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| Author(s)        | Sueyoshi, Masanao; Tojo, Koji; Ishiyama, Nobuo et al.                                                                                                      |
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## Supplementary material

Table S1. Environmental characteristics of study sites at pre-flood condition

| Site | Pasture (%) | Relative shear stress | Slope (%) | Average flow velocity (cm s <sup>-1</sup> ) | Average water depth (cm) | Average water width (m) | Average Sand cover (%) | C.V. of velocity | C.V. of depth | C.V. of width | H' diversity of substrates |
|------|-------------|-----------------------|-----------|---------------------------------------------|--------------------------|-------------------------|------------------------|------------------|---------------|---------------|----------------------------|
| Ki1  | 0           | 2.07                  | 2.30      | 9.4                                         | 20.9                     | 1.93                    | 29.6                   | 0.98             | 0.83          | 0.40          | 0.56                       |
| Ki2  | 0           | 1.98                  | 2.51      | 17.9                                        | 13.9                     | 3.03                    | 20.8                   | 0.88             | 0.63          | 0.21          | 0.48                       |
| Ki3  | 4.1         | 1.87                  | 1.33      | 24.5                                        | 13.8                     | 2.92                    | 18.3                   | 0.66             | 0.64          | 0.23          | 0.51                       |
| Ki4  | 7.2         | 2.21                  | 1.57      | 23.1                                        | 12.2                     | 4.15                    | 22.1                   | 0.59             | 0.28          | 0.06          | 0.40                       |
| Ki5  | 8.8         | 1.88                  | 1.92      | 16.9                                        | 20.6                     | 4.25                    | 19.2                   | 0.55             | 0.54          | 0.15          | 0.34                       |
| Ki6  | 10.8        | 2.14                  | 1.04      | 18.9                                        | 12.6                     | 4.28                    | 30.8                   | 0.51             | 0.47          | 0.13          | 0.27                       |
| Ki7  | 16.2        | 2.32                  | 1.21      | 21.7                                        | 29.8                     | 10.05                   | 40.8                   | 0.48             | 0.49          | 0.23          | 0.47                       |
| Ki8  | 17.1        | 1.55                  | 1.12      | 27.2                                        | 51.9                     | 9.15                    | 35.8                   | 0.53             | 0.63          | 0.14          | 0.46                       |
| Ki9  | 17.9        | 1.58                  | 1.01      | 16.4                                        | 62.5                     | 9.92                    | 35.0                   | 0.42             | 0.41          | 0.08          | 0.47                       |
| Pe1  | 0           | 1.35                  | 4.90      | 21.0                                        | 10.6                     | 2.77                    | 7.5                    | 0.74             | 0.52          | 0.22          | 0.48                       |
| Pe2  | 0           | 1.24                  | 3.19      | 18.3                                        | 15.5                     | 2.82                    | 18.3                   | 0.96             | 0.53          | 0.27          | 0.45                       |
| Pe3  | 0.1         | 1.68                  | 2.47      | 14.9                                        | 15.1                     | 2.7                     | 11.3                   | 0.78             | 0.45          | 0.17          | 0.42                       |
| Pe4  | 1.0         | 1.55                  | 2.15      | 21.1                                        | 24.9                     | 4.35                    | 8.3                    | 0.68             | 0.92          | 0.26          | 0.52                       |
| Pe5  | 2.4         | 1.49                  | 3.35      | 27.6                                        | 15.7                     | 4.52                    | 2.9                    | 0.65             | 0.42          | 0.20          | 0.51                       |
| Pe6  | 4.3         | 2.19                  | 1.98      | 26.8                                        | 16.5                     | 5.67                    | 5.0                    | 0.67             | 0.40          | 0.17          | 0.28                       |
| Pe7  | 9.0         | 1.98                  | 1.13      | 12.6                                        | 35.1                     | 9.2                     | 45.8                   | 0.76             | 0.48          | 0.26          | 0.52                       |
| Pe8  | 9.8         | 2.17                  | 2.08      | 34.8                                        | 18.3                     | 5.48                    | 17.9                   | 0.53             | 0.40          | 0.11          | 0.43                       |
| Pe9  | 11.7        | 2.08                  | 1.91      | 20.4                                        | 28.5                     | 6.42                    | 29.6                   | 0.69             | 0.51          | 0.11          | 0.45                       |
| Ke1  | 4.8         | 1.60                  | 1.51      | 15.1                                        | 10.5                     | 1.58                    | 32.9                   | 0.44             | 0.36          | 0.17          | 0.30                       |
| Ke2  | 7.8         | 1.56                  | 1.72      | 11.1                                        | 21.5                     | 2.22                    | 56.7                   | 0.49             | 0.56          | 0.20          | 0.38                       |
| Ke3  | 14.4        | 1.66                  | 1.22      | 9.1                                         | 19.7                     | 2.27                    | 68.8                   | 0.56             | 0.38          | 0.18          | 0.27                       |
| Ke4  | 17.9        | 2.46                  | 2.11      | 21.5                                        | 11.8                     | 4.08                    | 57.1                   | 0.53             | 0.33          | 0.10          | 0.30                       |
| Ke5  | 14.5        | 1.79                  | 0.83      | 4.9                                         | 53.7                     | 3.75                    | 76.3                   | 0.52             | 0.21          | 0.09          | 0.24                       |
| Ke6  | 14.6        | 1.58                  | 1.44      | 9.4                                         | 33.6                     | 2.85                    | 53.3                   | 0.54             | 0.53          | 0.18          | 0.43                       |
| Ke7  | 11.3        | 1.87                  | 1.89      | 22.6                                        | 32.7                     | 6.98                    | 39.2                   | 0.67             | 0.61          | 0.21          | 0.40                       |
| Ke8  | 10.5        | 1.97                  | 0.99      | 18.3                                        | 41.2                     | 6.5                     | 46.7                   | 0.57             | 0.52          | 0.13          | 0.51                       |
| Ke9  | 10.2        | 2.15                  | 1.48      | 17.2                                        | 29.0                     | 7.03                    | 19.6                   | 0.61             | 0.54          | 0.23          | 0.48                       |

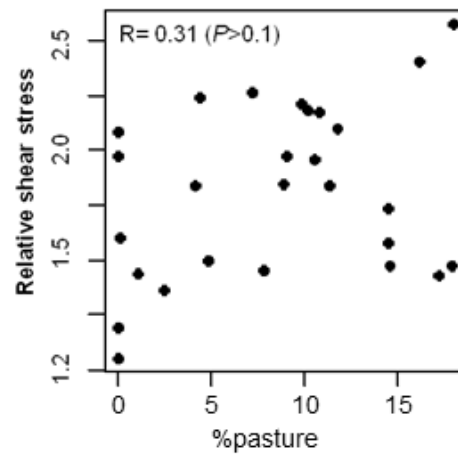


Figure S1. A relationship between agricultural intensity (catchment %pasture) and flood magnitude (relative shear stress). There is no significant correlation between %pasture and relative shear stress (Pearson's correlation).