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Corrigendum: The roles for branch shelters and sheep manure to accelerate the restoration of degraded grasslands in northern China

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KEYWORDS

caragana branch shelters, soil water availability, sheep manure decomposition, soil nutrients, plant growth, degraded grassland

A Corrigendum on
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The original article contained a previous version of the manuscript. The article has now been corrected to show the most updated version that includes all the corrections detailed below.

In the original article, there was an error as Table 2 was not included in the text. The table and its caption appear below.

In the original article, there was an error in the phrasing of a sentence in the **Abstract**. This sentence previously stated: "Strategies are desperately needed for restoring the millions of hectares of degraded grasslands which have been simultaneously impacted by overgrazing and Caragana shrub encroachment in arid and semiarid areas of northern China." The corrected sentence appears below:

"New strategies are desperately needed for restoring the millions of hectares of degraded grasslands in arid and semiarid areas of northern China."

In the original article, there was an error in one of the words in the **Abstract**. The word previously stated: "*Artemis*". The corrected word appears below:

TABLE 2 The correlations between plant growth parameters and soil properties.

Year	Plant growth parameters	SWS	SOC	TN	TP	AN	AP
2017	Plant coverage	0.184	−0.008	0.056	−0.053	0.006	−0.124
	Plant height	0.527**	0.666**	0.532**	0.507**	0.583**	0.526**
	Plant biomass	0.667**	0.815**	0.653**	0.809**	0.809**	0.674**
2018	Plant coverage	0.349*	0.609**	0.624**	0.759**	0.630**	0.310*
	Plant height	0.471**	0.802**	0.783**	0.788**	0.836**	0.368*
	Plant biomass	0.422**	0.663**	0.660**	0.868**	0.715**	0.232

SWS, mean soil water storage; SOC, soil organic carbon; TN, total N; TP, total P; AN, available N; AP, available P. *$p < 0.05$, **$p < 0.01$.

"*Artemisia*"

In the original article, there was an error in one of the words in section **I Introduction**. The word previously stated: "bill". The corrected sentence appears below:

"billion"

In the original article, there was an error in a sentence in section **I Introduction.** This sentence previously stated: "This litter has been shown to be a key contributor to the development of soil organic content in the soil profile to 1 m depth (Xu et al., 2021)." This sentence should be deleted.

In the original article, Rashid et al., 2017 was not cited in the article and a change in paragraph wording was not included in section **2 Materials and methods**, sub-section *2.4 Measurement of decompositions and nutrient inputs both for manure and Caragana branches*, paragraph 2. This paragraph previously stated: "Both for manure and branches, one bag in each plot was collected at the end of September in 2017, and another was collected at the end of September in 2018. Then the decomposition rate was determined as the change in oven-dried weight loss determined after oven drying at 85°C. Organic carbon was assayed by the acidified potassium dichromate ($K_2Cr_2O_7$-H_2SO_4) heating method (Bao, 2013). Total nitrogen (N) was determined using the Kjeldahl procedure (Bao, 2013). Meanwhile, cumulative decomposition rate of manure and branches, as well as the potential maximum C and N which manure and branches input into soil were evaluated with the following equations:

$$DR = 100 \times (DM_{initial} - DM_{end})/DM_{initial} \quad (2)$$

$$C_{released} \text{ or } N_{released} = DR \times DM_{initial} \times C_{content} \text{ or } N_{content} \times 0.001 \quad (3)$$

$$C_{input} \text{ or } N_{input} = \frac{C_{released} \text{ or } N_{released}}{BD \times S \times H} \quad (4)$$

where, DR (%) is cumulative decomposition rate of manure or branches after one or 2 years; $DM_{initial}$ (g m^{-2}) is the initial dry matter weight of manure or sheltered branches in each plot; DM_{end} is the dry matter weight of manure or sheltered branches were decomposed after one or 2 years in each plot; $C_{released}$ or $N_{released}$ (g m^{-2}) is cumulative released C or N from decomposed manure or branches after one or 2 years in each plot; $C_{content}$ (g kg^{-1}) or $N_{content}$ (g kg^{-1}) is the concentration of C or N in manure or branches; C_{input} (g kg^{-1}) or N_{input} (g kg^{-1}) is the potential maximum C or N which manure or branches cumulatively input into soil; BD (g cm^{-3})is soil bulk density, and in this study BD = 1.4 g cm^{-3}; S (m^2) is soil area in calculation, and 1 m^2 soil area was applied in calculation in this study; H is soil depth, H = 20 cm in this study." The corrected sentence and citation appear below:

"Both for manure and branches, one bag in each plot was collected at the end of September in 2017, and another was collected at the end of September in 2018. Then the decomposition rate was determined as the change in oven-dried weight loss determined after oven drying at 85°C. Organic carbon was assayed by the acidified potassium dichromate ($K_2Cr_2O_7$-H_2SO_4) heating method (Bao, 2013). Total nitrogen (N) was determined using the Kjeldahl procedure (Bao, 2013). Considering the influence of soil to interfere accurate evaluation for manure decomposition, ash correction was applied according to Rashid et al. (2017). Thus, a muffle furnace was used to determine ash content in bags by loss-on-ignition at 550°C for 4 h, and the soil dry weight that contaminated the manure calculated as following equations:

$$CDW = \frac{AS_R - A_{IC}}{A_{SL}} \quad (2)$$

where CDW is soil dry weight (g) than contaminated the manure bag, AS_R is ash content (mg) that remained in manure bag, A_{IC} is the initial ash content (mg) in manure bag and A_{SL} is the soil ash content (mg g^{-1}). After ash correction, cumulative decomposition rate of manure and branches, as well as the potential maximum C and N which manure and branches input into soil were evaluated with the following equations:

$$DR = 100 \times (DM_{initial} - DM_{end})/DM_{initial}, \quad (3)$$

$$C_{released} \text{ or } N_{released} = DR \times DM_{initial} \times C_{content} \text{ or } N_{content} \times 0.001, \quad (4)$$

$$C_{input} \text{ or } N_{input} = \frac{C_{released} \text{ or } N_{released}}{BD \times S \times H}, \quad (5)$$

where, DR (%) is cumulative decomposition rate of manure or branches after one or 2 years; $DM_{initial}$ (g m^{-2}) is the initial dry matter weight of manure or sheltered branches in each plot; DM_{end} is the dry matter weight of manure or sheltered branches were decomposed after one or 2 years in each plot; $C_{released}$ or $N_{released}$ (g m^{-2}) is cumulative released C or N from decomposed manure or branches after one or 2 years in each plot; $C_{content}$ (g kg^{-1}) or $N_{content}$ (g kg^{-1}) is the concentration of C or N in manure or branches; C_{input} (g kg^{-1}) or N_{input} (g kg^{-1}) is the potential maximum C or N which manure or branches cumulatively input into soil; BD (g cm^{-3})is soil bulk density, and in this study BD = 1.4 g cm^{-3}; S (m^2) is soil area in

calculation, and 1 m^2 soil area was applied in calculation in this study; H is soil depth, H = 20 cm in this study."

In the original article, there was an error in Figure 6 as published. Figure 6 should be removed**.**

In the original article, there was an error in **section 2 Materials and methods**, sub-section *2.7 Statistical analyses*, paragraph 1. This sentence previously stated: "One-way analysis of variance (ANOVA) tests was used to compare soil water content, soil surface temperature, soil chemical properties, decomposition rates of manure and caragana branches, and plant growth among treatments in each year, respectively. Tukey HSD tests were used to make *post hoc* multiple pairwise comparisons among all treatments, when data showed homogeneity of variance. Two-way ANOVAs were applied to detect the effects of shelters, sheep manure, and shelters × manure on each determined soil and plant index, respectively. Regression analysis was applied to reveal the correlation of manure decomposition rate and soil water storage, as well as branch decomposition rate and soil water storage. Redundancy analysis (RDA) was run to reveal major drivers of soil properties affecting plant growth. All above analyses were carried out using the "vegan" package in R. In all tests, a p-value ≤0.05 was considered significant." The corrected sentence appears below:

"Two-way ANOVAs were applied to detect the effects of shelters, sheep manure, and shelters × manure on each determined soil and plant index, respectively. And when the results of two-way ANOVAs shown interaction effect is significant, the simple effect analysis, thus One-way analysis of variance (ANOVA), was used to determine the difference between the effects of one factor at different levels of another factor. Regression analysis was applied to reveal the correlation of manure decomposition rate and soil water storage, as well as branch decomposition rate and soil water storage. Correlation analysis was used to reveal the relationships between plant growth parameters and tested soil properties. All above analyses were carried out using the "vegan" package in R. In all tests, a p-value ≤0.05 was considered significant."

In the original article, there was an error in a sentence in section **3 Results,** sub-section *3.4 Effect of branch shelters on plant growth of grassland*. This sentence previously stated: "Redundancy analysis was performed to illustrate relationships between plant growth and soil properties at depth of 0–20 cm. All tested soil parameter were significantly influencing plant growth both in 2017 and 2018 (p < 0.05; Figure 6)". The corrected sentence appears below:

"Correlation analysis revealed that all tested soil properties positively correlated with plant heigh and biomass (p < 0.01), yet not correlated with plant coverage (p > 0.05) in 2017 (Table 2). However, in 2018, all tested soil properties (except available P) were positively correlated with plant coverage, height, and biomass (p < 0.01 or 0.05; Table 2)."

In the original article, there was an error in a sentence in section **4 Discussion,** page 13. This sentence previously stated: "In this study, the RDA model also showed that plant growth was significantly influenced by all tested indices including soil water, soil organic carbon, Total N, Total P, Available N, and Available P during whole period." The corrected sentence appears below:

"In this study, the correlation analysis also showed that plant growth was significantly influenced by all tested indices including soil water, soil organic carbon, Total N, Total P, Available N, and Available P during whole period."

In the original article, there was an error in a sentence in section **Conclusion.** This sentence previously stated: "I In summary, our study provided a template for restoration of degraded grassland simultaneously incurred by overgrazing and shrub encroachment in arid and semiarid areas." The corrected sentence appears below:

"In summary, our study provided a template using shrub branches and livestock manure to restore degraded grassland in arid and semiarid areas."

The authors apologize for these errors and state that this does not change the scientific conclusions of the article in any way. The original article has been updated.

Publisher's note