl]}];
```

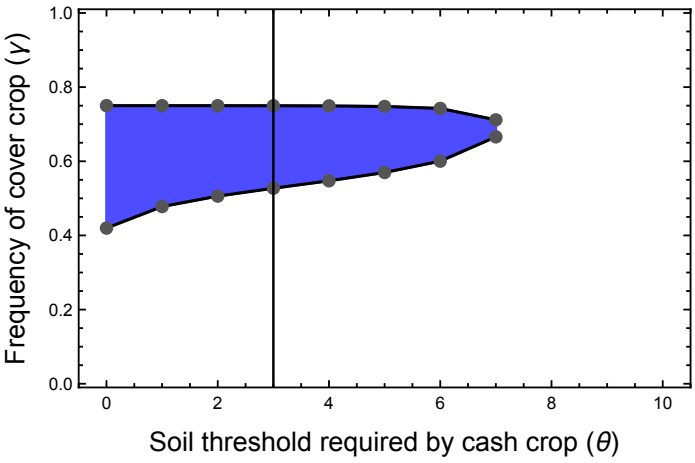
Out[ ]= { , }

In[ ]:=
```
q[i_, γ_] := γ p + (1 - γ) pi;
Pwin[γ_, th_] := q[1, γ] × ∑_{i=0}^{th} PDF[𝒟[γ], i + 1] + q[2, γ] × ∑_{i=th+1}^{K} PDF[𝒟[γ], i + 1];
extremes = {{0, Pwin[0, 1]}, {1, Pwin[1, 1]}};
explorethresh = Range[0, 5, 1];
pwinlist = Table[{γ, Pwin[γ, th]}, {th, explorethresh}, {γ, 0, 1, 0.01}];
```

Plotting

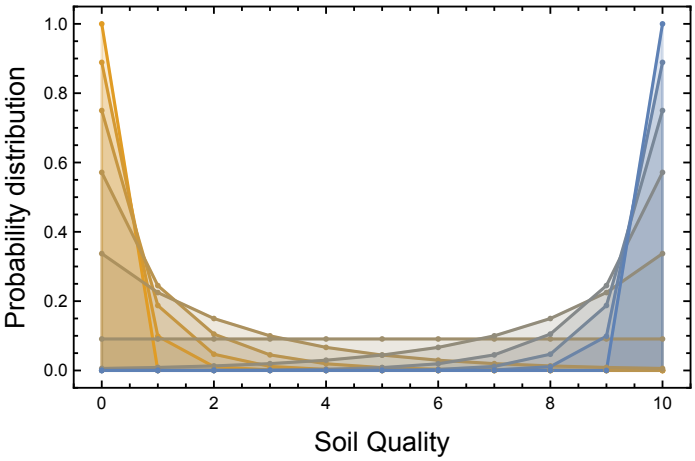
In[ ]:=
```
ListPlot[{toplone[[All, {1, 2}]], toplone[[All, {1, 3}]]},
 PlotStyle → {Black}, PlotRange → {{-0.5, K + 0.5}, {-0.01, 1.01}},
 Frame → True, FrameStyle → Directive[Black, Thickness[0.003]],
 FrameLabel → {Style["Soil threshold required by cash crop (θ)", 14, Black],
   Style["Frequency of cover crop (γ)", 14, Black]}, Joined → True,
 Mesh → All, Filling → {1 → {2}}, FillingStyle → Lighter[Blue, 0.3],
 MeshStyle → {PointSize[Large], Darker[Gray]}, GridLines → {{3}, None},
 GridLinesStyle → Directive[{Black, Thickness[0.004]}],
 Method → {"GridLinesInFront" → True}]
```

Out[ ]=



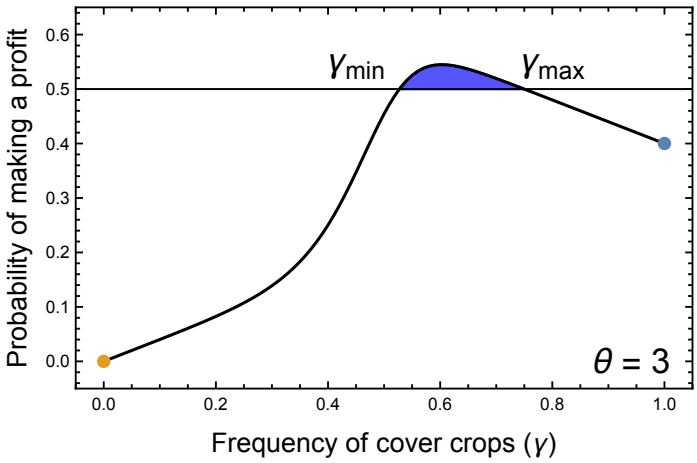
In[ ]:=
```
ListPlot[Table[{k - 1, PDF[𝒟[γ], k]}, {γ, gammastopl}, {k, 1, length + 1}],
 PlotStyle → coltopl, (*PlotLegends→gammastopl,*) Joined → True,
 Mesh → All, PlotRange → {{-0.5, length + 0.5}, {-0.05, 1.05}},
 Frame → True, FrameStyle → Directive[Black, Thickness[0.003]],
 FrameLabel → {Style["Soil Quality", 14, Black],
   Style["Probability distribution", 14, Black]}, Filling → Axis]
```

Out[ ]=



In[ ]:=
```
ListPlot[pwinlist[[4]], Joined → True, Frame → True,
 FrameStyle → Directive[Black, Thickness[0.003]],
 FrameLabel → {Style["Frequency of cover crops (γ)", 14, Black],
   Style["Probability of making a profit", 14, Black]}, PlotStyle → Black,
 PlotRange → {{-0.05, 1.05}, {-0.05, 0.65}}, GridLines → {None, {0.5}},
 GridLinesStyle → Directive[{Black, Thickness[0.0032]}],
 Filling → {1 → {0.5, {None, Lighter[Blue]}}},
 Epilog → {PointSize[Large], cashcol, Point[extremes[[1]]],
   PointSize[Large], covercol, Point[extremes[[2]]], Black,
   Inset[Style["γmin", 18], {0.45, 0.55}], Inset[Style["γmax", 18], {0.8, 0.55}],
   Inset[Style["θ = " <> ToString[explorethresh[[4]]], 18], {0.94, 0}]},
 Method → {"GridLinesInFront" → True}]
```

Out[ ]=




```
Manipulate[ListPlot[pwinlist[[j]], Joined → True,
  Frame → True, FrameStyle → Directive[Black, Thickness[0.003]],
  FrameLabel → {Style["Frequency of cover crops (γ)", 14, Black],
    Style["Probability of making a profit", 14, Black]}, PlotStyle → Black,
  PlotRange → {{-0.05, 1.05}, {-0.05, 0.65}}, GridLines → {None, {0.5}},
  GridLinesStyle → Black, Filling → {1 → {0.5, {None, Lighter[Blue]}}},
  Epilog → {PointSize[Large], cashcol, Point[extremes[[1]]],
    PointSize[Large], covercol, Point[extremes[[2]]], Black,
    Inset[Style["γmin", 18], {0.45, 0.55}], Inset[Style["γmax", 18], {0.8, 0.55}],
    Inset[Style["θ = " <> ToString[explorethresh[[j]]], 18], {0.94, 0}]},
 {j, Range[Length[explorethresh]]}]
```