Tabela 1. Quantificação das áreas de uso agrícola, edificações, mata e campos em cada sub-bacia das bacias de captação Faxinal (Fx) e Maestra (Ma).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Pontos  sub-bacias | Área sub-bacias  (ha) | | Uso agrícola  (ha) | Uso agrícola  (%) | Área edificada  (%) | Área mata e campo (ha) |
| Fx-01 | 2.910,71 | 332,22 | | 11,41 | 0,27 | 2.567 |
| Fx-02 | 1.206,90 | 334,26 | | 27,70 | 0,36 | 867,6 |
| Fx-03 | 195,65 | 42,13 | | 21,53 | 0,37 | 152,8 |
| Fx-04 | 684,09 | 156,13 | | 22,8 | 1,28 | 517,1 |
| Fx-05 | 282,87 | 28,22 | | 9,98 | 0,63 | 252,8 |
| Fx-06 | 1.239,33 | 80,34 | | 6,48 | 0,83 | 1.148 |
| Fx-07 | 159,74 | 18,43 | | 11,54 | 2,25 | 137,7 |
| Total | 6.679,29 | 991,72 | | 14,85 | 0,56 | 5.644 |
| Ma-01 | 403,34 | 44,72 | | 11,08 | 1,32 | 353,2 |
| Ma-02 | 358,75 | 20,36 | | 5,67 | 32,44 | 221,9 |
| Total | 762,09 | 65,08 | | 8,53 | 15,97 | 575,1 |

Tabela 2. Análise de componentes principais pelo Método de extração e método de rotação Varimax com normalização de Kaiser.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parâmetro**  **Químico** | **Componentes** | | | |
| **1** | **2** | **3** | **4** |
| Er | ,989 | -,029 | ,132 | -,044 |
| Dy | ,987 | ,044 | ,049 | -,053 |
| Yb | ,986 | -,006 | ,105 | -,080 |
| Ho | ,979 | ,044 | ,129 | -,031 |
| Tb | ,979 | ,077 | ,116 | ,063 |
| Sm | ,976 | ,062 | ,076 | -,005 |
| Gd | ,971 | ,123 | ,142 | ,033 |
| Tm | ,958 | ,016 | ,191 | ,040 |
| Eu | ,949 | ,172 | -,053 | -,006 |
| Pr | ,917 | ,160 | ,212 | ,094 |
| Nd | ,896 | -,203 | ,137 | ,015 |
| Lu | ,879 | -,219 | ,261 | -,266 |
| Se | ,729 | ,447 | -,025 | ,343 |
| As | ,721 | ,472 | -,217 | -,084 |
| Fe | ,713 | ,385 | -,444 | -,221 |
| Ce | ,700 | ,158 | ,272 | ,252 |
| Cr | -,113 | ,956 | ,116 | ,084 |
| Ni | -,085 | ,940 | ,168 | ,094 |
| Sn | ,269 | ,909 | ,046 | -,117 |
| Pb | ,121 | ,878 | -,175 | -,038 |
| Zn | ,333 | ,739 | ,303 | -,249 |
| Cu | -,051 | ,703 | ,083 | ,023 |
| Ca | ,046 | ,038 | ,953 | -,227 |
| Mg | ,140 | ,079 | ,924 | ,043 |
| K | ,178 | ,107 | ,898 | -,111 |
| Sr | ,386 | ,173 | ,848 | -,173 |
| Al | -,176 | ,015 | -,143 | ,944 |
| Li | ,261 | -,097 | -,219 | ,871 |

Tabela 3. Concentrações dos principais elementos químicos analisados nos sedimentos e os valores *outliers* identificados na estatística descritiva.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| (mg.kg-1) | **B** | **Na** | **Ca** | **Ti** | **Cr** | **Mn** | **Co** | **Ni** | **Cu** | **Zn** | **As** | **Se** | **Sr** | **Mo** | **Cd** | **Sn** | **Ba** | **Pb** |
| FX BR | 0,20 | 28,95 | 1.166,70 | 338,79 | 8,38 | 574,64 | 14,65 | 4,63 | 38,77 | 52,34 | 2,70 | 0,20 | 11,90 | 0,20 | 0,10 | 0,40 | 155,84 | 64,84 |
| FX 01 | 0,30 | 53,32 | 2.042,92 | 567,66 | **18,35\*** | 1.096,10 | 20,52 | **8,92\*** | **55,90\*** | 121,30 | 3,55 | 0,39 | 20,05 | **0,30\*** | 0,20 | **3,95\*** | 234,34 | **305,87\*** |
| FX 02 | 0,30 | 47,68 | 2.490,76 | 544,03 | **19,96\*** | 2.132,43 | 26,52 | **8,71\*** | 46,70 | 122,12 | 3,88 | 0,20 | 21,42 | **0,30\*** | 0,20 | **5,07\*** | 257,29 | **381,10\*** |
| FX-02a | 0,30 | 30,02 | 1.730,03 | 454,00 | 9,22 | 1.182,75 | 18,40 | 4,63 | 40,06 | 68,17 | 2,67 | <LD | 14,60 | 0,20 | 0,10 | 0,99 | 194,68 | 215,39 |
| FX 03 | 0,20 | 53,21 | 2.592,21 | 686,51 | 10,78 | 1.583,43 | 25,84 | 5,56 | 39,95 | 74,80 | 3,58 | 0,20 | 19,81 | 0,20 | 0,10 | 2,09 | 226,23 | 171,16 |
| FX 04 | 0,30 | 52,30 | 2.865,39 | 426,10 | 9,39 | 2.348,76 | 28,83 | 5,17 | 36,46 | 89,65 | 3,40 | 0,30 | 24,08 | 0,20 | 0,10 | 1,80 | 281,28 | 121,47 |
| FX-04a | 0,40 | 40,33 | 1.580,52 | 459,35 | 6,33 | 885,71 | 21,19 | 3,89 | 40,44 | 80,21 | 3,09 | <LD | 12,28 | 0,20 | 0,10 | 0,80 | 185,00 | 73,15 |
| FX-04b | 0,40 | 58,79 | 3.109,63 | 472,11 | 12,75 | 1.131,42 | 18,52 | 6,20 | 50,62 | 84,09 | 2,90 | <LD | 24,25 | 0,20 | 0,10 | 1,10 | 241,18 | 69,12 |
| FX 05 | 0,20 | 46,80 | 2.678,13 | 511,33 | 9,27 | 1.765,94 | 29,63 | 4,98 | 35,24 | 89,15 | 4,03 | 0,29 | 27,83 | **0,29\*** | 0,10 | 2,16 | 255,49 | 97,64 |
| FX 06 | 0,30 | 61,90 | 2.831,84 | 534,95 | 10,74 | 1.825,77 | 28,35 | 5,67 | 43,22 | 99,67 | 2,49 | 0,10 | 23,83 | 0,20 | 0,20 | 1,30 | 227,24 | 91,34 |
| FX 07 | 0,30 | **141,54\*** | 3.538,42 | 724,45 | 8,13 | 1.440,21 | 21,47 | 4,70 | 43,83 | 108,91 | 2,50 | 0,10 | 25,72 | 0,20 | 0,10 | 1,90 | 245,58 | 148,00 |
| MA BR | 0,40 | 49,03 | 3.395,73 | 239,79 | 13,23 | 1.142,35 | 17,83 | 6,72 | 40,87 | 71,24 | 2,69 | 0,10 | 23,87 | 0,20 | 0,10 | 1,09 | 208,76 | 71,29 |
| MA 01 | 0,30 | 59,52 | 2.873,81 | 351,57 | 11,61 | 2.405,99 | 26,24 | 6,34 | 37,00 | 83,84 | 2,40 | 0,10 | 22,02 | 0,20 | 0,20 | 2,10 | 266,87 | 91,62 |
| MA 02 | 0,30 | **86,03\*** | 2.371,89 | 325,46 | 10,68 | 737,95 | 13,04 | 5,37 | 36,05 | 70,96 | 2,48 | <LD | 14,83 | 0,20 | 0,10 | 1,49 | 143,67 | 78,33 |
| IQR - | 0,29 | 28,54 | 1.005,35 | 112,86 | 4,38 | 46,10 | 6,40 | 2,47 | 28,09 | 34,59 | 1,08 | -0,16 | 4,14 | 0,20 | 0,00 | 0,00 | 115,97 | 61,95 |
| IQR + | 0,31 | 77,82 | 3.991,52 | 799,10 | 17,32 | 2.869,64 | 38,47 | 8,60 | 53,03 | 134,71 | 4,97 | 0,53 | 35,97 | 0,20 | 0,28 | 3,59 | 335,24 | 301,77 |

<LD = Inferior ao limite de detecção

\*Valores *outliers*

Tabela 4. Representação dos elementos químicos com Fator de Enriquecimento (FE) > 2.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ponto | B | Na | Ca | Ti | Cr | Mn | Co | Ni | Zn | As | Se | Sr | Mo | Cd | Ba | Sn | Pb |
| Fx-01 | --- | 2,2 | 2,1 | 2,0 | 2,7 | 2,3 | --- | 2,3 | 2,8 | --- | 2,4 | 2,0 | --- | 2.4 | --- | 12,0\* | 5,7\* |
| Fx-02 | --- | 2,0 | 2,6 | --- | 3,0 | 4,6 | 2,2 | 2,3 | 2,9 | --- | --- | 2,2 | --- | 2.5 | 2,0 | 15,7\* | 7,3\* |
| Fx-02a | --- | --- | --- | --- | --- | 2,5 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 3,0 | 4,1 |
| Fx-03 | --- | 2,6 | 3,1 | 2,8 | --- | 3,8 | 2,5 | --- | --- | --- | --- | 2,3 | --- | --- | 2,0 | 7,3\* | 3,7 |
| Fx-04 | --- | 2,0 | 2,7 | --- | --- | 4,5 | 2,2 | --- | --- | --- | --- | 2,2 | --- | --- | 2,0 | 5,0\* | 2,1 |
| Fx-04a | 2,8 | --- | --- | --- | --- | 2,1 | 2,0 | --- | 2,1 | --- | --- | --- | --- | --- | --- | 2,8 | --- |
| Fx-04b | 2,5 | 2,5 | 3,3 | --- | --- | 2,4 | --- | --- | 2,0 | --- | --- | 2,5 | --- | --- | --- | 3,4 | --- |
| Fx-05 | --- | 2,3 | 3,3 | 2,2 | --- | 4,4 | 2,9 | --- | 2,4 | 2,1 | 2,1 | 3,3 | 2,1 | --- | 2,3 | 7,7\* | 2,1 |
| Fx-06 | 2,1 | 3,0 | 3,4 | 2,2 | --- | 4,5 | 2,7 | --- | 2,7 | --- | --- | 2,8 | --- | 2,8 | 2,0 | 4,6 | --- |
| Fx-07 | 2,1 | 6,8\* | 4,2 | 3,0 | --- | 3,5 | 2,1 | --- | 2,9 | --- | --- | 3,0 | --- | --- | 2,2 | 6,7\* | 3,2 |
| Ma-01 | --- | --- | --- | --- | --- | 2,6 | --- | --- | --- | --- | --- | --- | --- | 2,5 | --- | 2,4 | --- |
| Ma-02 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

--- Sem enriquecimento ou < 2.

FE entre 2 e 5 (sinal antropogênico moderado).

\*FE entre 5 e 20 (sinal antropogênico significativo).

Tabela 5. Concentração dos elementos químicos nos fertilizantes NPK analisados.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| (mg.kg-1) | B | Na | Ca | Ti | Cr | Mn | Co | Ni | Cu | Zn | Se | Sr | Cd | Sn | Ba | Pb |
| Fert-01 | 842,0 | 7.472,0 | 107.754,0 | 124 | 62,3 | 116 | 1,3 | 8,1 | 44 | 2.638 | 1,6 | 695 | 13,8 | 6,1 | 61,4 | 51,4 |
| Fert-02 | 265,0 | 6.032,0 | 116.697,0 | 130 | 92,6 | 250 | 4,3 | 22,9 | 181 | 409 | 1,7 | 398 | 6,9 | 4,5 | 43,4 | 4,4 |
| Fert-03 | 30.9 | 7.403,0 | 92.403,0 | 133 | 64,1 | 40,6 | --- | 8,0 | 8,1 | 64,9 | 3,2 | 731 | 11,1 | --- | 26,9 | 2,7 |

Tabela 6. Concentração de alguns metais pesados no sulfato de cobre e cal virgem.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Amostras  (mg.kg-1) | Cu | Zn | Pb | Cd | Ni | Cr |
| CuSO4\* | 326.000 | 1.309 | 96 | 1,4 | 13 | 20 |
| CuSO4\*\* | >10.000 | 136,1 | 25,25 | 2,89 | 10,7 | 3,9 |
| Cal Virgem\*\* | 146,93 | 10,6 | 1,03 | 0,02 | 4,5 | 7,1 |

\*Fonte: Mirlean *et al*. (2005).

\*\*Fonte: Kuhn (2011).

Tabela 7. Valores de CE e Na+ observados nas águas do ponto Fx-07.

|  |  |  |
| --- | --- | --- |
| **Ponto Fx-07** | **Condutividade a 25ºC (µS/cm)** | **Na+**  **(mg.L-1)** |
| Período estiagem | 196 | 20,5 |
| Background | 20,3 | 1,54 |
| Enriquecimento | 9,6 | 13,2 |
| Período cheia | 210 | 22 |
| Background | 19,7 | 1,5 |
| Enriquecimento | 10,6 | 14,7 |

Tabela 8. Representação dos valores Elementos Terras Raras e La/Lu analisados nos sedimentos, fertilizantes e rocha Tipo Palmas – Caxias\*. Amostras normalizadas pelos valores do manto primitivo (Sun e McDonough, 1989).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| (mg.kg-1) | La | Ce | Pr | Nd | Sm | Eu | Gd | Tb | Dy | Ho | Er | Tm | Yb | Lu | La/Lu |
| Fx-BR | 35,61 | 39,33 | 25,33 | 19,25 | 12,15 | 7,13 | 10,56 | 10,17 | 7,32 | 7,31 | 6,87 | 6,75 | 5,67 | 5,40 | 6,60 |
| Fx-01 | 35,89 | 39,18 | 30,38 | 21,35 | 15,77 | 9,98 | 13,57 | 12,79 | 9,50 | 9,62 | 8,43 | 8,00 | 7,00 | 6,66 | 5,39 |
| Fx-02 | 33,41 | 39,86 | 27,00 | 18,42 | 13,20 | 8,28 | 11,50 | 11,04 | 7,95 | 7,88 | 7,04 | 6,71 | 5,84 | 5,37 | 6,22 |
| Fx-02a | 29,91 | 32,45 | 21,48 | 18,39 | 12,02 | 7,06 | 9,61 | 9,15 | 7,10 | 6,63 | 6,17 | 5,34 | 5,01 | 5,34 | 5,60 |
| FX-03 | 35,88 | 42,50 | 28,81 | 21,29 | 14,33 | 8,87 | 12,84 | 11,96 | 9,03 | 9,09 | 8,49 | 8,06 | 7,06 | 8,06 | 4,45 |
| FX-04 | 37,83 | 44,71 | 32,96 | 23,77 | 17,56 | 10,71 | 15,09 | 14,81 | 10,71 | 10,97 | 9,79 | 9,46 | 7,91 | 8,10 | 4,67 |
| FX-04a | 30,47 | 33,41 | 22,39 | 20,25 | 13,47 | 8,31 | 10,70 | 11,08 | 8,52 | 8,51 | 7,48 | 6,74 | 6,27 | 6,74 | 4,52 |
| FX-04b | 33,59 | 37,03 | 23,53 | 21,25 | 13,50 | 8,33 | 10,73 | 11,10 | 8,13 | 7,92 | 7,28 | 6,75 | 5,88 | 6,75 | 4,98 |
| FX-05 | 37,59 | 39,06 | 33,80 | 23,50 | 17,91 | 11,11 | 14,99 | 14,55 | 10,93 | 10,78 | 10,02 | 9,29 | 8,37 | 9,29 | 4,05 |
| FX-06 | 34,98 | 36,01 | 26,01 | 19,52 | 12,58 | 7,12 | 11,21 | 10,16 | 7,71 | 7,90 | 7,27 | 6,74 | 6,07 | 6,74 | 5,19 |
| FX-07 | 38,84 | 42,23 | 30,05 | 21,26 | 14,41 | 7,73 | 12,58 | 12,03 | 8,68 | 9,14 | 8,33 | 8,10 | 6,89 | 8,10 | 4,79 |
| Ma-BR | 34,05 | 32,25 | 22,00 | 18,38 | 11,21 | 6,52 | 9,52 | 9,22 | 6,62 | 6,68 | 6,01 | 5,38 | 4,85 | 5,38 | 6,33 |
| Ma-01 | 32,84 | 38,86 | 22,79 | 18,36 | 12,14 | 7,13 | 10,22 | 9,24 | 7,31 | 7,30 | 6,65 | 6,74 | 5,47 | 5,40 | 6,09 |
| Ma-02 | 36,01 | 33,81 | 24,12 | 20,54 | 12,31 | 7,10 | 10,33 | 9,20 | 6,87 | 6,66 | 6,42 | 5.37 | 5,04 | 5,37 | 6,71 |
| Peate | 58,37 | 47,72 | NI\*\* | 29,54 | 18,09 | 9,52 | NI\*\* | 11,11 | NI\*\* | NI\*\* | NI\*\* | NI\*\* | 7,69 | 7,30 | 8,00 |
| Nardy-kse | 50,95 | 42,82 | NI\*\* | 26,59 | 15,77 | 9,88 | 12,25 | NI\*\* | 9,36 | 8,54 | 8,33 | NI\*\* | 6,90 | 6,76 | 7,54 |
| Nardy-kpt | 58,22 | 51,83 | NI\*\* | 32,50 | 20,95 | 10,95 | 15,44 | NI\*\* | 11,94 | 10,98 | 10,63 | NI\*\* | 9,74 | 9,46 | 6,16 |
| Fert \_01 | 37,52 | 27,16 | 21,67 | 16,67 | 7,36 | 4,89 | 5,52 | 3,39 | 2,52 | 2,37 | 2,35 | 1,95 | 1,83 | 1,91 | 19,66 |
| Fert \_02 | 59,60 | 11,72 | 23,03 | 20,33 | 12,78 | 8,94 | 13,09 | 10,94 | 10,62 | 11,61 | 12,40 | 11,37 | 11,44 | 13,04 | 4,57 |
| Fert \_03 | 25,59 | 12,71 | 13,28 | 11,69 | 7,16 | 4,65 | 6,29 | 4,97 | 4,43 | 4,49 | 4,55 | 4,00 | 3,84 | 4,13 | 6,19 |

\*Fonte: Peate (1997); Nardy (2008).

\*\*NI = não informado.