

Table S1. EBF IN Fuzzified Values Rules Optimization.

No.	RULE	Rainfall Fuzzy Value	EMC Parameters	Percentile Occurrence Frequency
1	(FTOC = 19) => (EBF_IN = 11)	EBF_IN = 11	FTOC = 19	20
2	(FTCu = 13) & (FTPb = 13) => (EBF_IN = 12);	EBF_IN = 12	FTCu = 13, FTPb = 13	30
3	(FTSS = 16) & (FTN = 17) => (EBF_IN = 12)	EBF_IN = 12	FTSS = 16, FTN = 17	30
4	(FTurbidity = 24) => (EBF_IN = 12)	EBF_IN = 12	FTurbidity = 24	30
5	(FTSS = 17) & (FCd = 16) => (EBF_IN = 13)	EBF_IN = 13	FTSS = 17, FCd = 16	40
6	(FTurbidity = 21) => (EBF_IN = 13)	EBF_IN = 13	FTurbidity = 21	40
7	(FCr = 3) => (EBF_IN = 13)	EBF_IN = 13	FCr = 3	40
8	(FPb = 13) => (EBF_IN = 13)	EBF_IN = 13	FPb = 13	40
9	(FConductivity = 13) & (FCOD _{Cr} = 13) => (EBF_IN = 14)	EBF_IN = 14	FConductivity = 13, FCOD _{Cr} = 13	50
10	(FTSS = 17) & (FTN = 15) => (EBF_IN = 14)	EBF_IN = 14	FTSS = 17, FTN = 15	50
11	(FNO ₂ = 11) & (FCu = 14) => (EBF_IN = 14)	EBF_IN = 14	FNO ₂ = 11, FCu = 14	50
12	(FNO ₄ = 0) & (FTFe = 12) => (EBF_IN = 14)	EBF_IN = 14	FNO ₄ = 0, FTFe = 12	50
13	(FNO ₂ = 15) => (EBF_IN = 14)	EBF_IN = 14	FNO ₂ = 15	50
14	(FTP = 15) & (FO&G = 17) => (EBF_IN = 14)	EBF_IN = 14	FTP = 15, FO&G = 17	50
15	(FNI = 11) & (FTCu = 10) => (EBF_IN = 15)	EBF_IN = 15	FNI = 11, FTCu = 10	60
16	(FBOD ₅ = 11) & (FTP = 11) => (EBF_IN = 15)	EBF_IN = 15	FBOD ₅ = 11, FTP = 11	60
17	(FPO ₄ -P = 15) & (FTFe = 12) => (EBF_IN = 15)	EBF_IN = 15	FPO ₄ -P = 15, FTFe = 12	60
18	(FNO ₂ = 17) => (EBF_IN = 15)	EBF_IN = 15	FNO ₂ = 17	60
19	(FTKN = 10) & (FTZn = 16) => (EBF_IN = 15)	EBF_IN = 15	FTKN = 10, FTZn = 16	60
20	(FTFe = 15) & (FTCd = 10) => (EBF_IN = 16)	EBF_IN = 16	FTFe = 15, FTCd = 10	70
21	(FpH = 14) & (FTPb = 14) => (EBF_IN = 16)	EBF_IN = 16	FpH = 14, FTPb = 14	70
22	(FTFe = 3) => (EBF_IN = 17)	EBF_IN = 17	FTFe = 3	80
23	(FCOD _{Mn} = 11) & (FPO ₄ -P = 0) => (EBF_IN = 18)	EBF_IN = 18	FCOD _{Mn} = 11, FPO ₄ -P = 0	90
24	(FTurbidity = 16) & (FTCr = 16) => (EBF_IN = 18)	EBF_IN = 18	FTurbidity = 16, FTCr = 16	90
25	(FBOD ₅ = 5) => (EBF_IN = 26)	EBF_IN = 26	FBOD ₅ = 5	98
26				
Approximation Rule	(FTFe = 0) => (EBF_IN = 1) OR (EBF_IN = 13)	EBF_IN = 1) OR (EBF_IN = 13)	FTFe = 0	1 OR 40

Table S2. GEF1 IN Fuzzified Values Rules Optimization.

No.	RULE	Rainfall Fuzzy Value	EMC Parameters	Percentile Occurrence Frequency
1	(FpH = 11) => (GEF1_IN = 11)	GEF1_IN = 11	FpH = 11	20
2	(FTurbidity = 1) => (GEF1_IN = 12)	GEF1_IN = 12	FTurbidity = 1	30
3	(FConductivity = 21) => (GEF1_IN = 13)	GEF1_IN = 13	FConductivity = 21	40
4	(FTOC = 2) => (GEF1_IN = 14)	GEF1_IN = 14	FTOC = 2	50
5	(FpH = 21) => (GEF1_IN = 14)	GEF1_IN = 14	FpH = 21	50
6	(FTSS = 13) => (GEF1_IN = 15)	GEF1_IN = 15	FTSS = 13	60

7	(FTSS = 8) => (GEF1_IN = 16)	GEF1_IN = 16	FTSS = 8	70
8	(FpH = 9) => (GEF1_IN = 17)	Rainfall_GEF1_IN = 17	FpH = 9	80
9	(FpH = 6) => (GEF1_IN = 17)	GEF1_IN = 17	FpH = 6	80
10	(FpH = 8) => (GEF1_IN = 18)	GEF1_IN = 18	FpH = 8	90
11				
Approximation Rule	(FConductivity = 0) => (GEF1_IN = 16) OR (GEF1_IN = 18)	GEF1_IN = 16 OR GEF1_IN = 18	FConductivity = 0	70 OR 90

Table S3. GEF2 IN Fuzzified Values Rules Optimization.

No.	RULE	Rainfall Fuzzy Value	EMC Parameters	Percentile Occurrence Frequency
1	(FO&G = 0) & (FTNi = 0) => (GEF2_IN = 1)	GEF2_IN = 1	FO&G = 0, FTKNi = 0	1
2	(FConductivity = 25) => (GEF2_IN = 11)	GEF2_IN = 11	FConductivity = 25	20
3	(FFe = 3) => (GEF2_IN = 11)	GEF2_IN = 11	FFe = 3	20
4	(FpH = 17) => (GEF2_IN = 12)	GEF2_IN = 12	FpH = 17	30
5	(FTSS = 17) => (GEF2_IN = 12)	GEF2_IN = 12	FTSS = 17	30
6	(FCr = 10) => (GEF2_IN = 13)	GEF2_IN = 13	FCr = 10	40
7	(FPb = 16) => (GEF2_IN = 13)	GEF2_IN = 13	FPb = 16	40
8	(FTP = 12) & (FCr = 13) => (GEF2_IN = 13)	GEF2_IN = 13	FTP = 12, FCr = 13	40
9	(FCOD _{Cr} = 14) & (FTKN = 0) & (FFe = 11) => (GEF2_IN = 13)	GEF2_IN = 13	FCOD _{Cr} = 14, FTKN = 0, FFe = 11	40
10	(FTSS = 3) => (GEF2_IN = 14)	GEF2_IN = 14	FTSS = 3	50
11	(FTSS = 18) => (GEF2_IN = 14)	GEF2_IN = 14	FTSS = 18	50
12	(FConductivity = 26) => (GEF2_IN = 14)	GEF2_IN = 14	FConductivity = 26	50
13	(FO&G = 11) & (FTNi = 12) => (GEF2_IN = 15)	GEF2_IN = 15	FO&G = 11, FTKNi = 12	60
14	(FTKN = 0) & (FZn = 10) & (FTAs = 0) => (GEF2_IN = 16)	GEF2_IN = 16	FTKN = 0, FZn = 10, FTAs = 0	70
15	(FTFe = 13) & (FTZn = 12) => (GEF2_IN = 16)	GEF2_IN = 16	FTFe = 13, FTZn = 12	70
16	(FpH = 10) & (FTFe = 10) => (GEF2_IN = 17)	GEF2_IN = 17	FpH = 10, FTFe = 10	80
17	(FTOC = 0) & (FTZn = 16) => (GEF2_IN = 17)	GEF2_IN = 17	FTOC = 0, FTZn = 16	80
18	(FBOD ₅ = 2) => (GEF2_IN = 17)	GEF2_IN = 17	FBOD ₅ = 2	80
19	(FTOC = 9) => (GEF2_IN = 18)	GEF2_IN = 18	FTOC = 9	90

Table S4. SCW1 IN Fuzzified Values Rules Optimization.

No.	RULE	Rainfall Fuzzy Value	EMC Parameters	Percentile Occurrence Frequency
1	(FpH = 0) => (SCW1_IN = 1)	SCW1_IN = 1	FpH = 0	1
2	(FCOD _{Cr} = 12) => (SCW1_IN = 12)	SCW1_IN = 12	FCOD _{Cr} = 12	30
3	(FConductivity = 15) => (SCW1_IN = 12)	SCW1_IN = 12	FConductivity = 15	30
4	(FCr = 17) => (SCW1_IN = 12)	SCW1_IN = 12	FCr = 17	30
5	(FTZn = 13) => (SCW1_IN = 12)	SCW1_IN = 12	FTZn = 13	30
6	(FCu = 12) & (FZn = 13) => (SCW1_IN = 13)	SCW1_IN = 13	FCu = 12, FZn = 13	40
7	(FTN = 10) & (FCr = 16) => (SCW1_IN = 14)	SCW1_IN = 14	FTN = 10, FCr = 16	50

8	(FBOD ₅ = 0) & (FCr = 14) => (SCW1_IN = 14)	SCW1_IN = 14	FBOD ₅ = 0, FCr = 14	50
9	(FTN = 7) => (SCW1_IN = 14)	SCW1_IN = 14	FTN = 7	50
10	(FTN = 16) => (SCW1_IN = 14)	SCW1_IN = 14	FTN = 16	50
11	(FTPb = 5) => (SCW1_IN = 14)	SCW1_IN = 14	FTPb = 5	50
12	(FNO ₂ = 5) => (SCW1_IN = 15)	SCW1_IN = 15	FNO ₂ = 5	60
13	(FConductivity = 13) & (FCOD _{Cr} = 14) => (SCW1_IN = 15)	SCW1_IN = 15	FConductivity = 13, FCOD _{Cr} = 14	60
14	(FpH = 11) & (FTSS = 11) & (FTP = 10) => (SCW1_IN = 16)	SCW1_IN = 16	FpH = 11, FTSS = 11, FTP = 10	70
15	(FTP = 12) & (FTZn = 15) => (SCW1_IN = 16)	SCW1_IN = 16	FTP = 12, FTZn = 15	70
16	(FPb = 12) & (FTCr = 11) => (SCW1_IN = 17)	SCW1_IN = 17	FPb = 12, FTCr = 11	80
17	(FCOD _{Mn} = 1) & (FPO ₄ -P = 0) => (SCW1_IN = 18)	SCW1_IN = 18	FCOD _{Mn} = 1, FPO ₄ -P = 0	90

Table S5. SCW2 IN Fuzzified Values Rules Optimization.

No.	RULE	Rainfall Fuzzy Value	EMC Parameters	Percentile Occurrence Frequency
1	(FTNi = 0) => (SCW2_IN = 1)	SCW2_IN = 1	FTNi = 0	1
2	(FBOD ₅ = 20) => (SCW2_IN = 1)	SCW2_IN = 1	FBOD ₅ = 20	1
3	(FTOC = 11) => (SCW2_IN = 11)	SCW2_IN = 11	FTOC = 11	20
4	(FpH = 12) & (FTZn = 10) => (SCW2_IN = 12)	SCW2_IN = 12	FpH = 12, FTZn = 10	30
5	(FpH = 21) => (SCW2_IN = 12)	SCW2_IN = 12	FpH = 21	30
6	(FTOC = 6) => (SCW2_IN = 12)	SCW2_IN = 12	FTOC = 6	30
7	(FO&G = 13) => (SCW2_IN = 13)	SCW2_IN = 13	FO&G = 13	40
8	(FCr = 12) => (SCW2_IN = 13)	SCW2_IN = 13	FCr = 12	40
9	(FCOD _{Cr} = 16) => (SCW2_IN = 14)	SCW2_IN = 14	FCOD _{Cr} = 16	50
10	(FTSS = 3) => (SCW2_IN = 14)	SCW2_IN = 14	FTSS = 3	50
11	(FTSS = 13) & (FTN = 12) => (SCW2_IN = 14)	SCW2_IN = 14	FTSS = 13, FTN = 12	50
12	(FTSS = 15) => (SCW2_IN = 15)	SCW2_IN = 15	FTSS = 15	60
13	(FTPb = 15) => (SCW2_IN = 15)	SCW2_IN = 15	FTPb = 15	60
14	(FBOD ₅ = 18) => (SCW2_IN = 16)	SCW2_IN = 16	FBOD ₅ = 18	70
15	(FpH = 7) => (SCW2_IN = 17)	SCW2_IN = 17	FpH = 7	80
16	(FTOC = 1) => (SCW2_IN = 18)	SCW2_IN = 18	FTOC = 1	90

Table S6. EBF OUT Fuzzified Values Rules Optimization.

No.	RULE	Rainfall Fuzzy Value	EMC Parameters	Percentile Occurrence Frequency
1	(FZn = 12) & (FTAs = 0) =>(EBF_OUT = 12)	EBF_OUT = 12	FZn=12, FTAs=0	30
2	(FpH = 19) =>(EBF_OUT = 12)	EBF_OUT = 12	FpH=19	30
3	(FpH = 16) =>(EBF_OUT = 13)	EBF_OUT = 13	FpH=16	40
4	(FBOD ₅ = 13) & (FTKN = 12) =>(EBF_OUT = 13)	EBF_OUT = 13	FBOD ₅ =13, FTKN=12	40
5	(FTSS = 14) & (FNI = 15) =>(EBF_OUT = 14)	EBF_OUT = 14	FTSS=14, FNI=15	50
6	(FNI = 13) =>(EBF_OUT = 14)	EBF_OUT = 14	FNI=13	50
7	(FTP = 15) =>(EBF_OUT = 14)	EBF_OUT = 14	FTP=15	50

8	(FTN = 11) & (FTNi = 15) =>(EBF_OUT = 14)	EBF_OUT = 14	FTN=11, FTNi=15	50
9	(FNO ₂ = 10) =>(EBF_OUT = 14)	EBF_OUT = 14	FNO ₂ =10	50
10	(FCOD _{Cr} = 14) & (FTP = 11) =>(EBF_OUT = 15)	EBF_OUT = 15	FCOD _{Cr} =14, FTP=11	60
11	(FTurbidity = 13) & (FTNi = 12) =>(EBF_OUT = 15)	EBF_OUT = 15	FTurbidity=13, FTNi=12	60
12	(FConductivity = 21) =>(EBF_OUT = 15)	(EBF_OUT = 15);	FConductivity=21	60
13	(FTurbidity = 5) =>(EBF_OUT = 15)	EBF_OUT = 15	FTurbidity=5	60
14	(FCOD _{Cr} = 10) & (FNi = 12) =>(EBF_OUT = 16)	EBF_OUT = 16	FCOD _{Cr} =10, FNi=12	70
15	(FTSS = 17) & (FTFe = 15) =>(EBF_OUT = 16)	EBF_OUT = 16	FTSS=17, FTFe=15	70
16	(FTOC = 10) =>(EBF_OUT = 17)	EBF_OUT = 17	FTOC=10	80
17	(FNi = 17) & (FTCr = 15) =>(EBF_OUT = 18)	(EBF_OUT = 18);	FNi=17, FTCr=15	90
18	(FNH ₄ = 19) =>(EBF_OUT = 18)	EBF_OUT = 18	FNH ₄ =19	90
19	(FConductivity = 6) =>(EBF_OUT = 26)	EBF_OUT = 26	FConductivity=6	98
20	(FTSS = 0) => (EBF_OUT = 1) OR (EBF_OUT = 11) OR (EBF_OUT = 12) OR (EBF_OUT = 13) OR (EBF_OUT = 14) OR (EBF_OUT = 15) OR (EBF_OUT = 17)	EBF_OUT = 1 OR EBF_OUT = 11 OR EBF_OUT = 12 OR EBF_OUT = 13 OR EBF_OUT = 14 OR EBF_OUT = 15 OR EBF_OUT = 17	FTSS=0	1 OR 20 OR 30 OR 40 OR 50 OR 60 OR 80

Table S7. GEF2 OUT Fuzzified Values Rules Optimization.

No.	RULE	Rainfall Fuzzy Value	EMC Parameters	Percentile Occurrence Frequency
1	(FTN = 9) => (GEF2_OUT = 11)	GEF2_OUT = 11	FTN = 9	20
2	(FTCr = 13) => (GEF2_OUT = 13)	GEF2_OUT = 13	FTCr = 13	30
3	(FBOD ₅ = 12) => (GEF2_OUT = 13)	GEF2_OUT = 13	FBOD ₅ = 12	30
4	(FTSS = 16) => (GEF2_OUT = 14)	GEF2_OUT = 14	FTSS = 16	40
5	(FTSS = 4) => (GEF2_OUT = 14)	GEF2_OUT = 14	FTSS = 4	40
6	(FpH = 12) => (GEF2_OUT = 15)	GEF2_OUT = 15	FpH = 12	50
7	(FTSS = 15) => (GEF2_OUT = 16)	GEF2_OUT = 16	FTSS = 15	60
8	(FPb = 10) => (GEF2_OUT = 16)	GEF2_OUT = 16	FPb = 10	60
9	(FTN = 5) => (GEF2_OUT = 17)	GEF2_OUT = 17	FTN = 5	70
10	(FConductivity = 10) & (FTKN = 0) =>(GEF2_OUT = 17)	GEF2_OUT = 17	FConductivity = 10, FTKN = 0	70
11	(FTurbidity = 17) => (GEF2_OUT = 17)	GEF2_OUT = 17	FTurbidity = 17	70
12	(FpH = 21) => (GEF2_OUT = 18)	GEF2_OUT = 18	FpH = 21	80
13	(FTurbidity = 0) => (GEF2_OUT = 1) OR (GEF2_OUT = 11) OR (GEF2_OUT = 12) OR (GEF2_OUT = 13) OR (GEF2_OUT = 14) OR (GEF2_OUT = 15)	GEF2_OUT = 1 OR GEF2_OUT = 11 OR GEF2_OUT = 12 OR GEF2_OUT = 13 OR GEF2_OUT = 14 OR GEF2_OUT = 15	FTurbidity=0	1 OR 20 OR 30 OR 40 OR 50 OR 60

Table S8. SCW1 OUT Fuzzified Values Rules Optimization.

No.	RULE	Rainfall Fuzzy Value	EMC Parameters	Percentile Occurrence Frequency
1	(FTN = 11) => (SCW1_OUT = 12)	SCW1_OUT = 12	FTN = 11	30
2	(FTCr = 12) & (TCu = 13) => (SCW1_OUT = 12)	SCW1_OUT = 12	FTCr = 12, FTCu = 13	30
3	(FTN = 13) => (SCW1_OUT = 12)	SCW1_OUT = 12	FTN = 13	30
4	(FpH = 19) => (SCW1_OUT = 13)	SCW1_OUT = 13	FpH = 19	40
5	(FConductivity = 16) => (SCW1_OUT = 13)	SCW1_OUT = 13	FConductivity = 16	40
6	(FTurbidity = 13) => (SCW1_OUT = 14)	SCW1_OUT = 14	FTurbidity = 13	50
7	(FCu = 13) => (SCW1_OUT = 14)	SCW1_OUT = 14	FCu = 13	50
8	(FTCr = 14) => (SCW1_OUT = 14)	SCW1_OUT = 14	FTCr = 14	50
9	(FCOD _{Cr} = 2) => (SCW1_OUT = 14)	SCW1_OUT = 14	FCOD _{Cr} = 2	50
10	(FTurbidity = 12) & (FTFe = 13) => (SCW1_OUT = 15)	SCW1_OUT = 15	FTurbidity = 12, FTFe = 13	60
11	(FTSS = 11) => (SCW1_OUT = 16)	SCW1_OUT = 16	FTSS = 11	70
12	(FConductivity = 11) & (FTCu = 10) => (SCW1_OUT = 16)	SCW1_OUT = 16	FConductivity = 11, FTCu = 10	70
13	(FCOD _{Cr} = 8) => (SCW1_OUT = 16)	SCW1_OUT = 16	FCOD _{Cr} = 8	70
14	(FTCr = 11) & (FTNi = 11) => (SCW1_OUT = 17)	SCW1_OUT = 17	FTCr = 11, FTNi = 11	80
15	(FConductivity = 7) => (SCW1_OUT = 18)	SCW1_OUT = 18	FConductivity = 7	90
16	(FpH = 0) => (SCW1_OUT = 1) OR (SCW1_OUT = 12)	SCW1_OUT = 1) OR SCW1_OUT = 12	FpH = 0	1 OR 30

Table S9. SCW2 OUT Fuzzified Values Rules Optimization.

No.	RULE	Rainfall Fuzzy Value	EMC Parameters	Percentile Occurrence Frequency
1	(FTKN = 11) & (FTNi = 0) => (SCW2_OUT = 1)	SCW2_OUT = 1	FTKN = 11, FTNi = 0	1
2	(FConductivity = 25) => (SCW2_OUT = 1)	SCW2_OUT = 1	FConductivity = 25	1
3	(FpH = 0) & (FTurbidity = 8) => (SCW2_OUT = 1)	SCW2_OUT = 1	FpH = 0, FTurbidity = 8	1
4	(FTSS = 14) => (SCW2_OUT = 11)	SCW2_OUT = 11	FTSS = 14	20
5	(FTOC = 10) => (SCW2_OUT = 12)	SCW2_OUT = 12	FTOC = 10	30
6	(FTOC = 17) => (SCW2_OUT = 12)	SCW2_OUT = 12	FTOC = 17	30
7	(FConductivity = 13) & (FZn = 13) => (SCW2_OUT = 13)	SCW2_OUT = 13	FConductivity = 13, FZn = 13	40
8	(FNI ₄ = 0) & (FTKN = 0) & (Pb = 11)	SCW2_OUT = 14	FNI ₄ = 0, FTKN = 0	50
9	(FConductivity = 12) & (FTSS = 16) => (SCW2_OUT = 14)	SCW2_OUT = 14	FConductivity = 12, FTSS = 16	50
10	(FTSS = 9) => (SCW2_OUT = 14)	SCW2_OUT = 14	FTSS = 9	50
11	(FO&G = 10) & (FTCu = 10) => (SCW2_OUT = 15)	SCW2_OUT = 15	FO&G = 10, FTCu = 10	60
12	(FConductivity = 0) & (FTP = 12) => (SCW2_OUT = 15)	SCW2_OUT = 15	FConductivity = 0, FTP = 12	60
13	(FTN = 9) => (SCW2_OUT = 16)	SCW2_OUT = 16	FTN = 9	70

14	(FO&G = 3) => (SCW2_OUT = 17)	SCW2_OUT = 17	FO&G = 3	80
15	(FConductivity = 4) => (SCW2_OUT = 18)	SCW2_OUT = 18	FConductivity = 4	90
16	(FTurbidity = 0) & (FTPb = 0) => (SCW2_OUT = 1) OR (SCW2_OUT = 12) OR (SCW2_OUT = 13)	SCW2_OUT = 1 OR SCW2_OUT = 12 OR SCW2_OUT = 13	FTurbidity = 0, FTPb = 0	1 OR 30 OR 40