

Supporting Information:

Nitrogen-Enriched Organic fertilizer (NEO) elevates nitrification rates shortly after application but has no lasting effect on nitrification in agricultural soils

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Figure S 1 The amount of nitrite (NO_2^-) (orange) and nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue) at different time points after incubation in unfertilized soil samples collected from the cereal field and incubated as agitated soil slurries in the lab. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

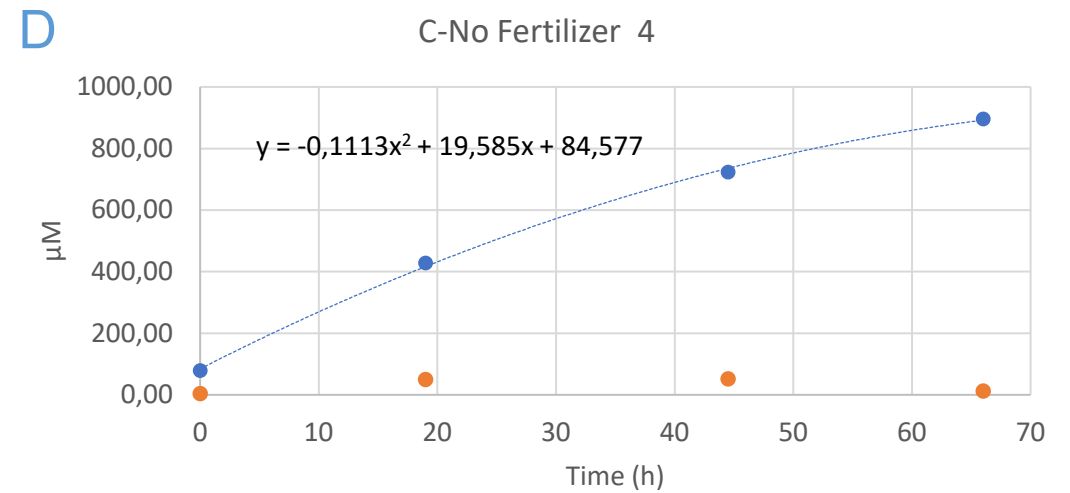
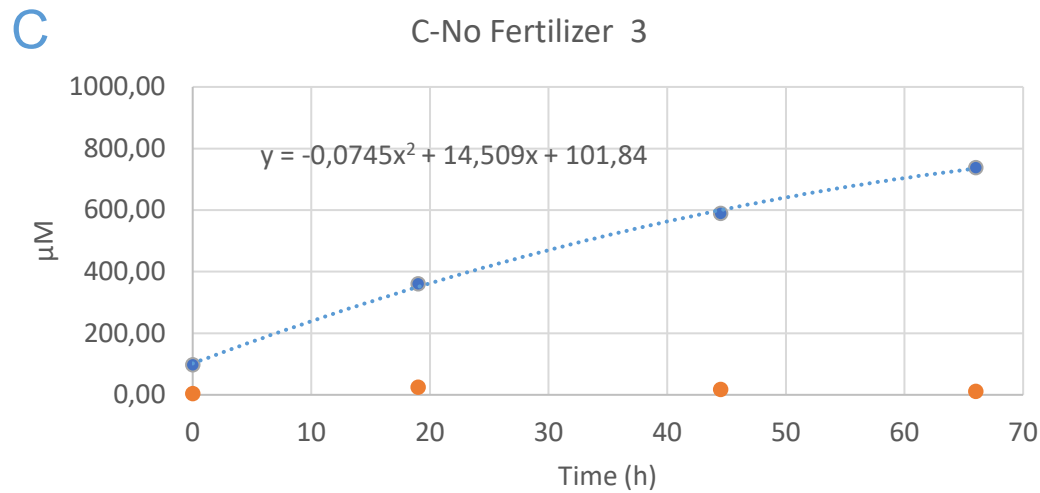
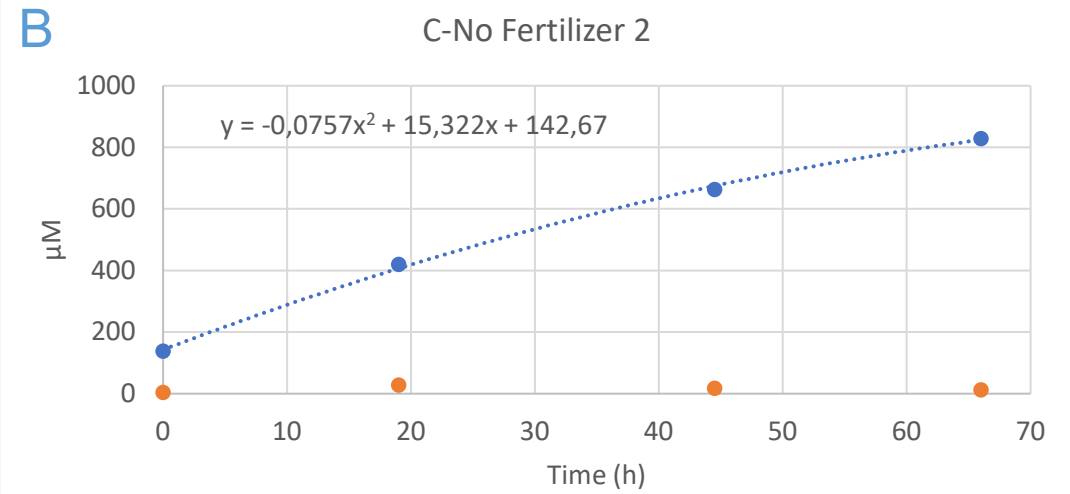
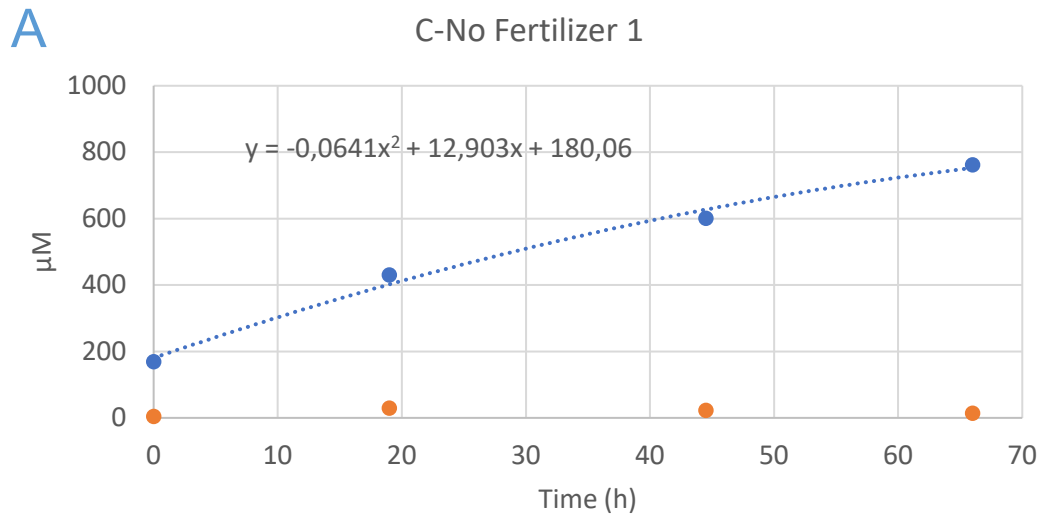


Figure S 2 The amount of nitrite (NO_2^-) (orange) and nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue) at different time points after incubation in untreated cattle slurry fertilized soil samples collected from the cereal field and incubated as agitated soil slurries in the lab. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

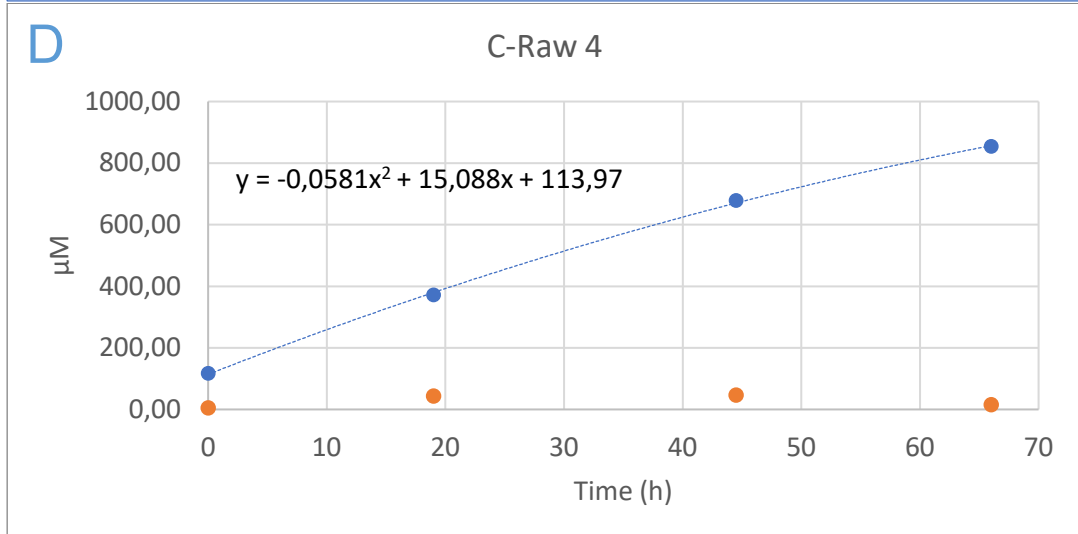
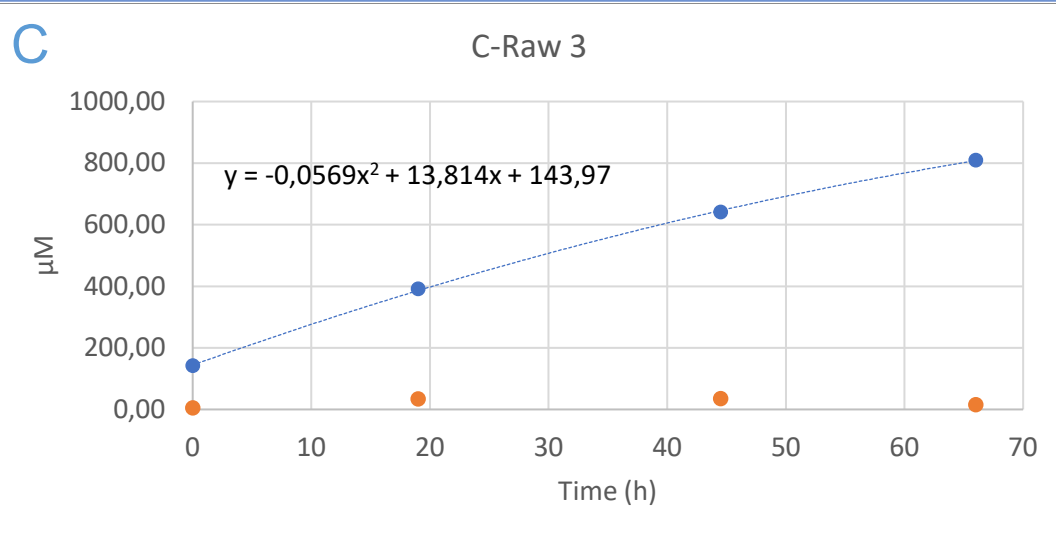
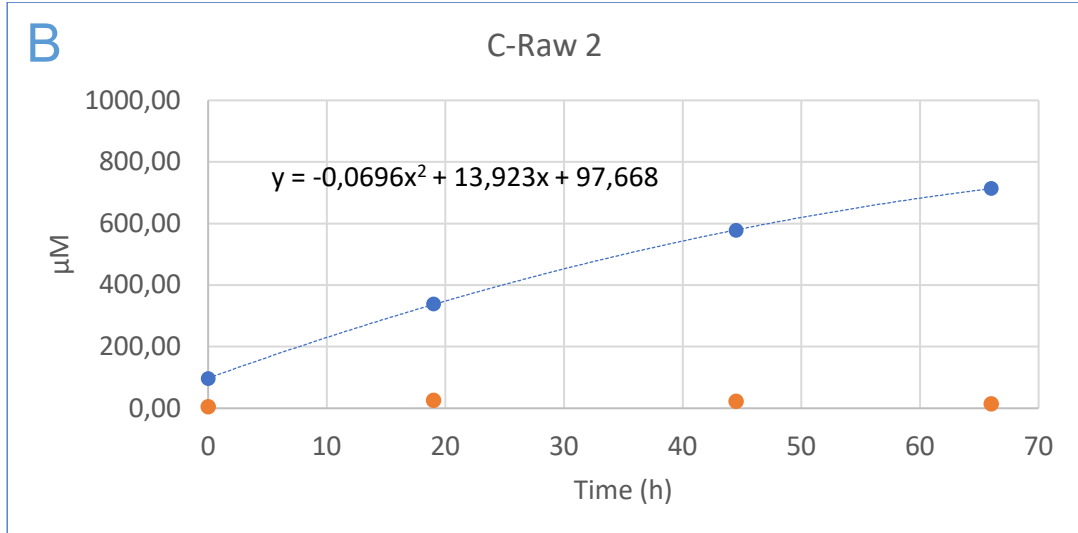
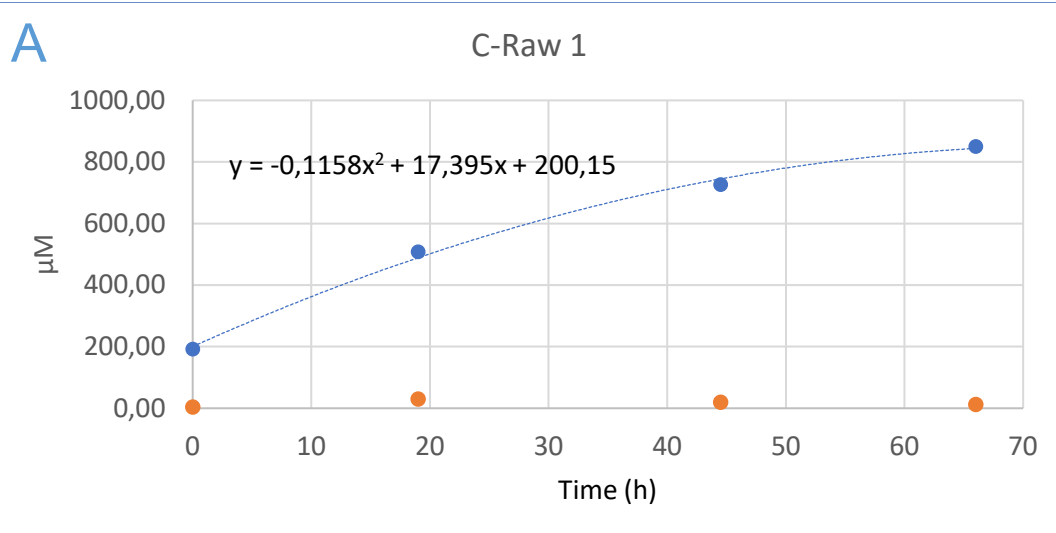


Figure S 3 The amount of nitrite (NO_2^-) (orange) and nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue) at different time points after incubation in NEO fertilized soil samples collected from the cereal field and incubated as agitated soil slurries in the lab. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

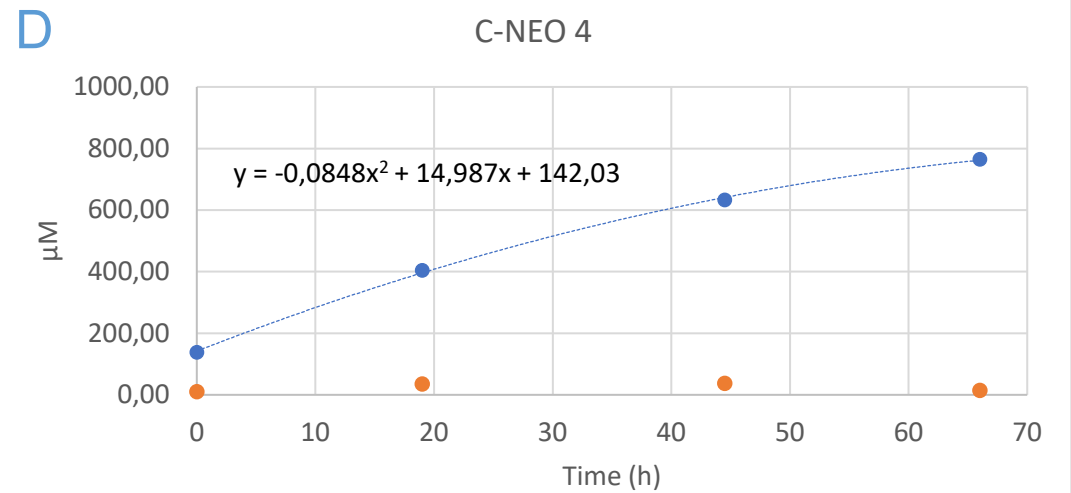
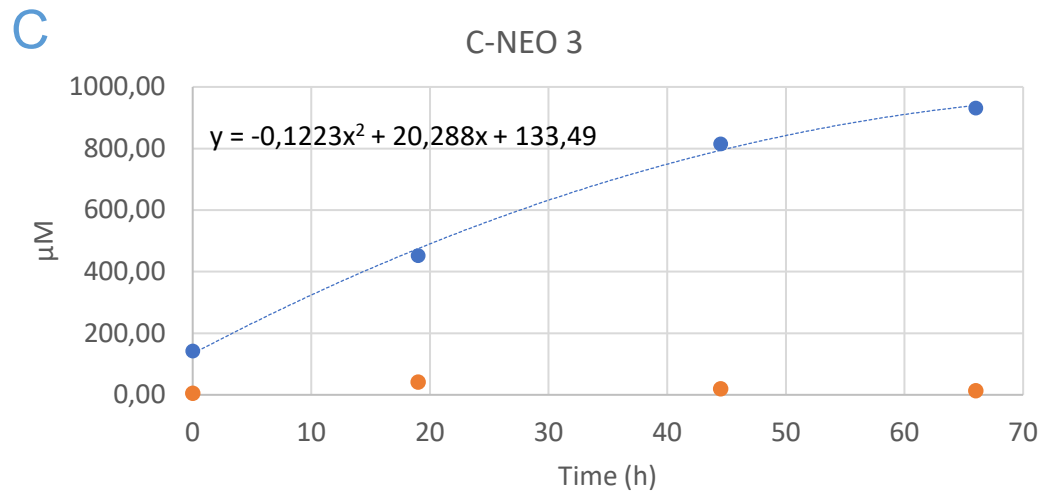
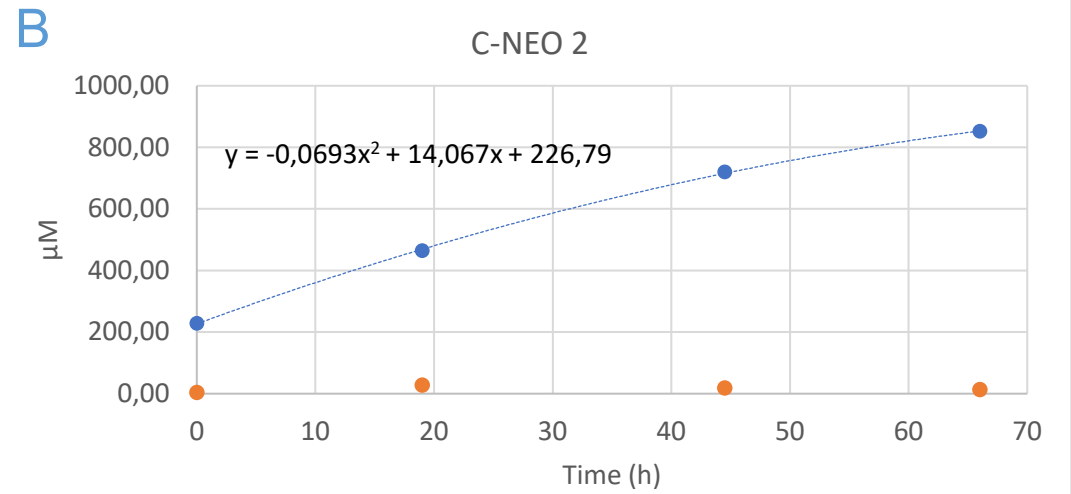
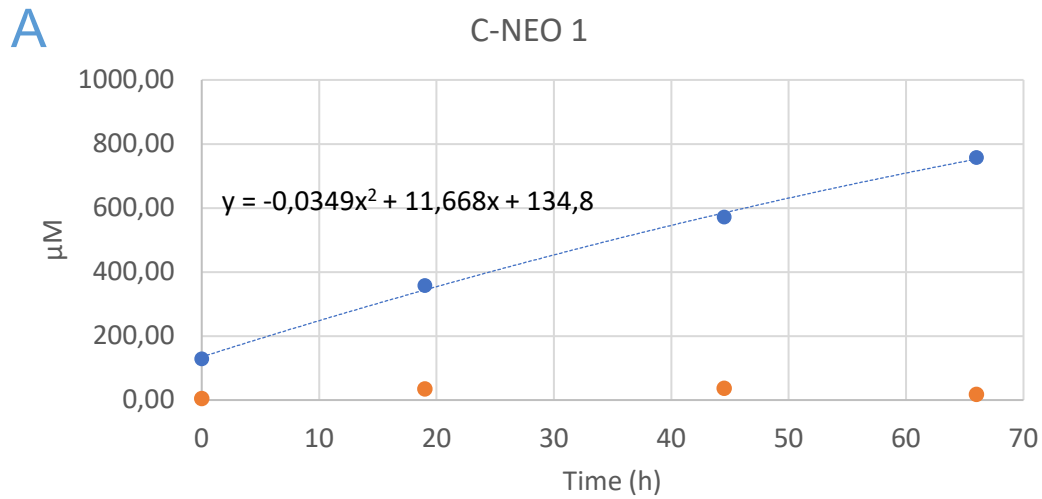


Figure S 4 The amount of nitrite (NO_2^-) (orange) and nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue) at different time points after incubation in mineral fertilizer fertilized soil samples collected from the cereal field and incubated as agitated soil slurries in the lab. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

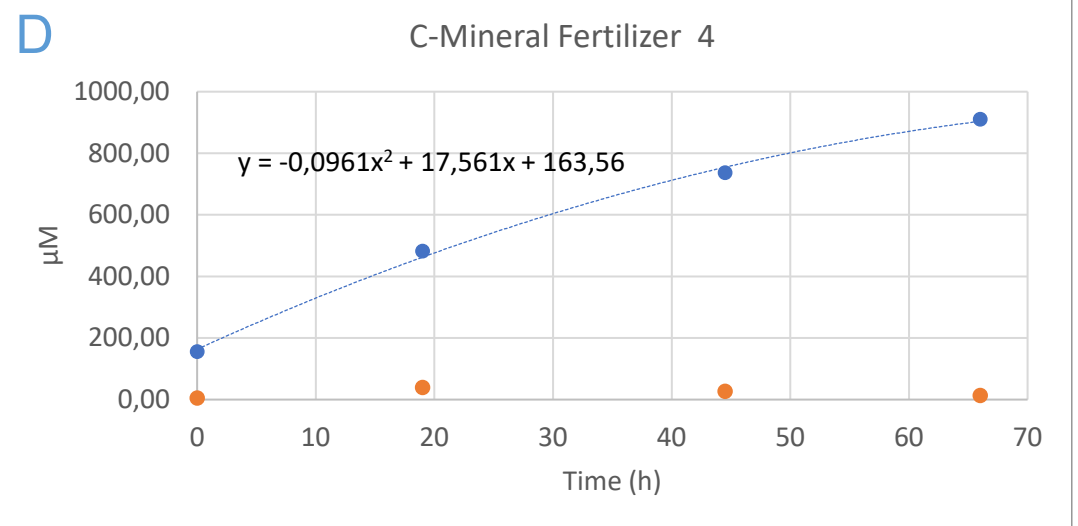
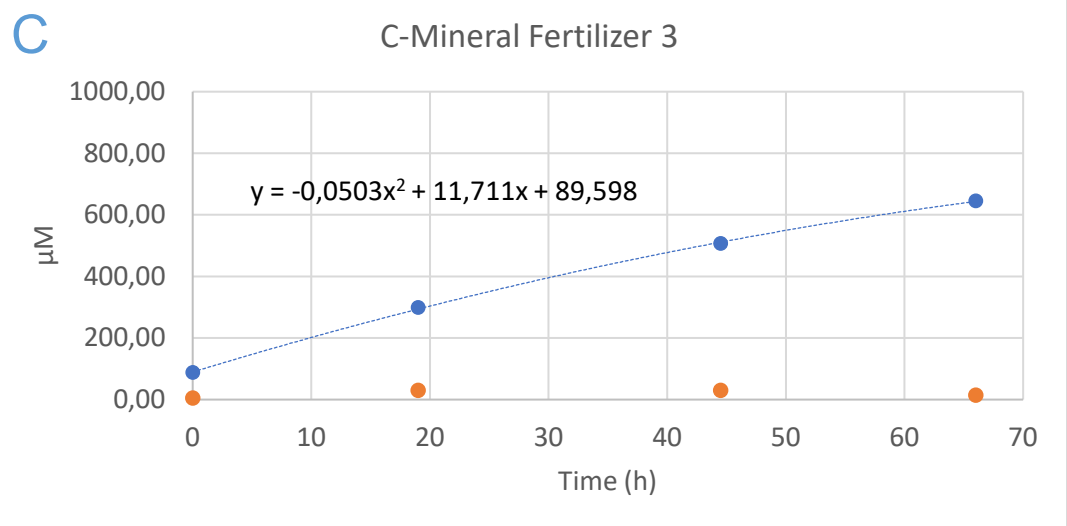
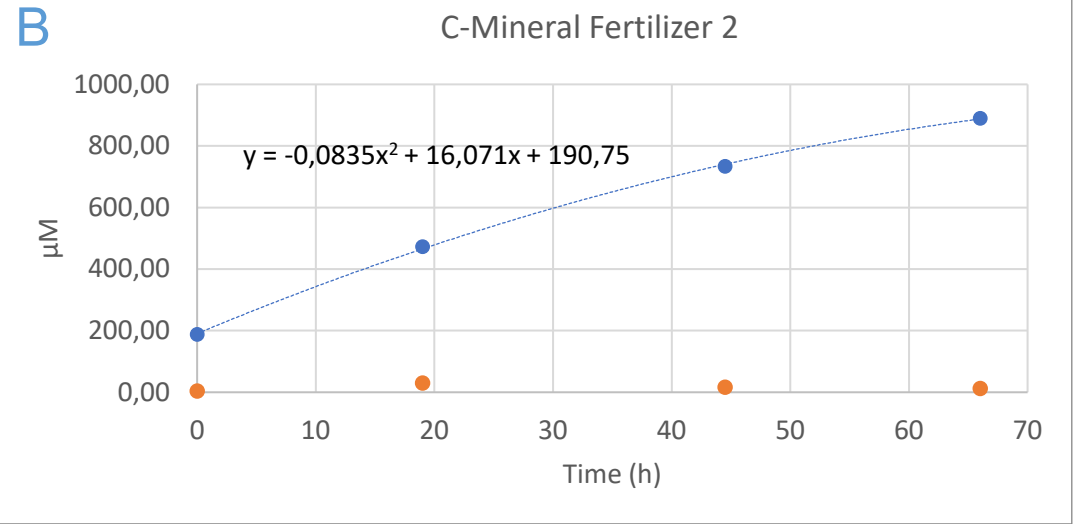
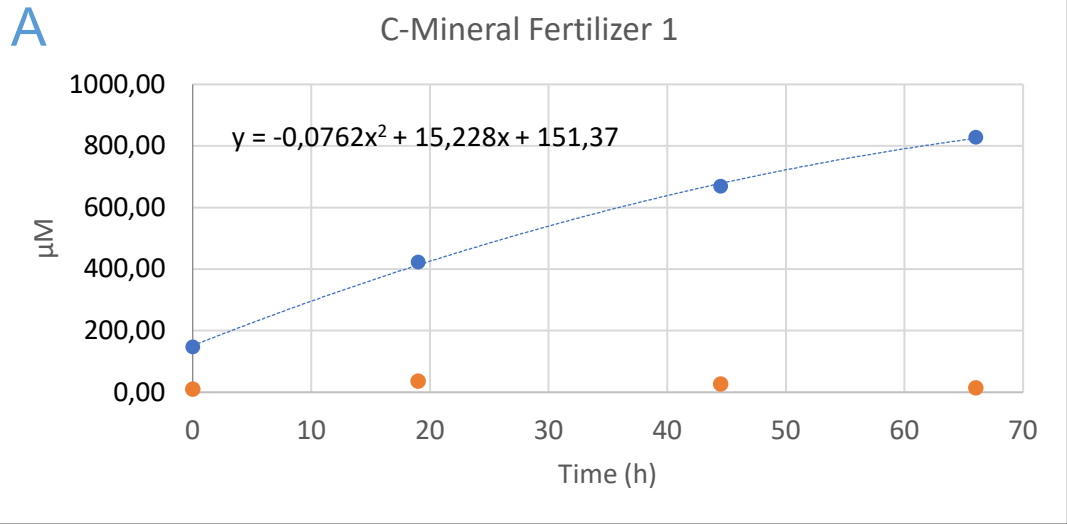


Figure S 5 The amount of nitrite (NO_2^-) (orange) and nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue) at different time points after incubation in unfertilized soil samples collected from the grass field and incubated as agitated soil slurries in the lab. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

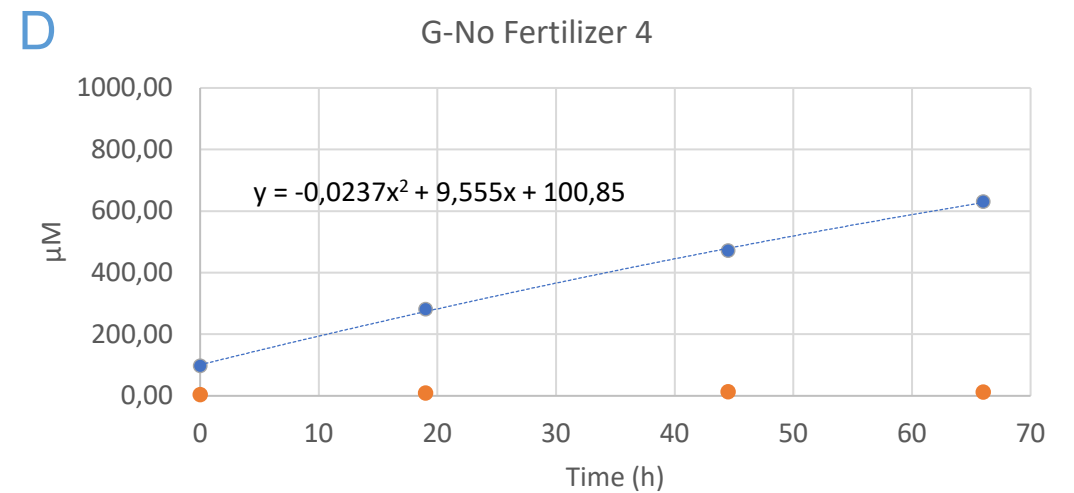
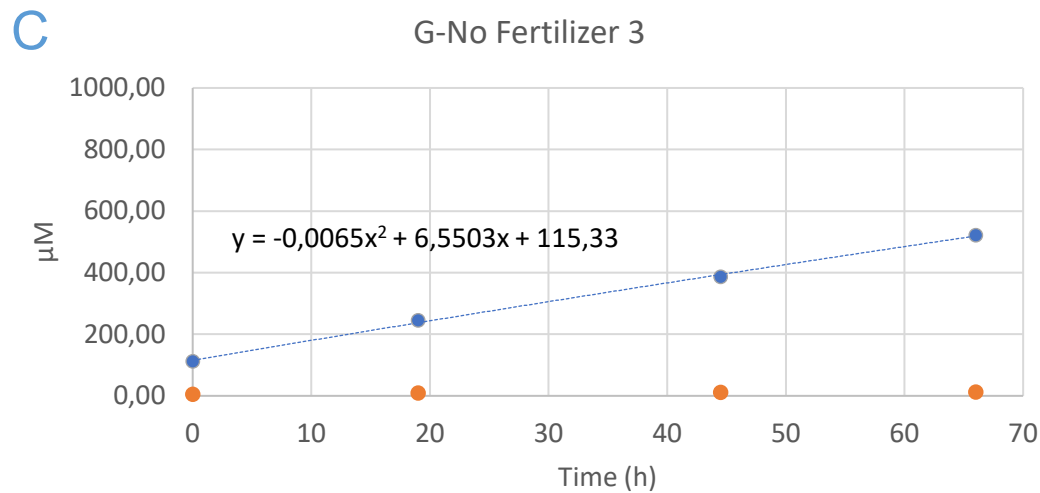
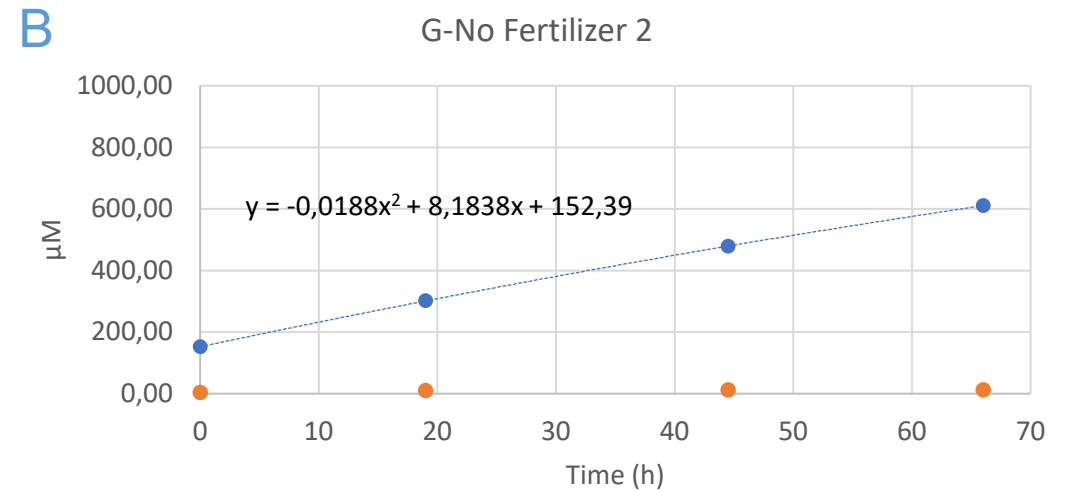
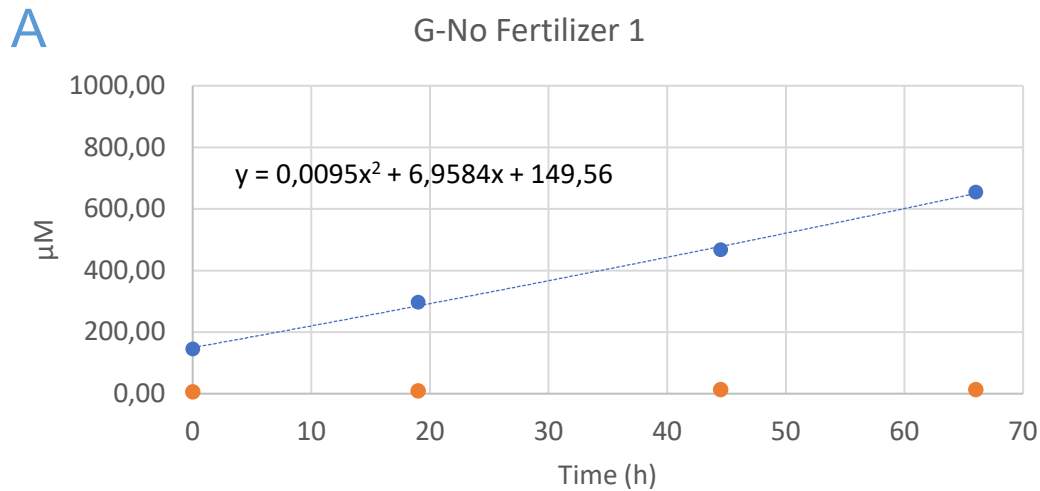


Figure S 6 The amount of nitrite (NO_2^-) (orange) and nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue) at different time points after incubation in untreated cattle slurry fertilized soil samples collected from the grass field and incubated as agitated soil slurries in the lab. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

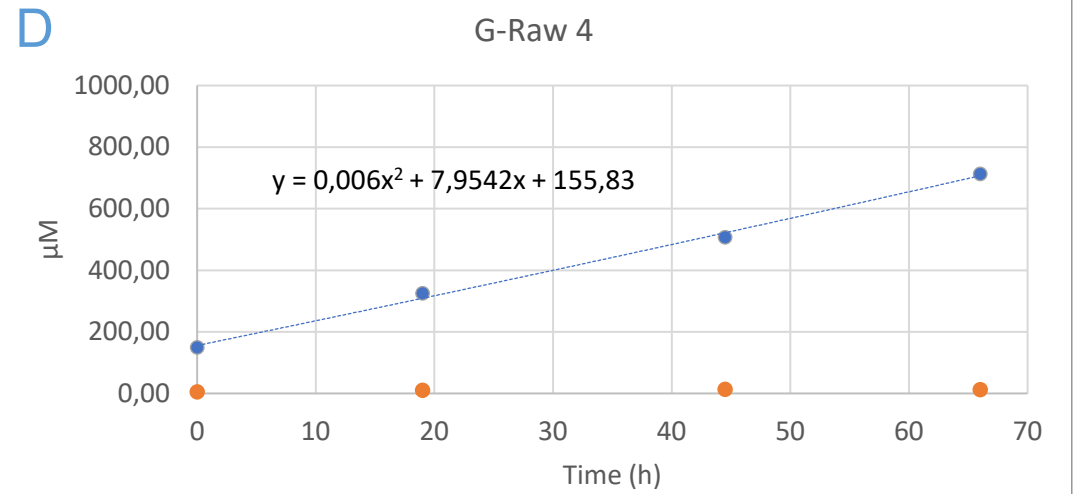
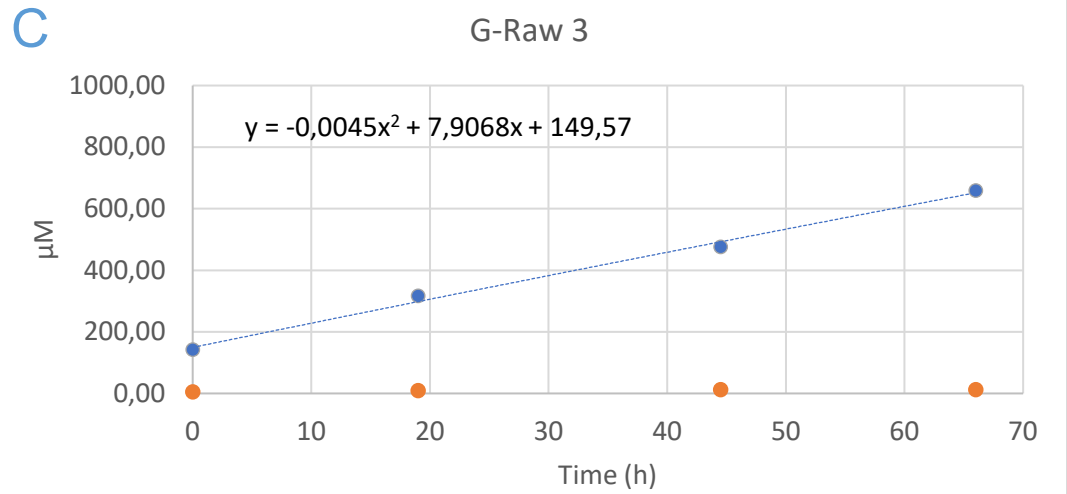
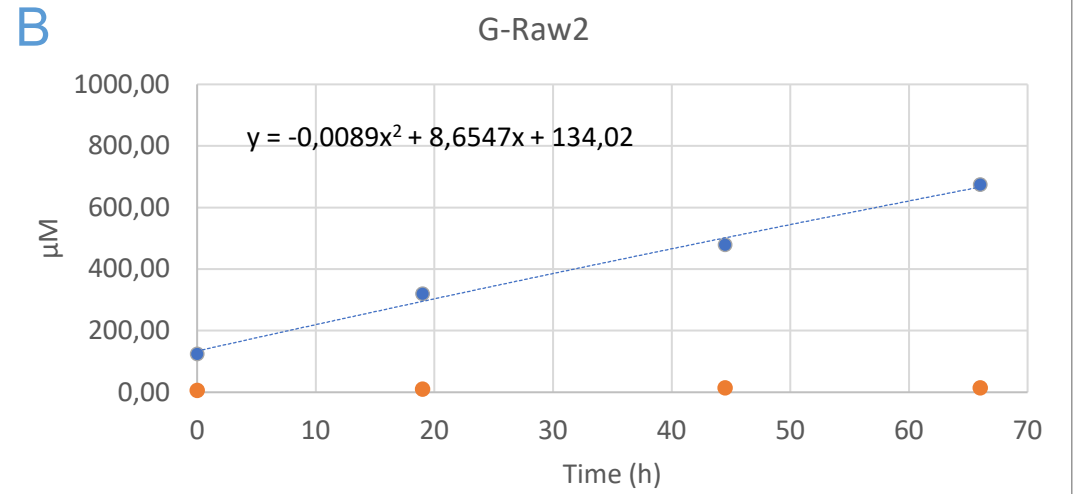
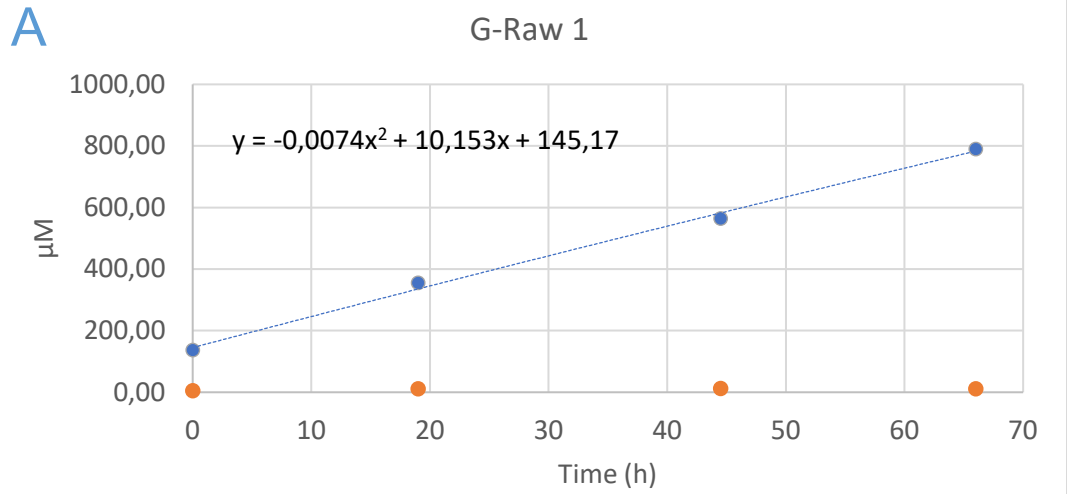


Figure S 7 The amount of nitrite (NO_2^-) (orange) and nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue) at different time points after incubation in NEO fertilized soil samples collected from the grass field and incubated as agitated soil slurries in the lab. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

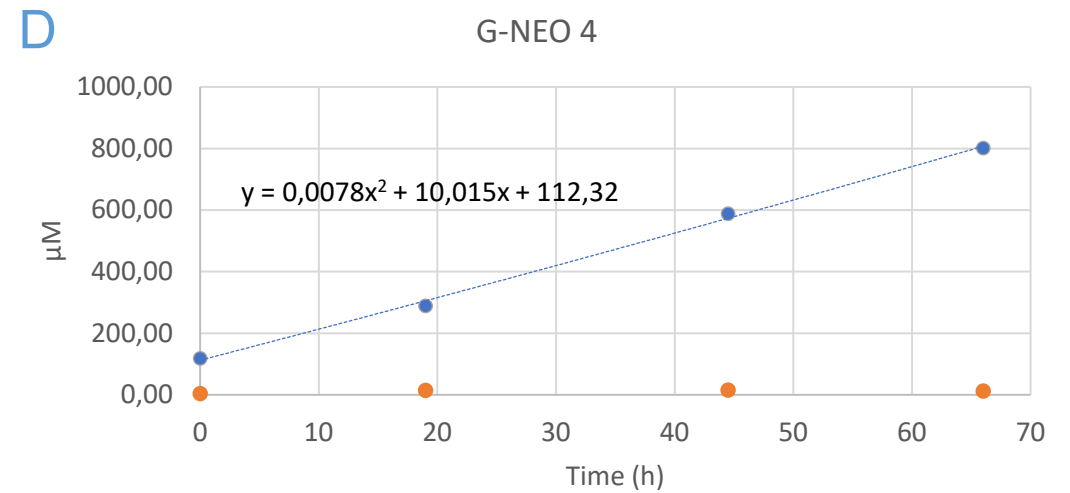
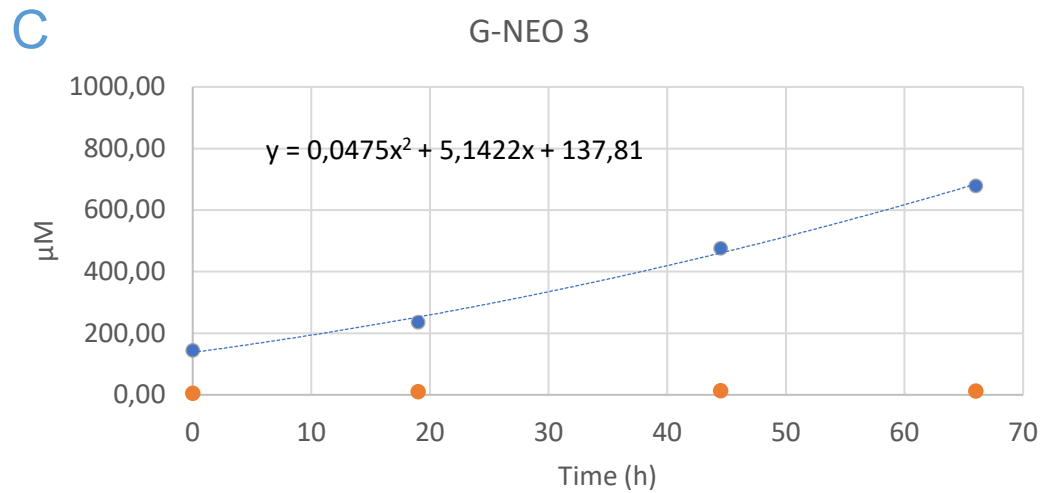
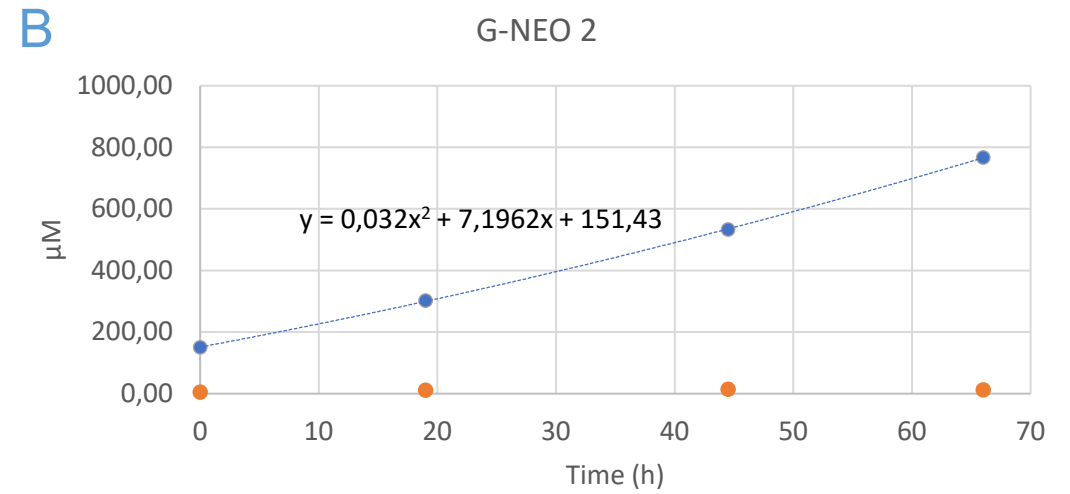
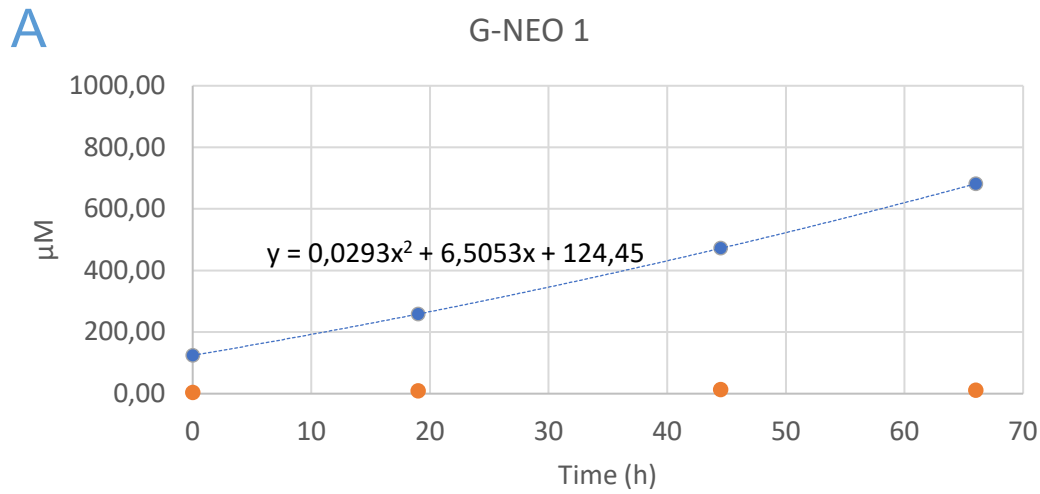


Figure S 8 The amount of nitrite (NO_2^-) (orange) and nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue) at different time points after incubation in mineral fertilizer fertilized soil samples collected from the grass field and incubated as agitated soil slurries in the lab. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

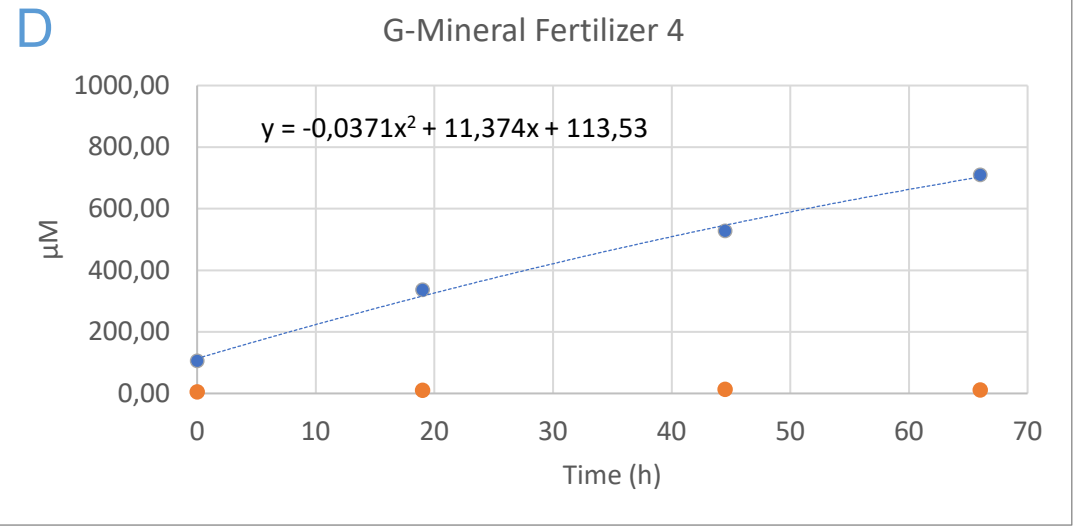
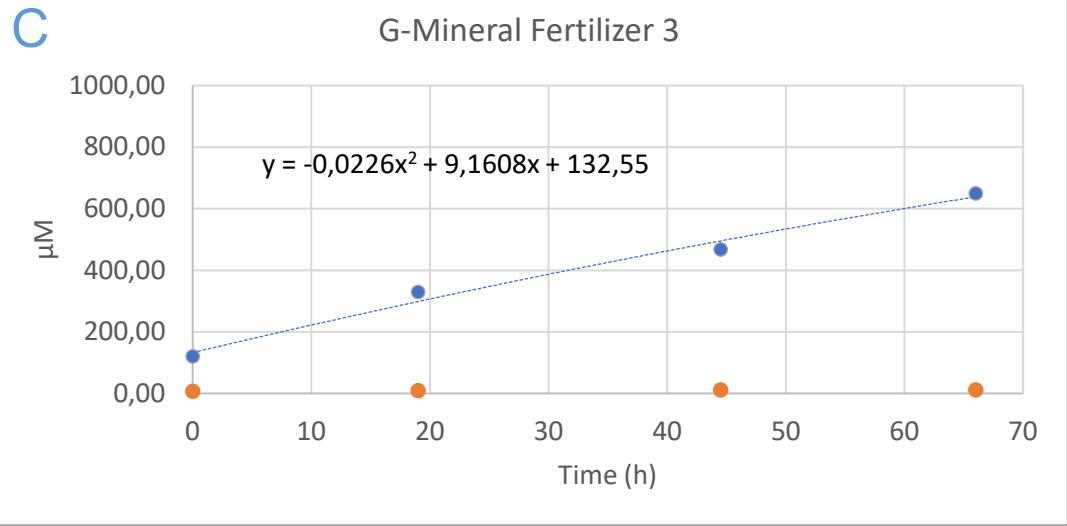
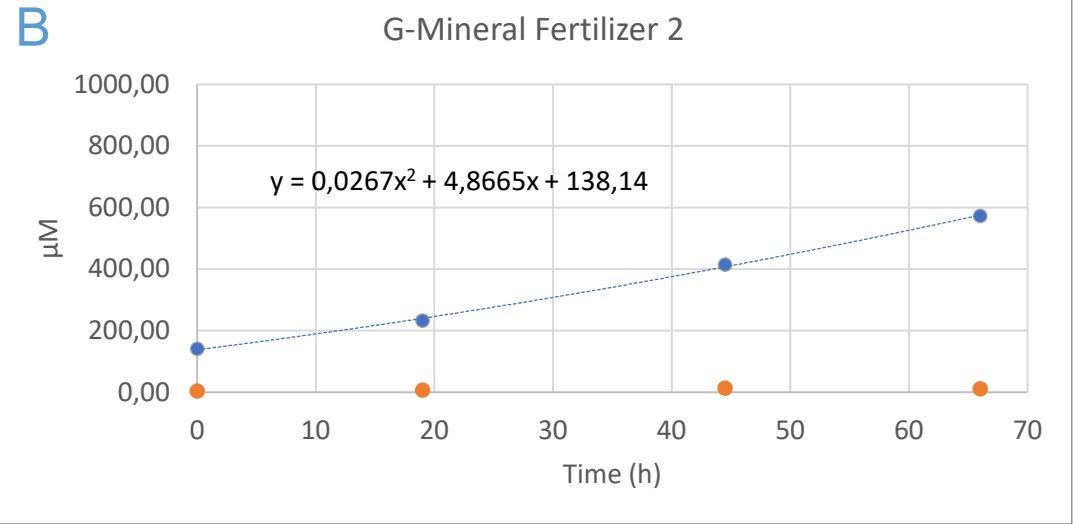
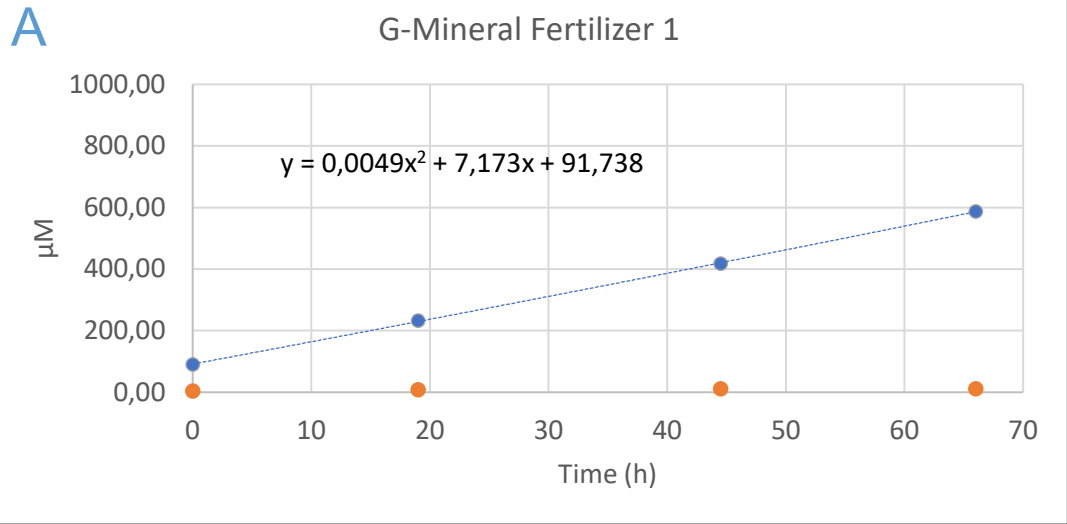


Figure S 9 The amount of nitrite (NO_2^-) (orange) and nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue) at different time points after incubation in untreated cattle slurry fertilized soil samples fertilized in the lab using the cereal field soil and incubated as agitated soil slurries. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

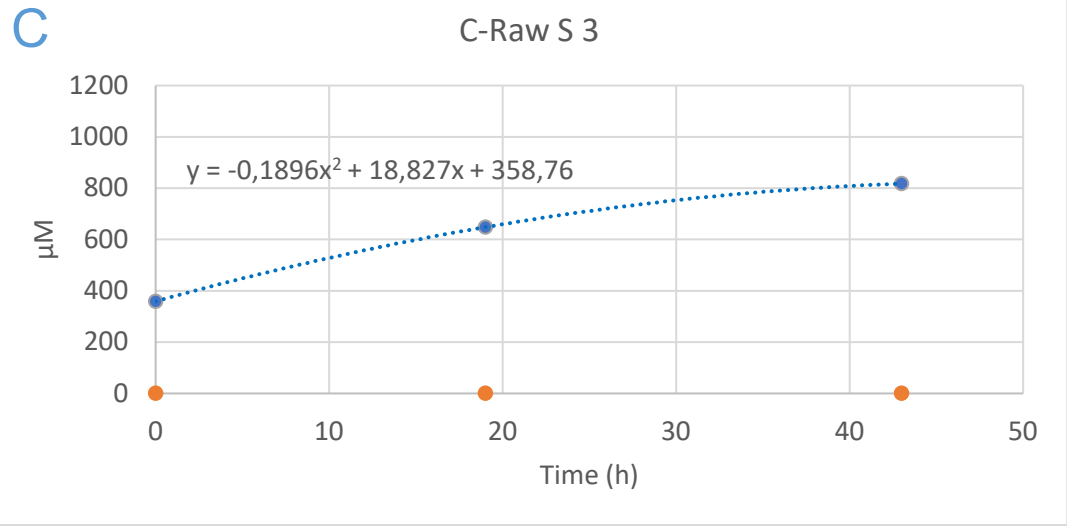
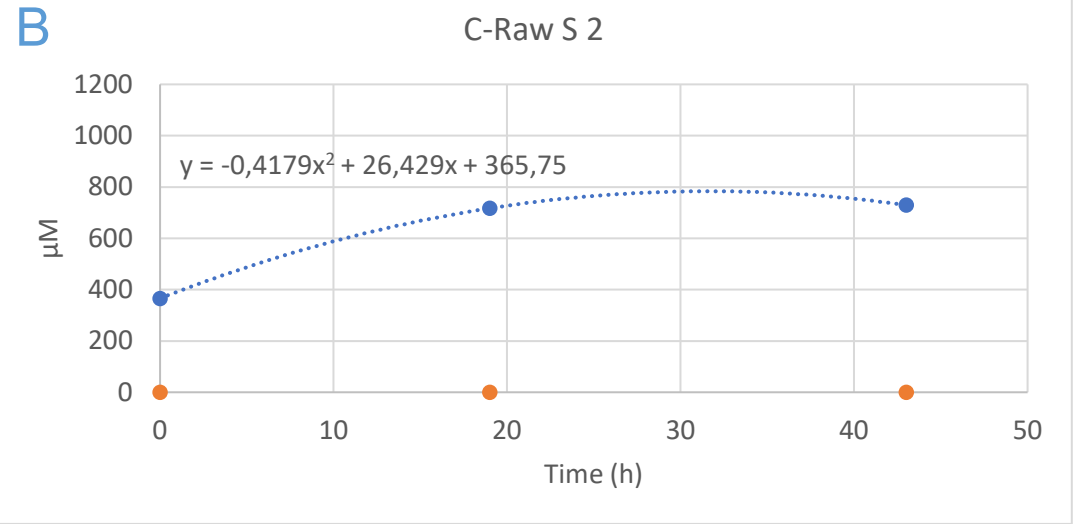
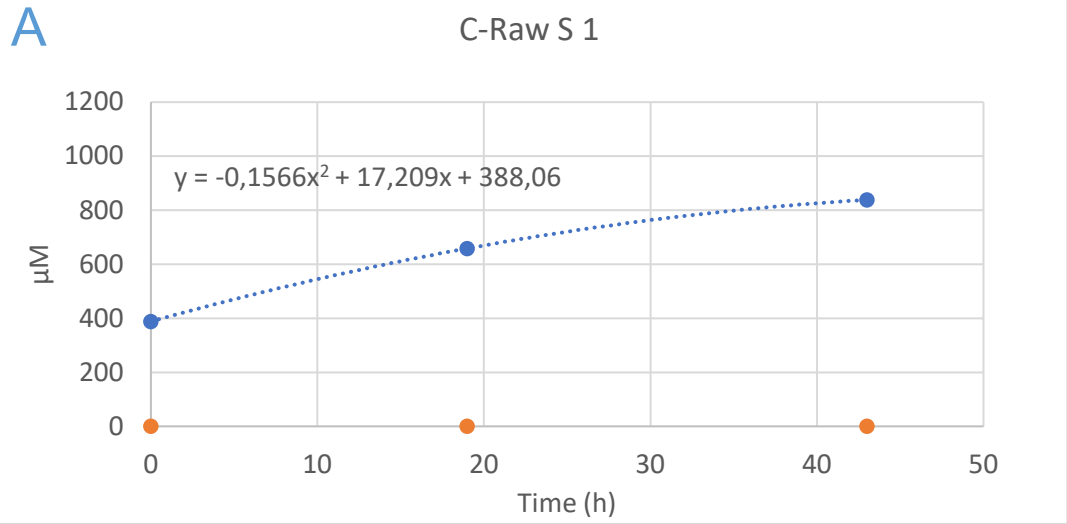


Figure S 10 The amount of nitrite (NO_2^-) (orange) and nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue) at different time points after incubation in untreated biogas digestate fertilized soil samples fertilized in the lab using the cereal field soil and incubated as agitated soil slurries. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

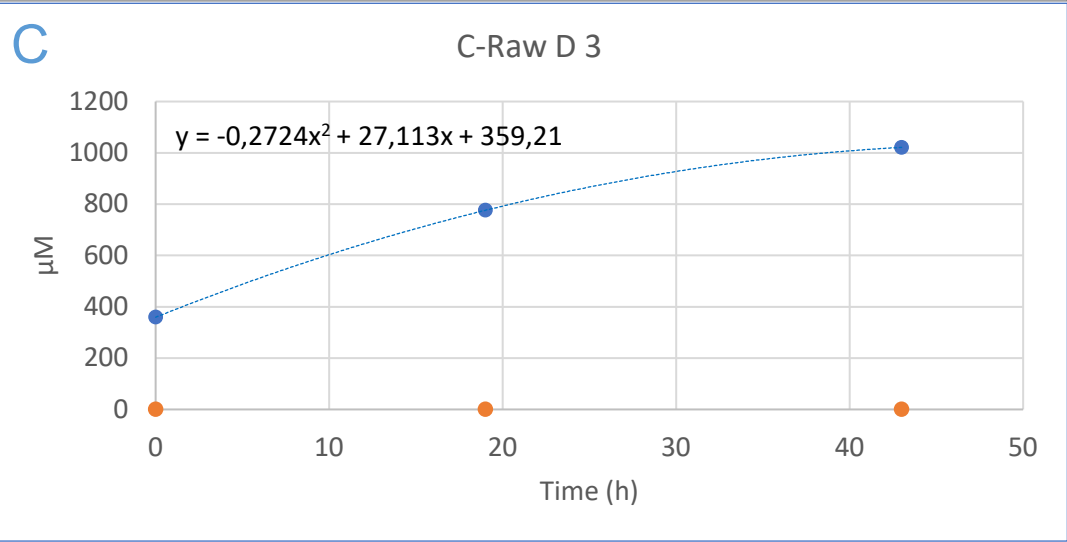
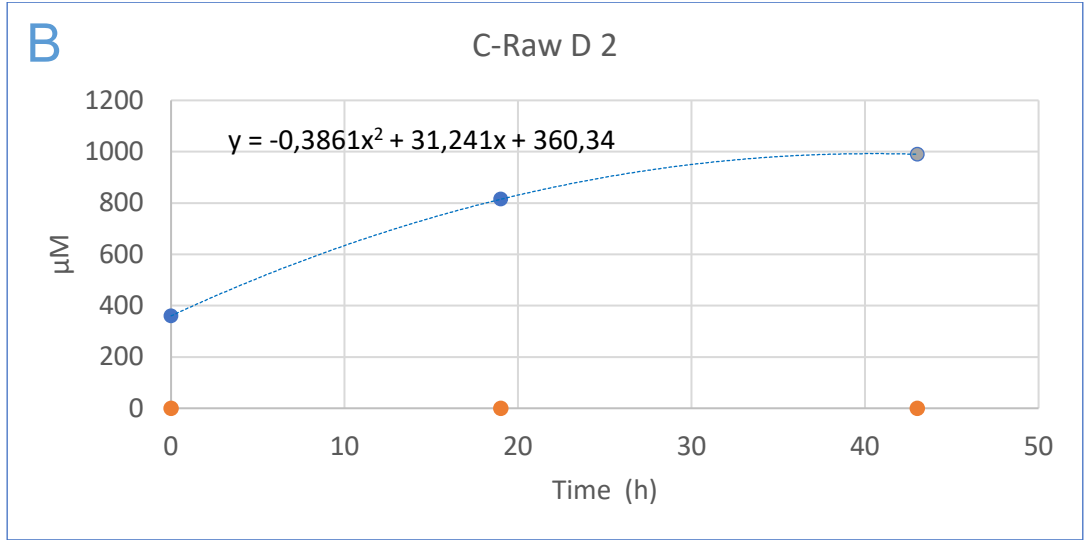
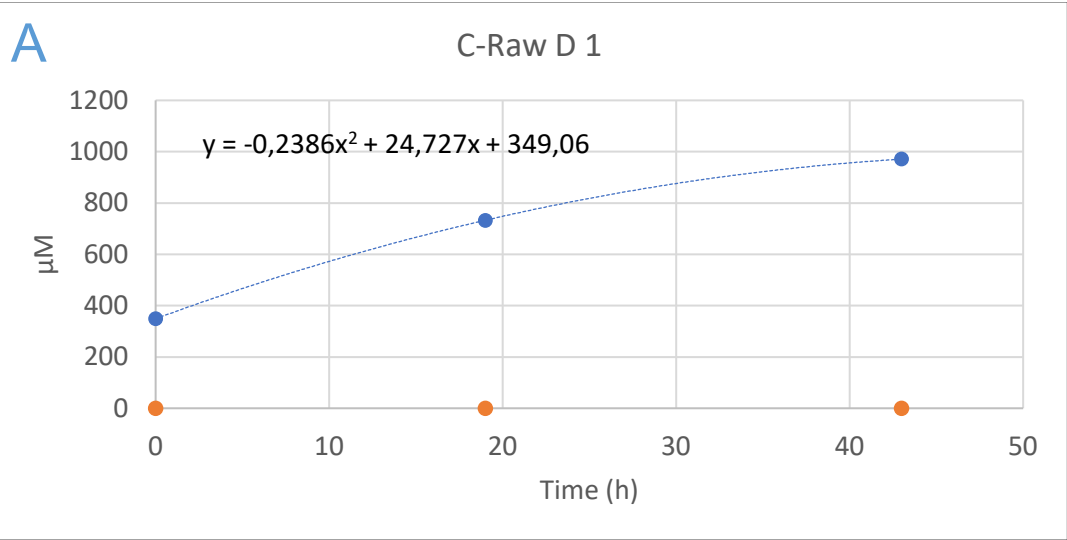


Figure S 11 The amount of nitrite (NO_2^-) (orange) and nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue) at different time points after incubation in NEO made from cattle slurry fertilized soil samples fertilized in the lab using the cereal field soil and incubated as agitated soil slurries. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

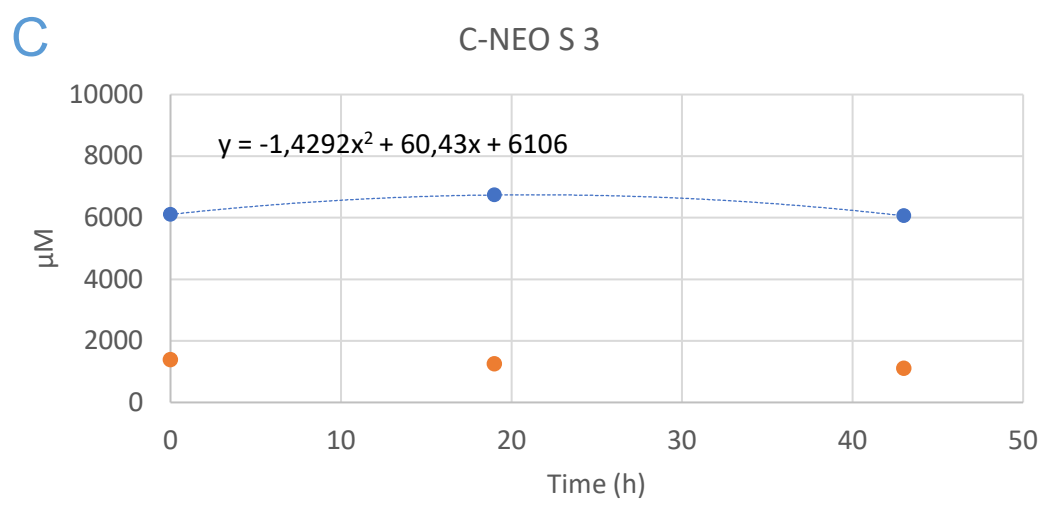
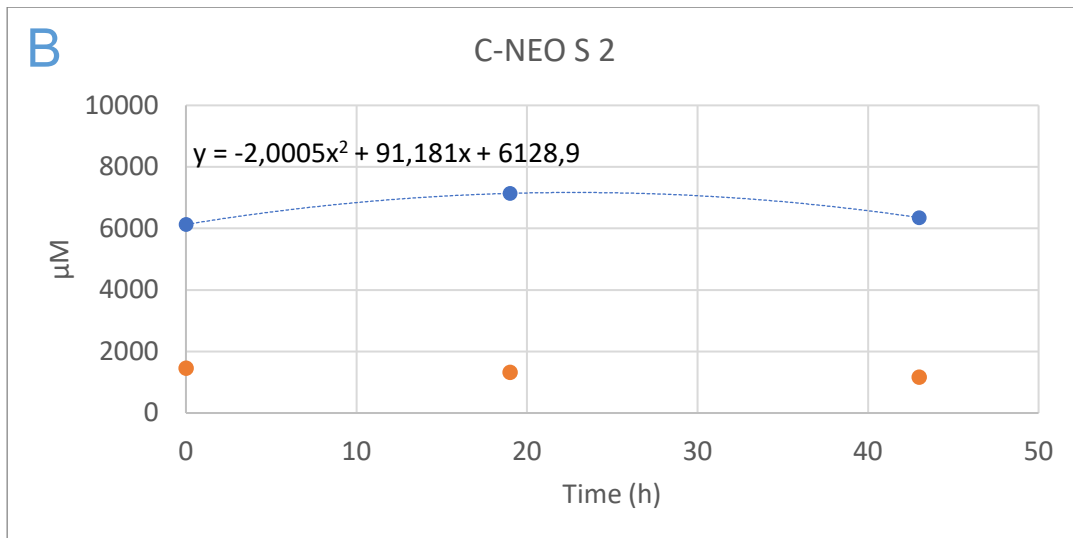
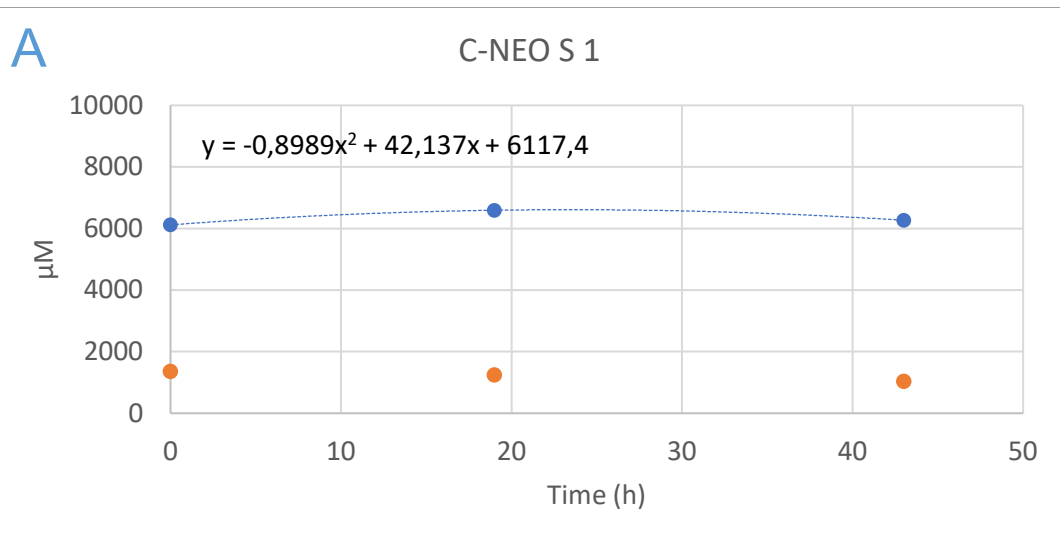


Figure S 12 The amount of nitrite (NO_2^-) (orange) and nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue) at different time points after incubation in NEO made from biogas digestate fertilized soil samples fertilized in the lab using the cereal field soil and incubated as agitated soil slurries. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

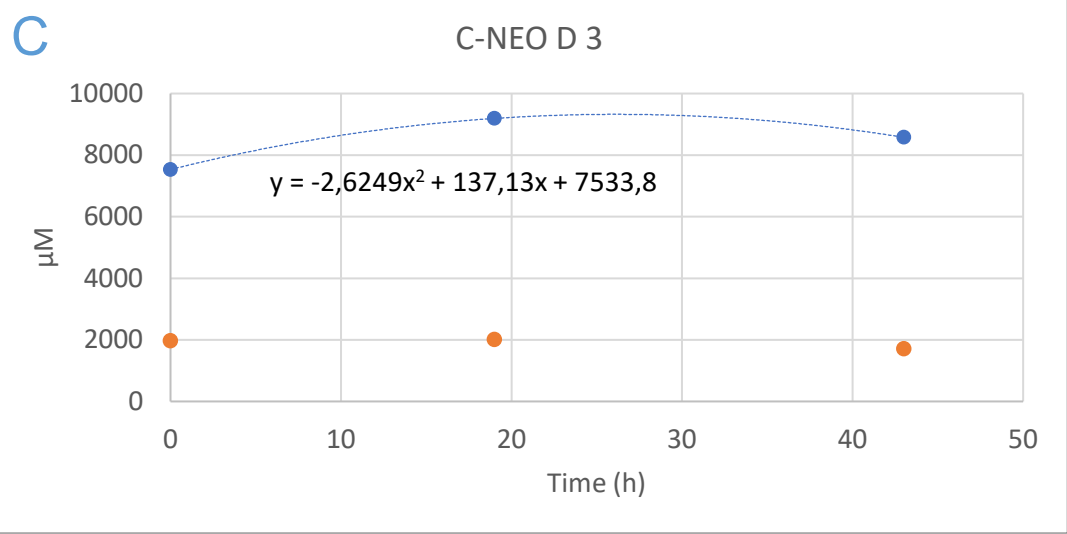
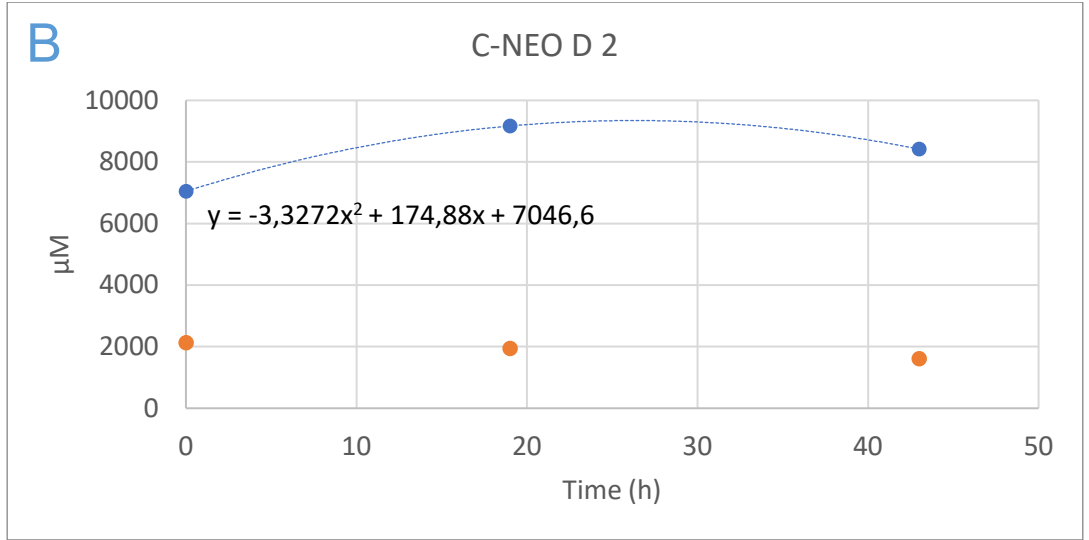
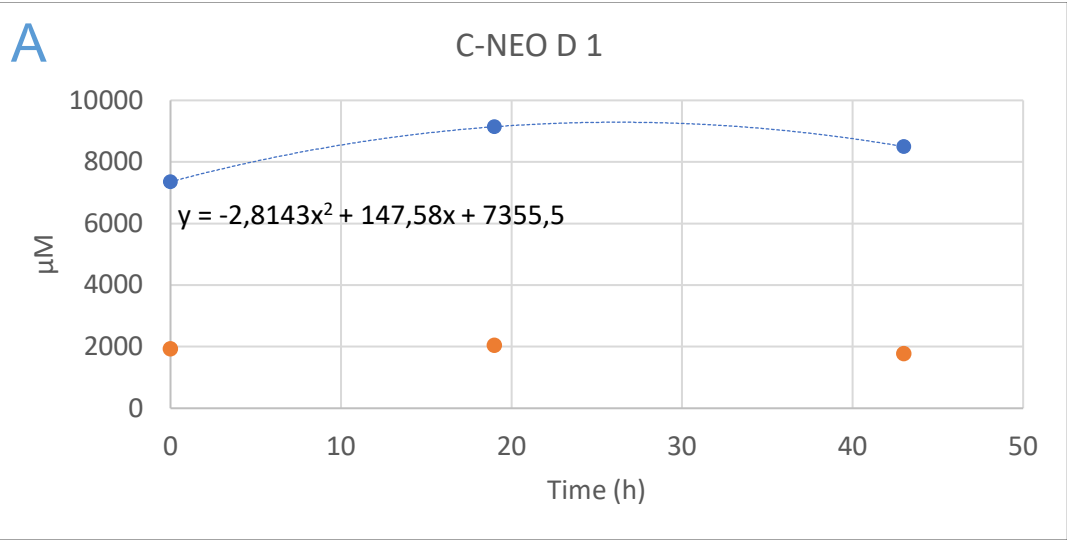


Figure S 13 The amount of nitrite (NO_2^-) (orange) and nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue) at different time points after incubation in acidified untreated cattle slurry fertilized soil samples fertilized in the lab using the cereal field soil and incubated as agitated soil slurries. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

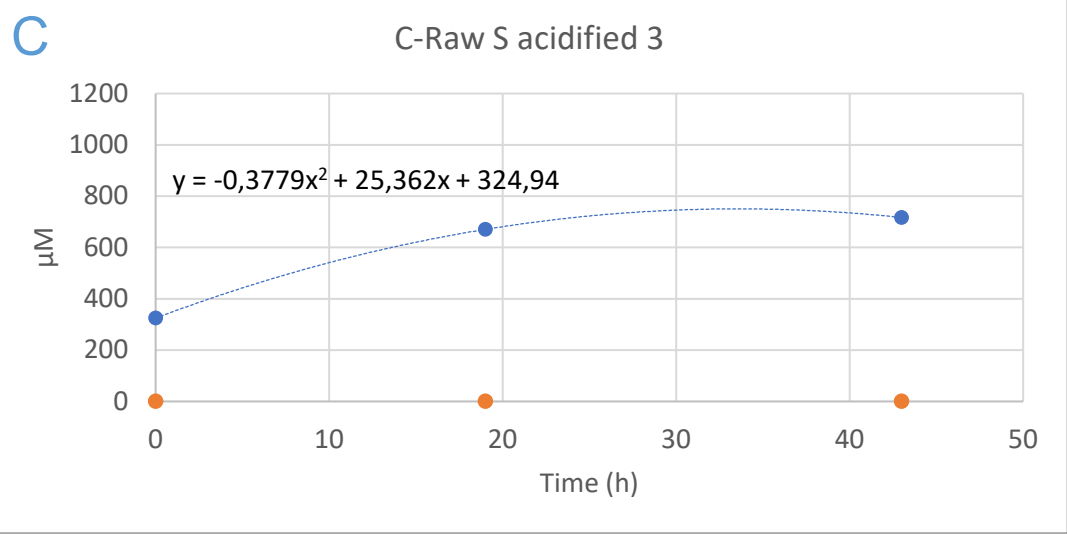
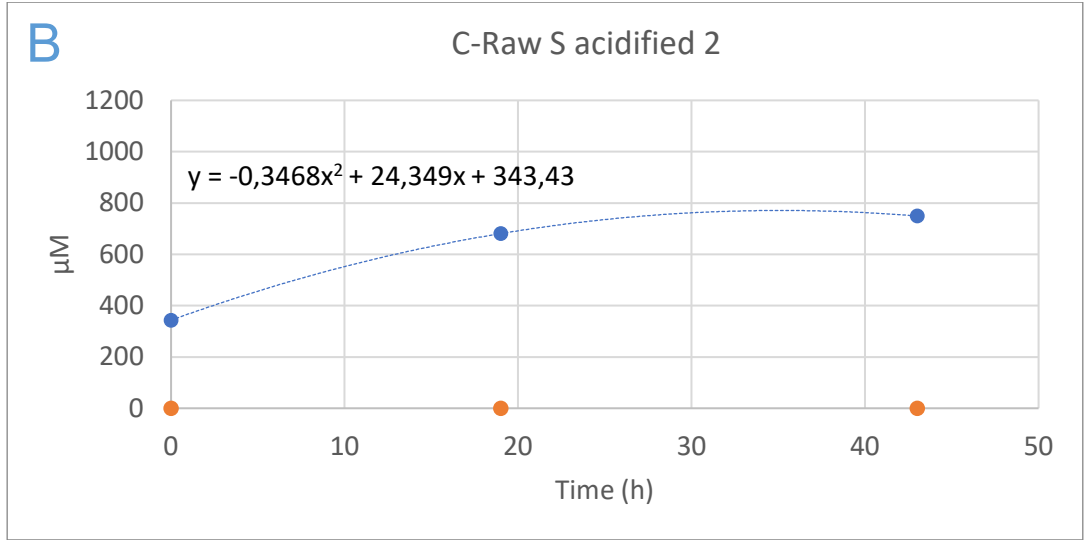
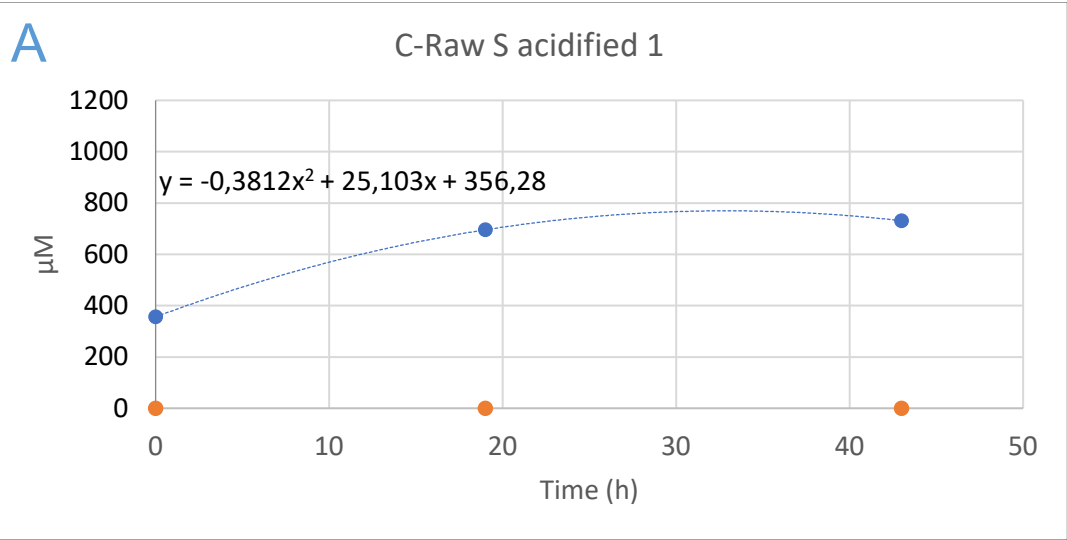


Figure S 14 The amount of nitrite (NO_2^-) (orange) and nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue) at different time points after incubation in acidified ammonium chloride fertilized soil samples fertilized in the lab using the cereal field soil and incubated as agitated soil slurries. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

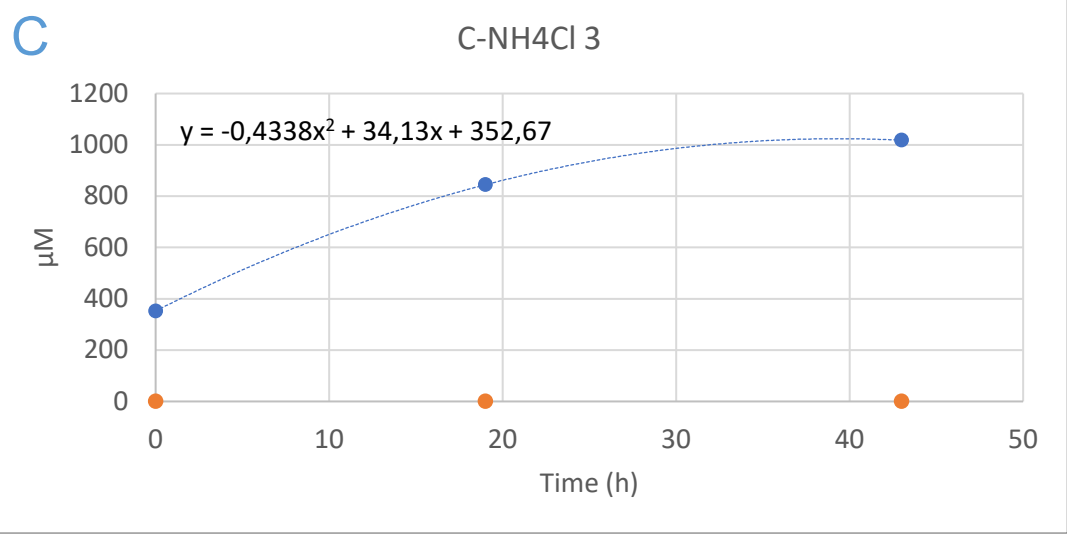
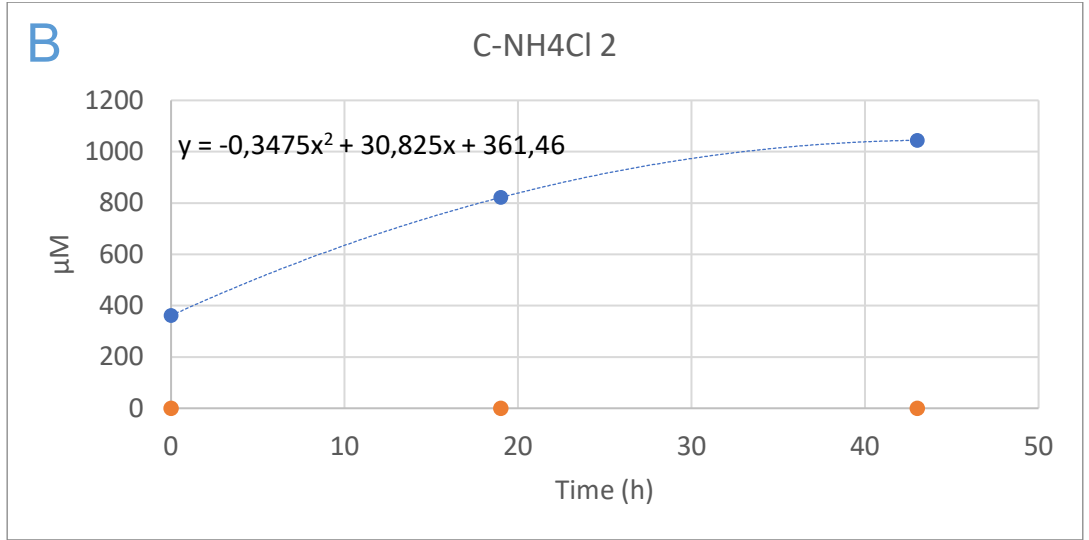
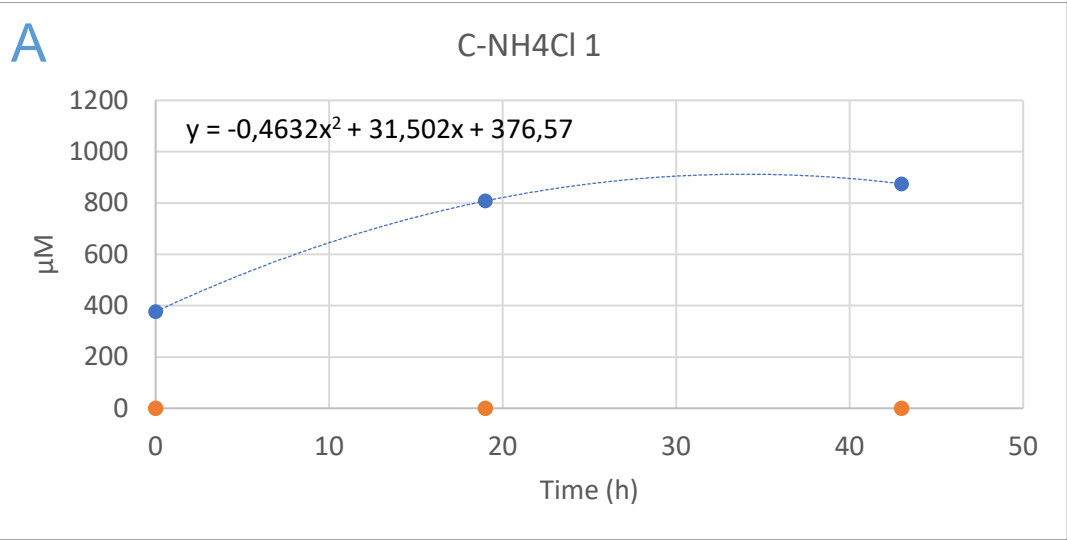


Figure S 15 The amount of nitrite (NO_2^-) (orange) and nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue) at different time points after incubation in untreated cattle slurry fertilized soil samples fertilized in the lab using the grass field soil and incubated as agitated soil slurries. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

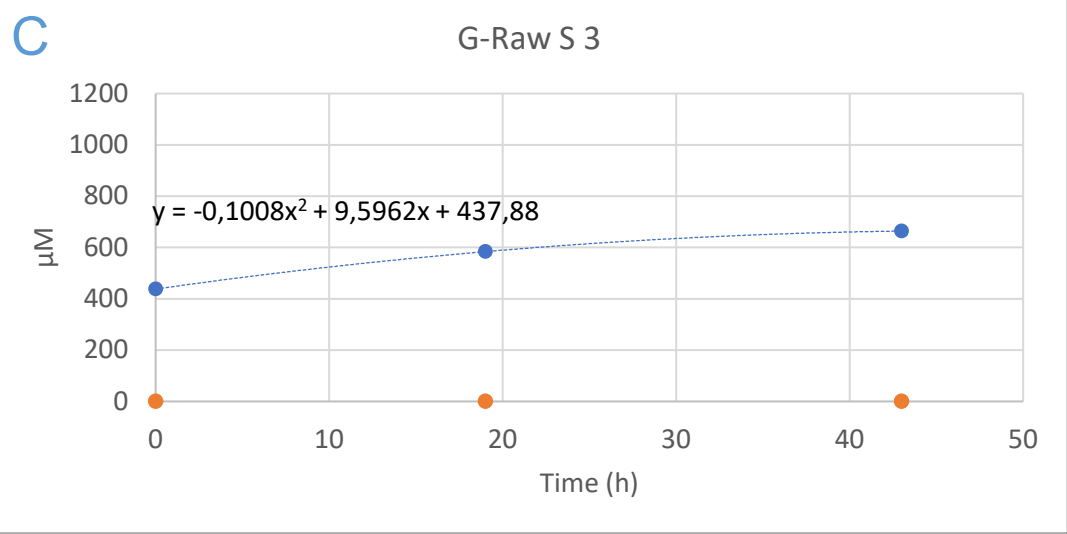
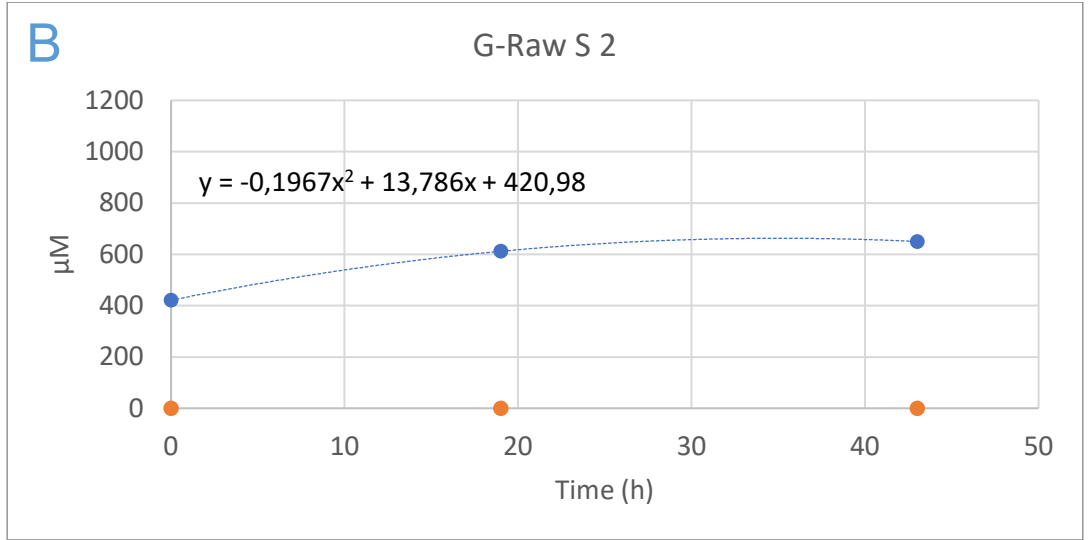
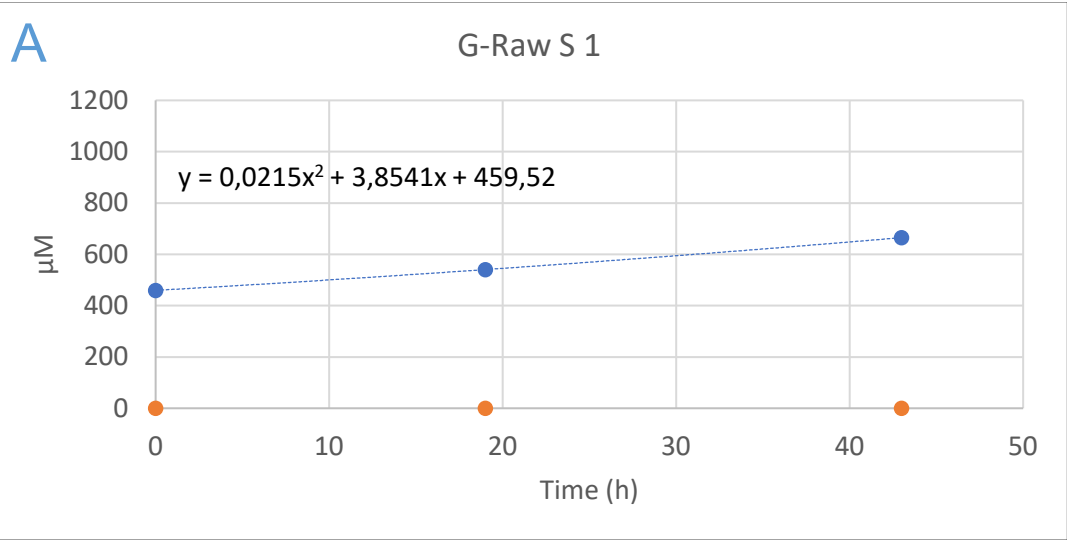


Figure S 16 The amount of nitrite (NO_2^-) (orange) and nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue) at different time points after incubation in untreated biogas digestate fertilized soil samples fertilized in the lab using the grass field soil and incubated as agitated soil slurries. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

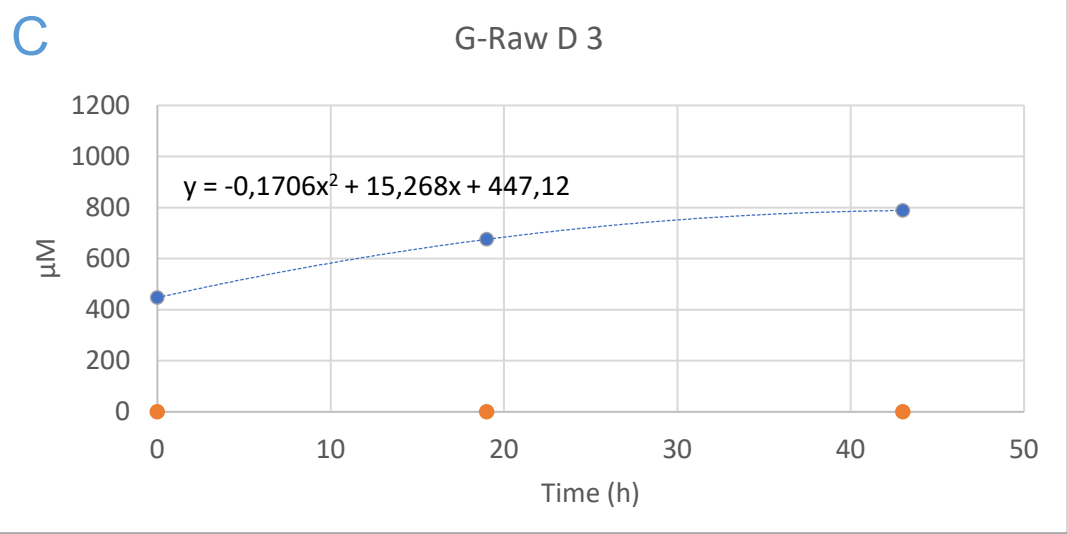
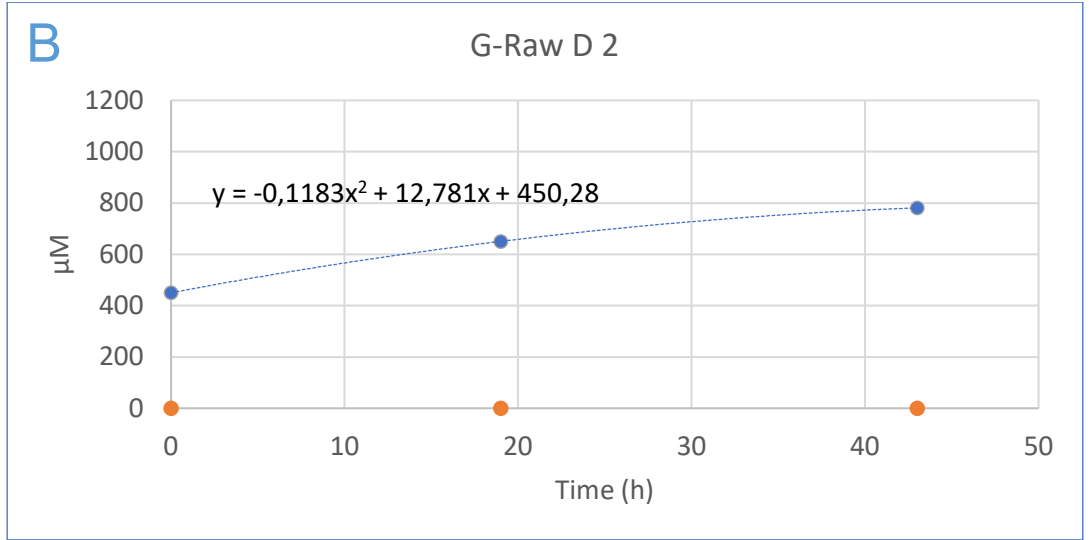
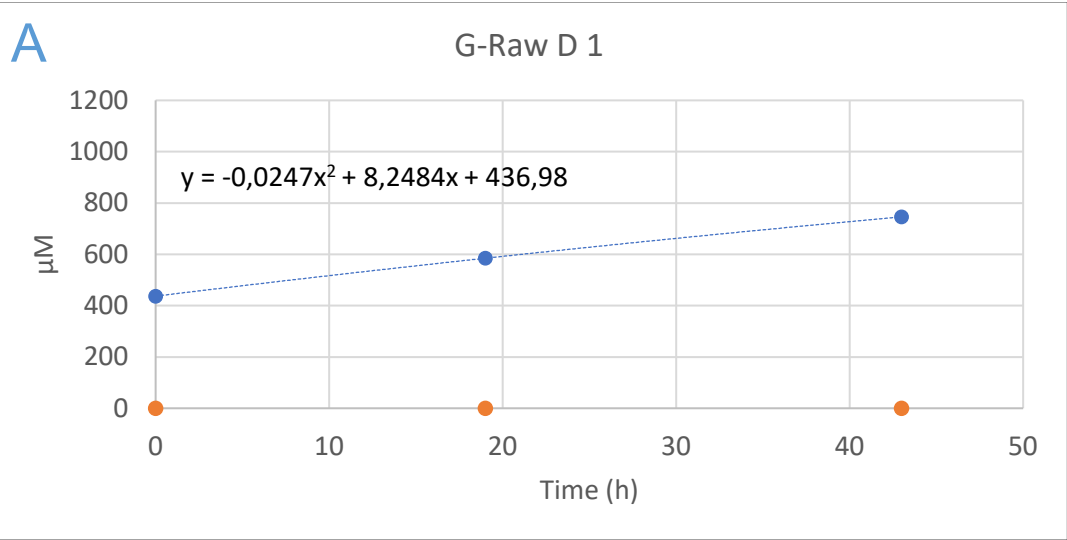


Figure S 17 The amount of nitrite (NO_2^-) (orange) and nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue) at different time points after incubation in NEO made from cattle slurry fertilized soil samples fertilized in the lab using the grass field soil and incubated as agitated soil slurries. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

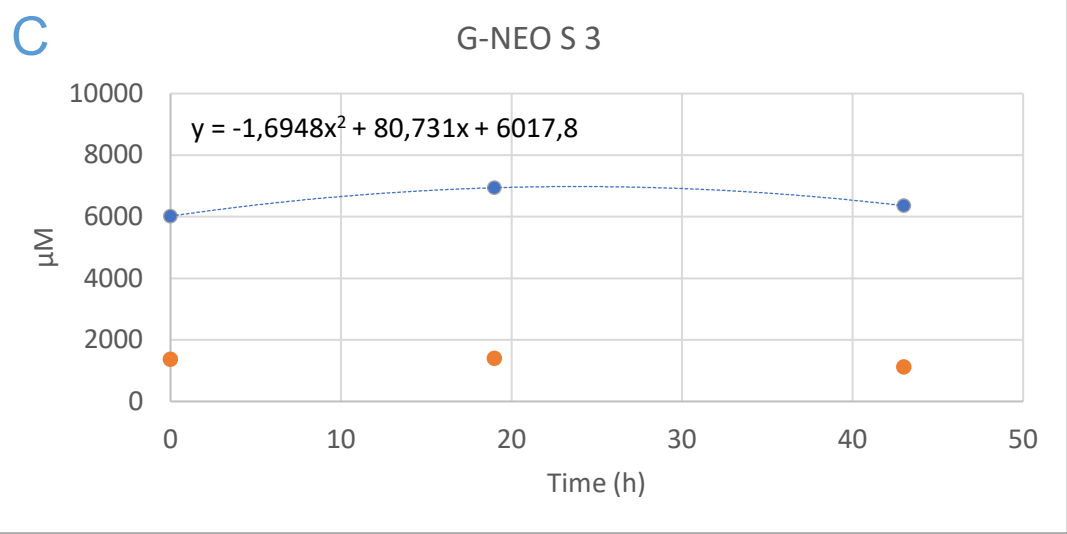
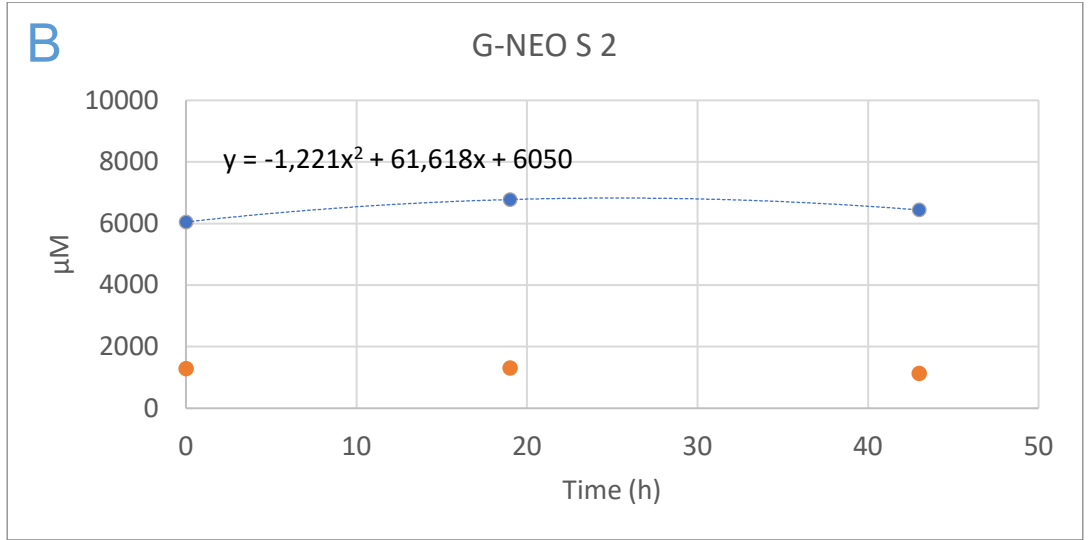
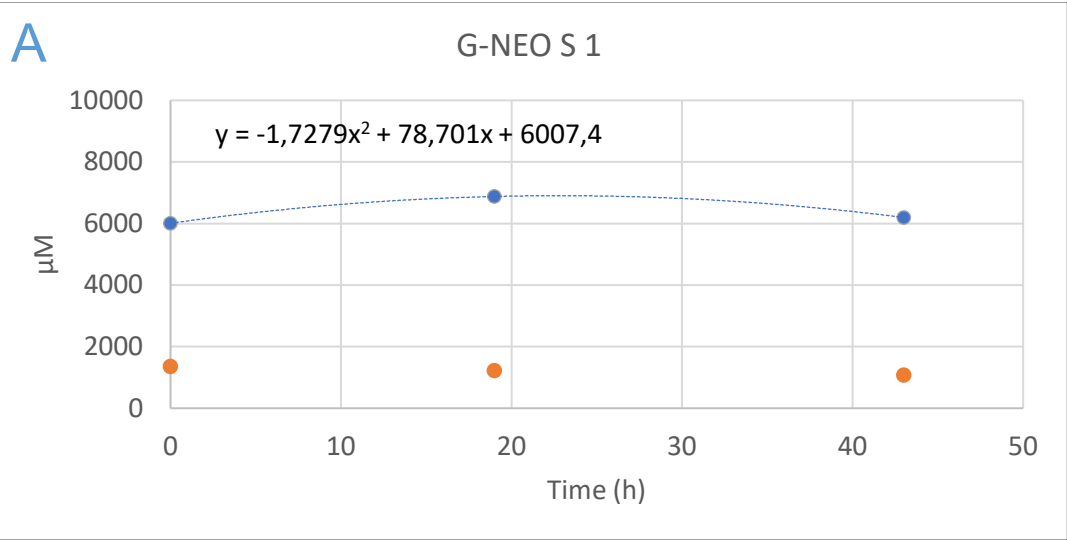


Figure S 18 The amount of nitrite (NO_2^-) (orange) and nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue) at different time points after incubation in NEO made from biogas digestate fertilized soil samples fertilized in the lab using the grass field soil and incubated as agitated soil slurries. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

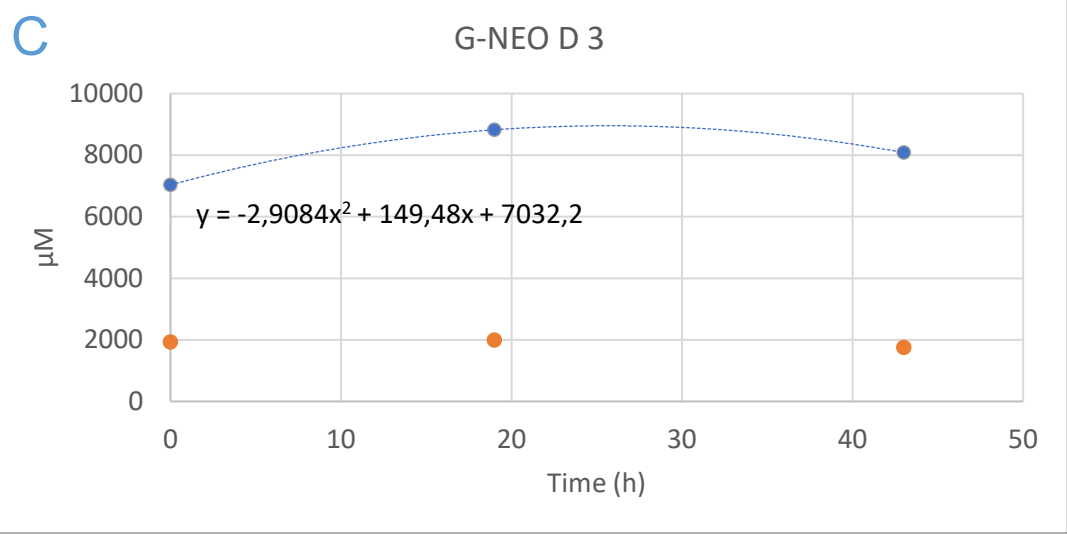
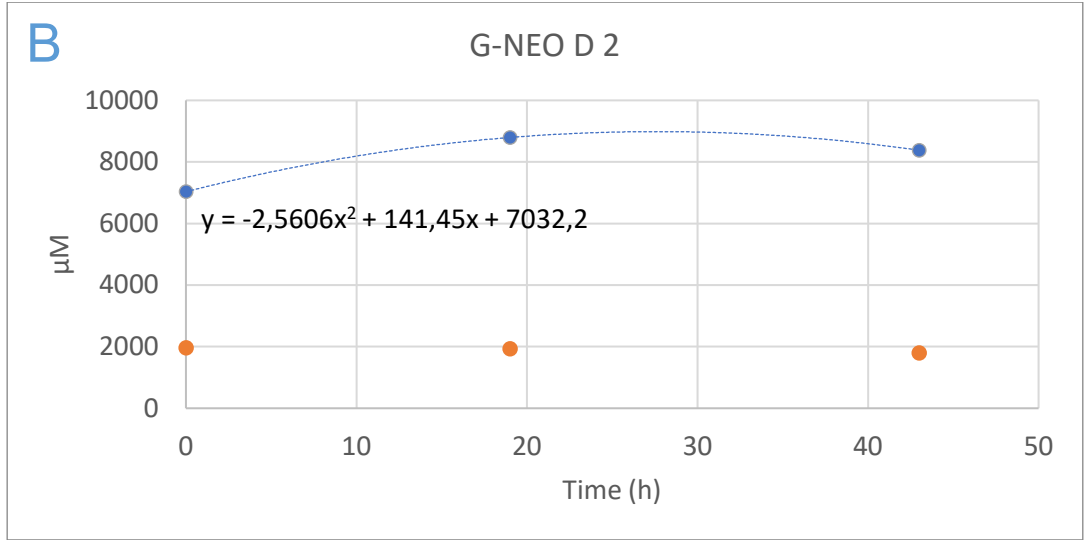
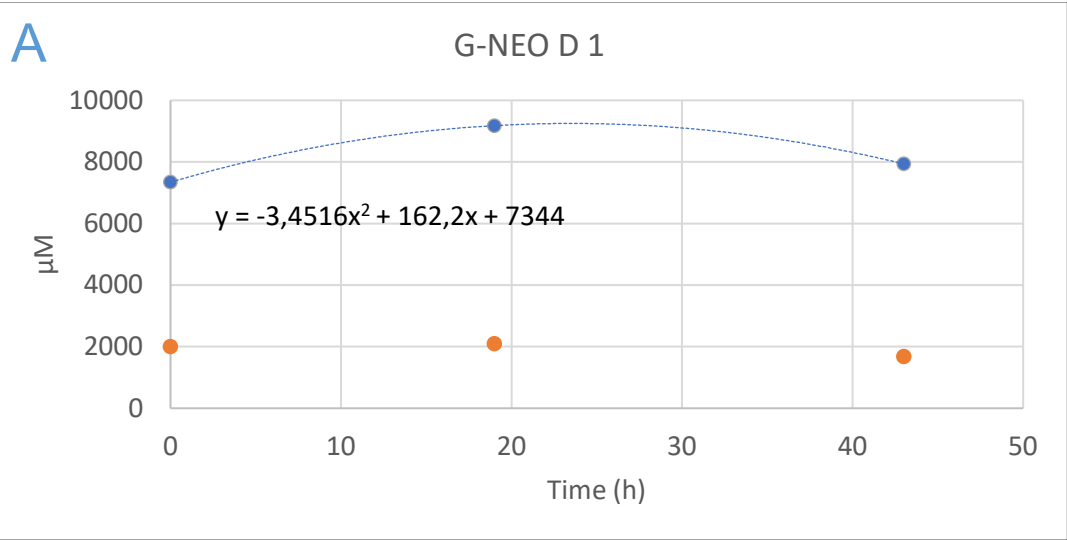


Figure S 19 The amount of nitrite (NO_2^-) (orange) and nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue) at different time points after incubation in acidified untreated cattle slurry fertilized soil samples fertilized in the lab using the grass field soil and incubated as agitated soil slurries. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

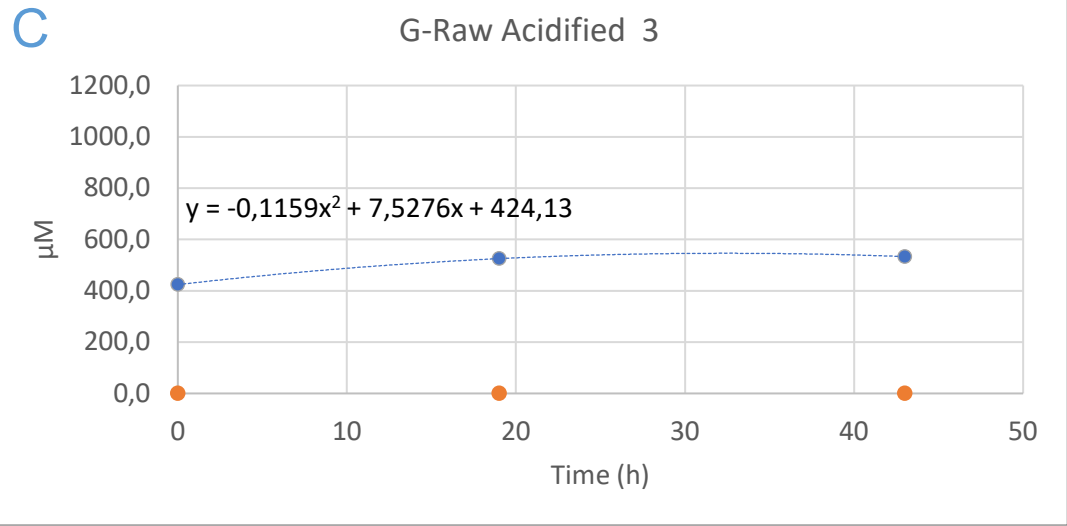
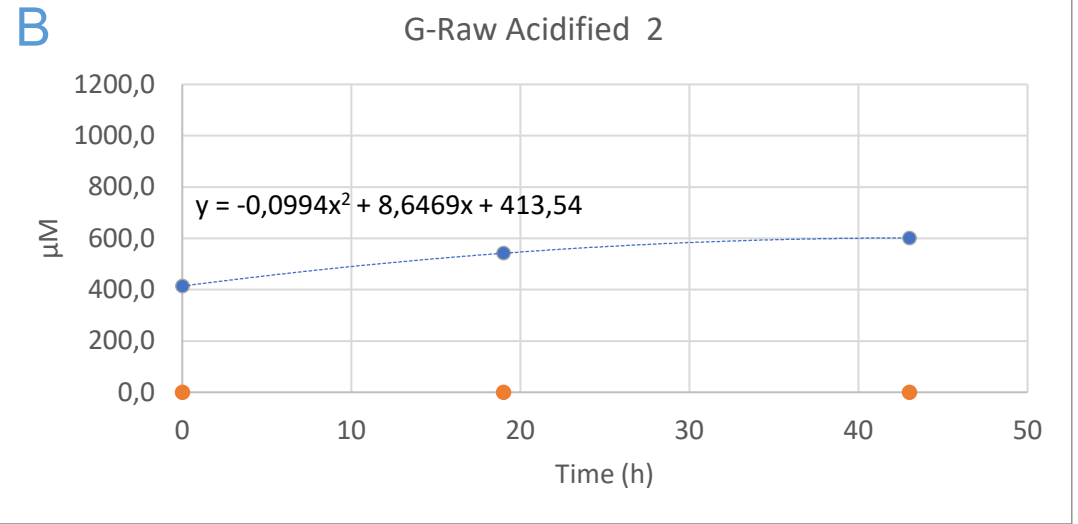
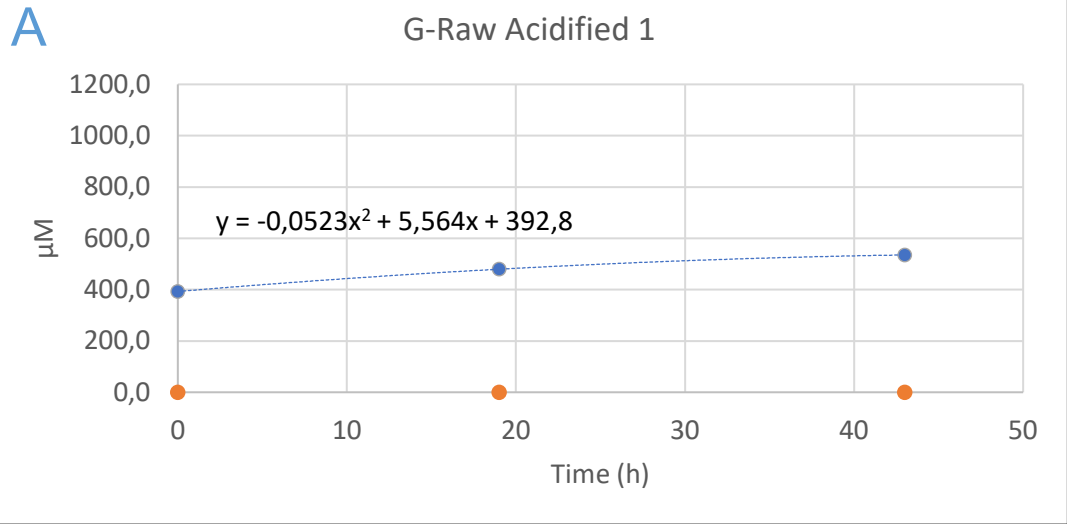


Figure S 20 The amount of nitrite (NO_2^-) (orange) and nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue) at different time points after incubation in ammonium chloride fertilized soil samples fertilized in the lab using the grass field soil and incubated as agitated soil slurries. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

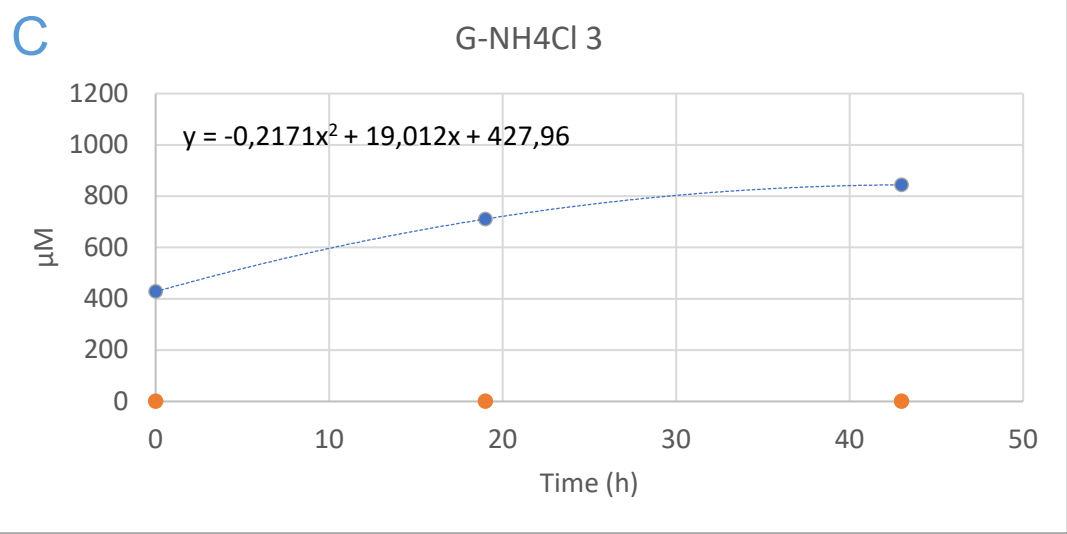
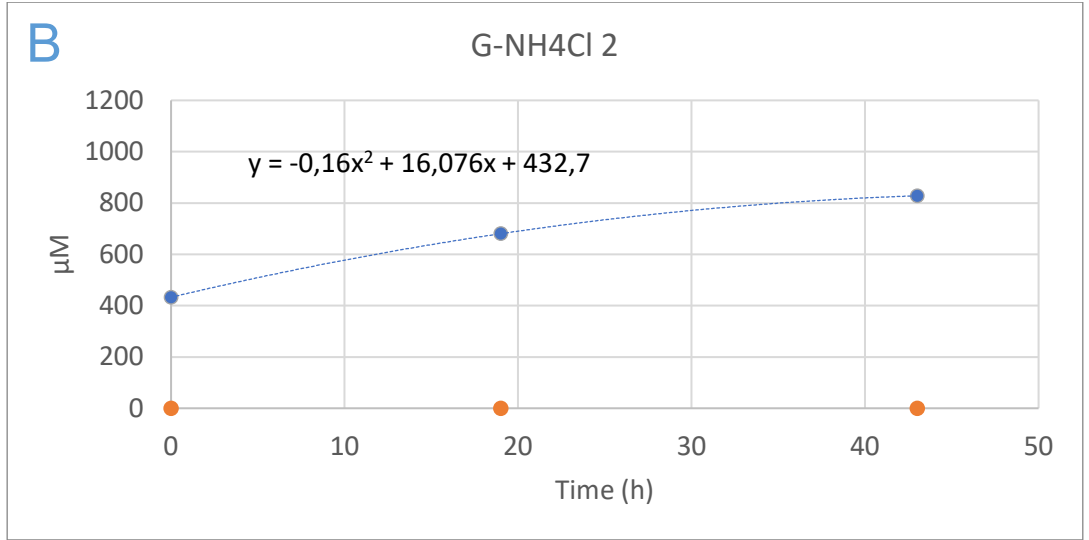
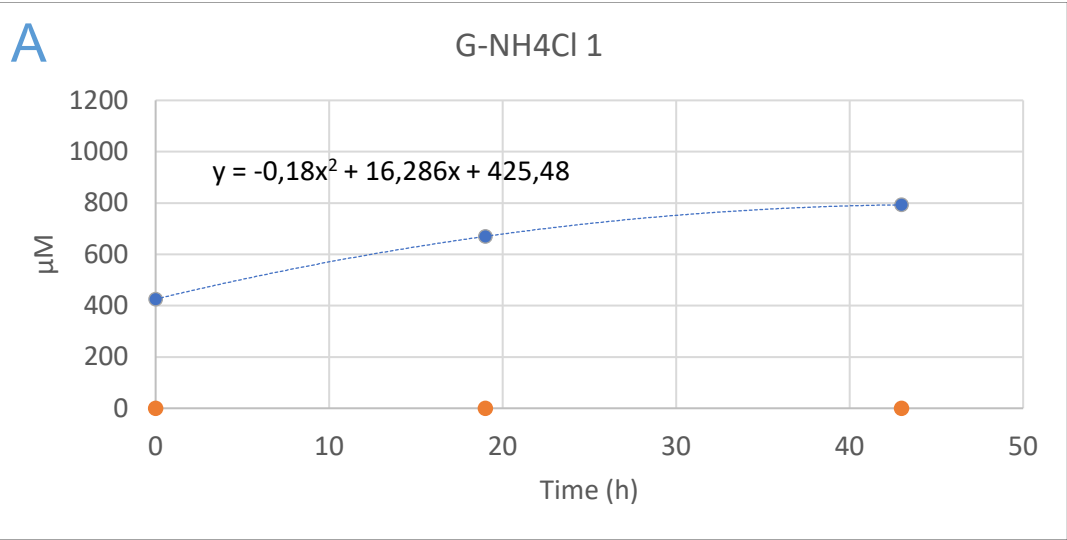


Figure S 21 The amount of nitrite (NO_2^-) (orange), nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue), at different time points after incubation in untreated cattle slurry fertilized soil samples fertilized in the lab using the cereal field soil and incubated as non-agitated loosely placed soil. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

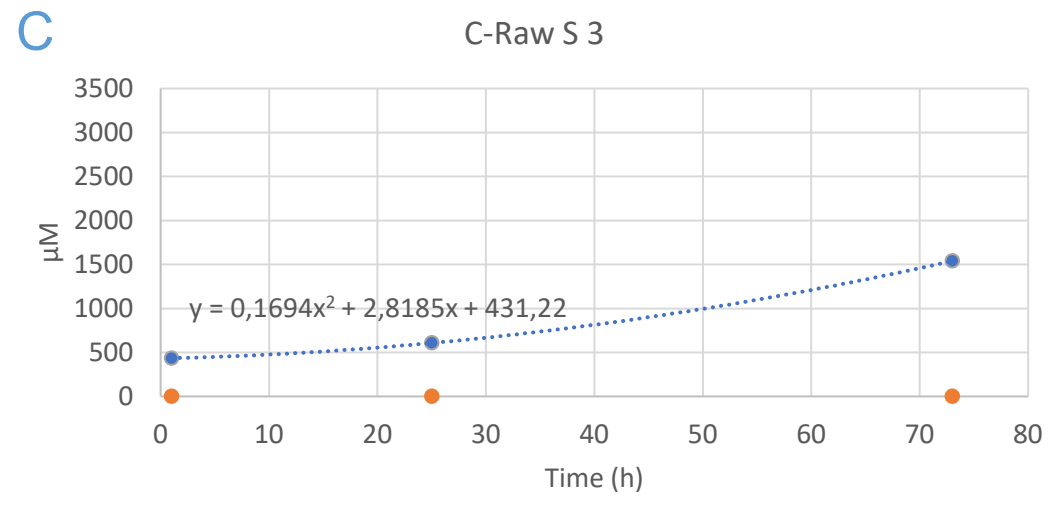
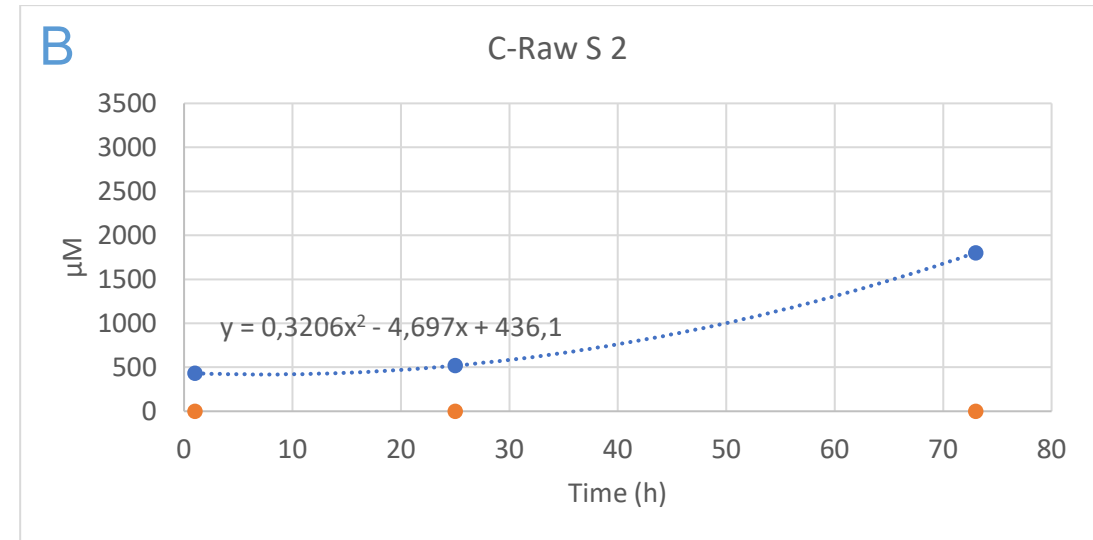
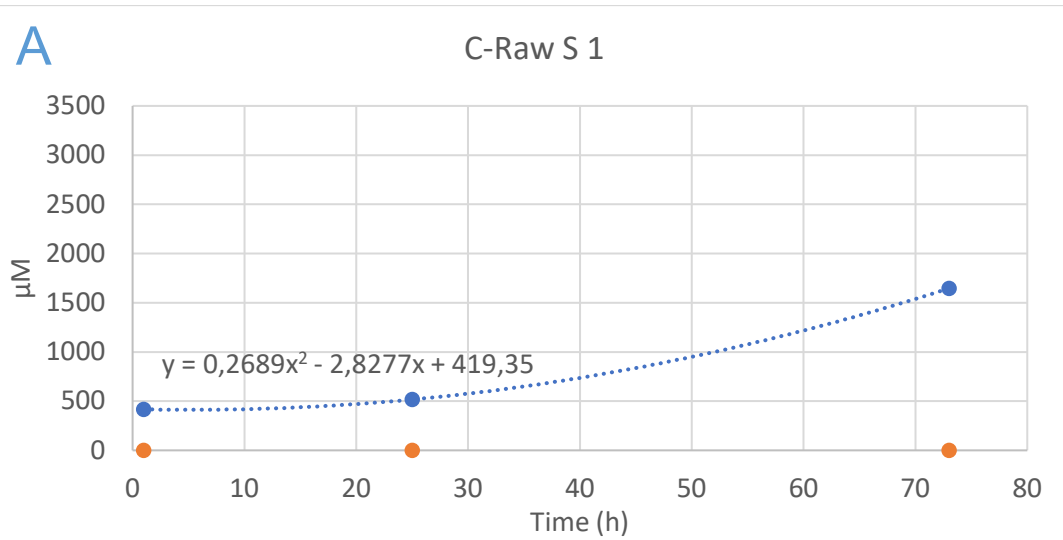


Figure S 22 The amount of nitrite (NO_2^-) (orange), nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue), at different time points after incubation in untreated biogas digestate fertilized soil samples fertilized in the lab using the cereal field soil and incubated as non-agitated loosely placed soil. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

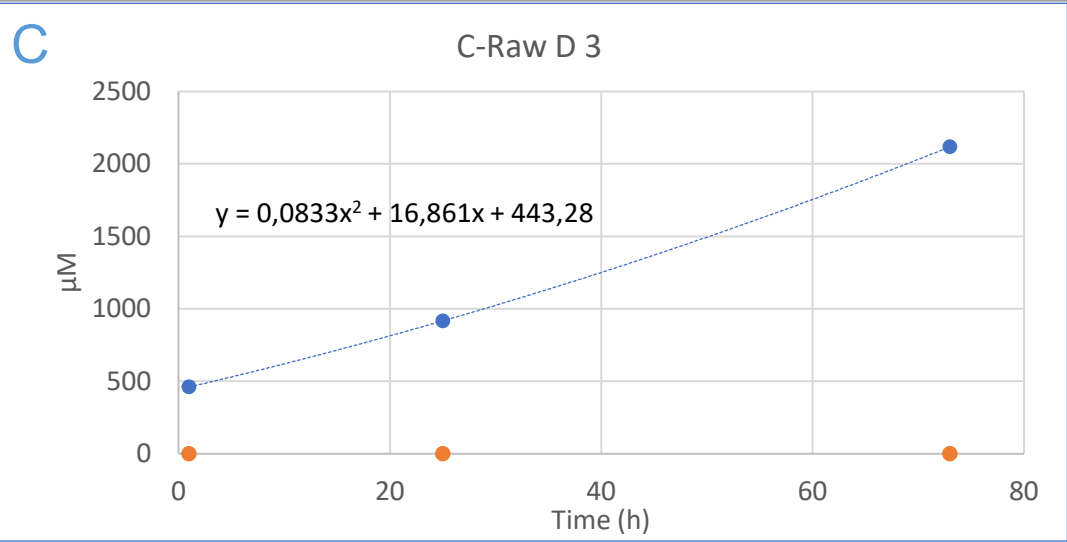
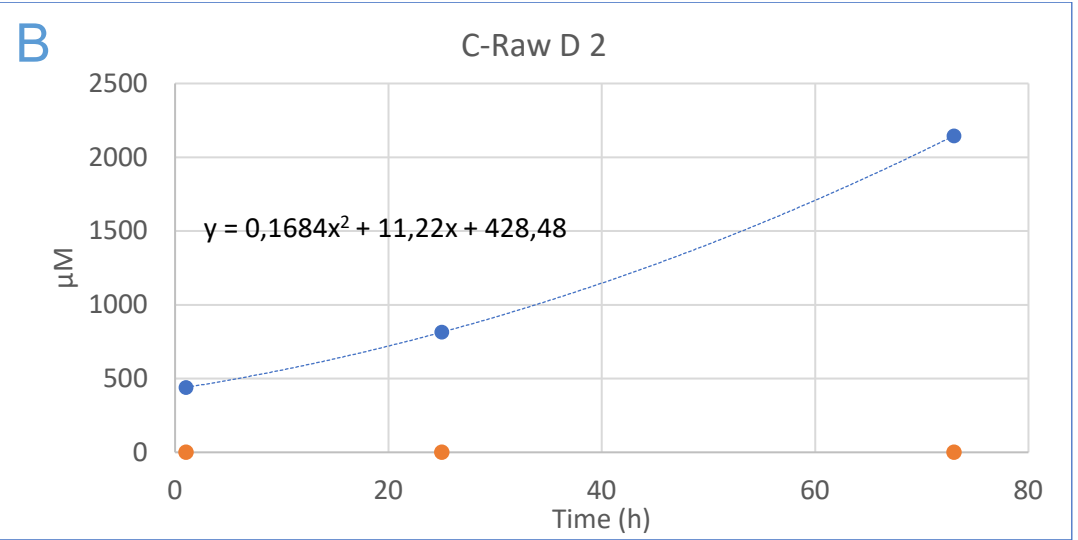
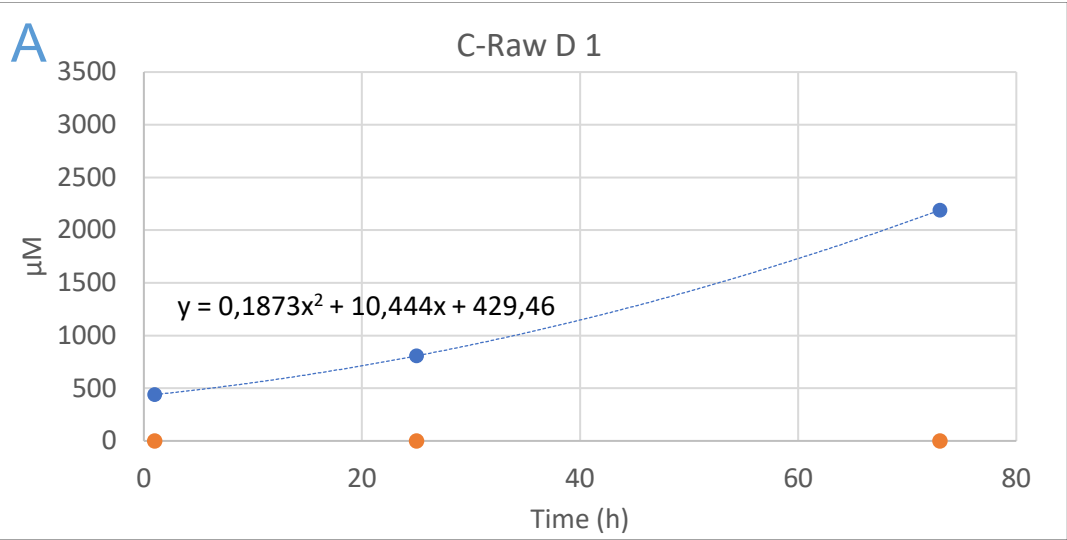


Figure S 23 The amount of nitrite (NO_2^-) (orange), nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue), at different time points after incubation in NEO made from cattle slurry fertilized soil samples fertilized in the lab using the cereal field soil and incubated as non-agitated loosely placed soil. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

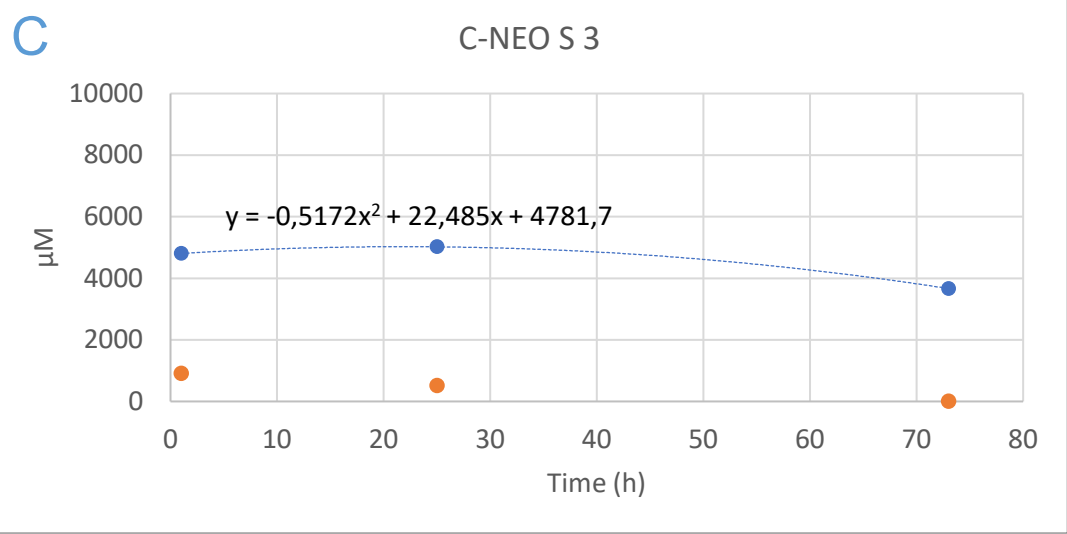
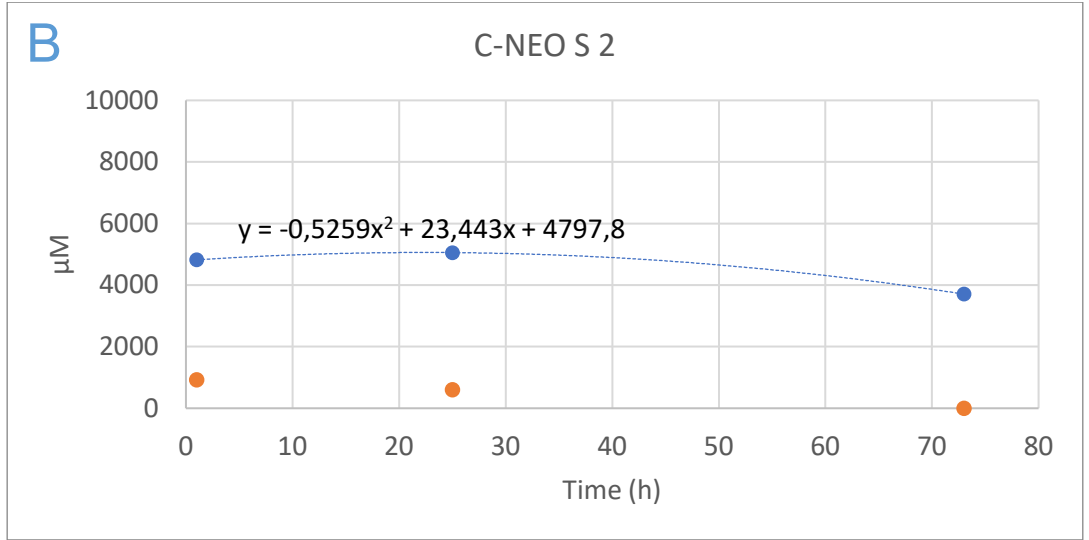
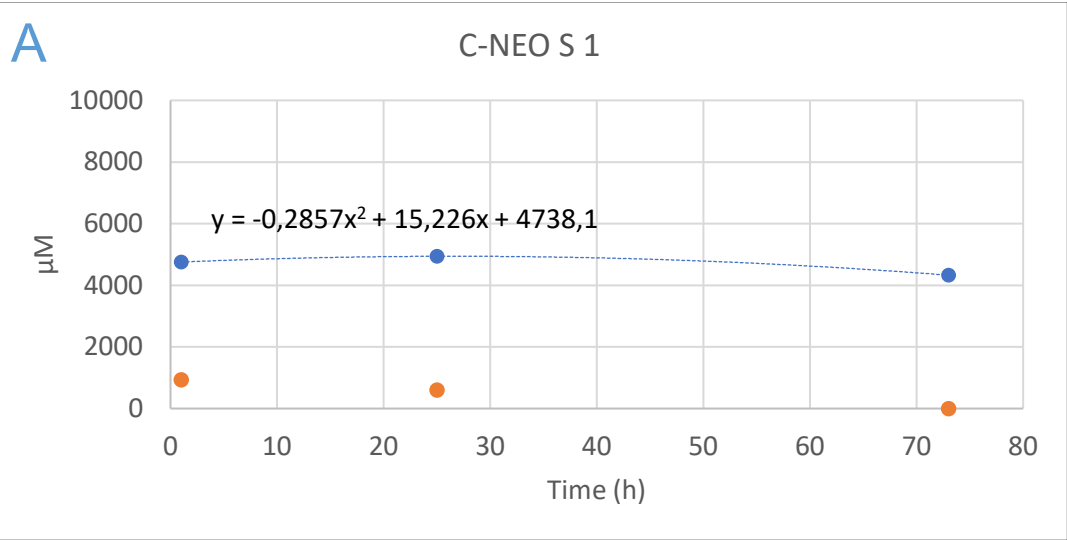


Figure S 24 The amount of nitrite (NO_2^-) (orange), nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue), at different time points after incubation in NEO made from biogas digestate fertilized soil samples fertilized in the lab using the cereal field soil and incubated as non-agitated loosely placed soil. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

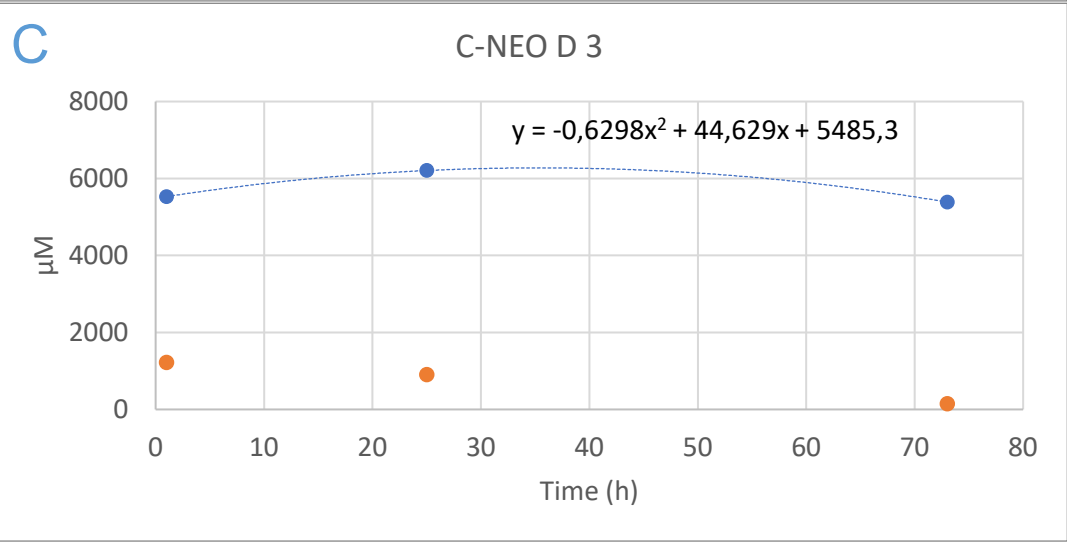
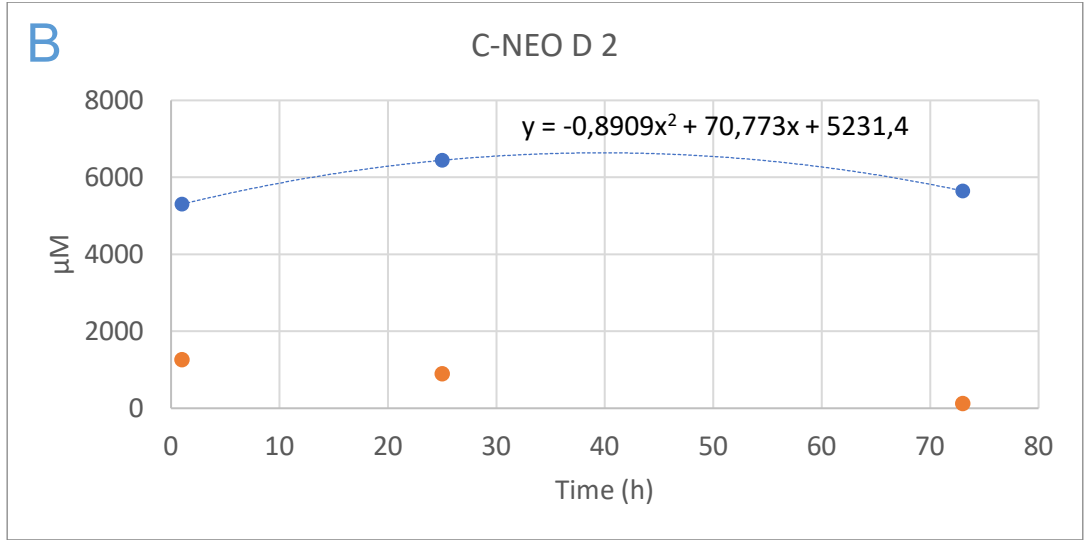
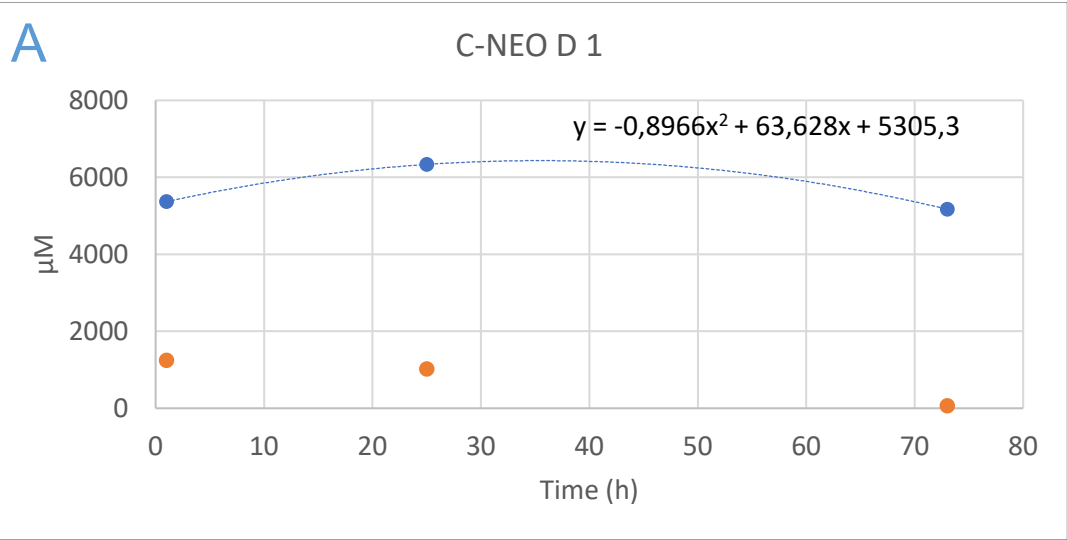


Figure S 25 The amount of nitrite (NO_2^-) (orange), nitrite + nitrate ($\text{NO}_2^- + \text{NO}_3^-$) (blue), at different time points after incubation in ammonium chloride fertilized soil samples fertilized in the lab using the cereal field soil and incubated as non-agitated loosely placed soil. The polynomial regression equation indicates the growth rate of nitrite + nitrate (nitrification) in the samples over time after incubation.

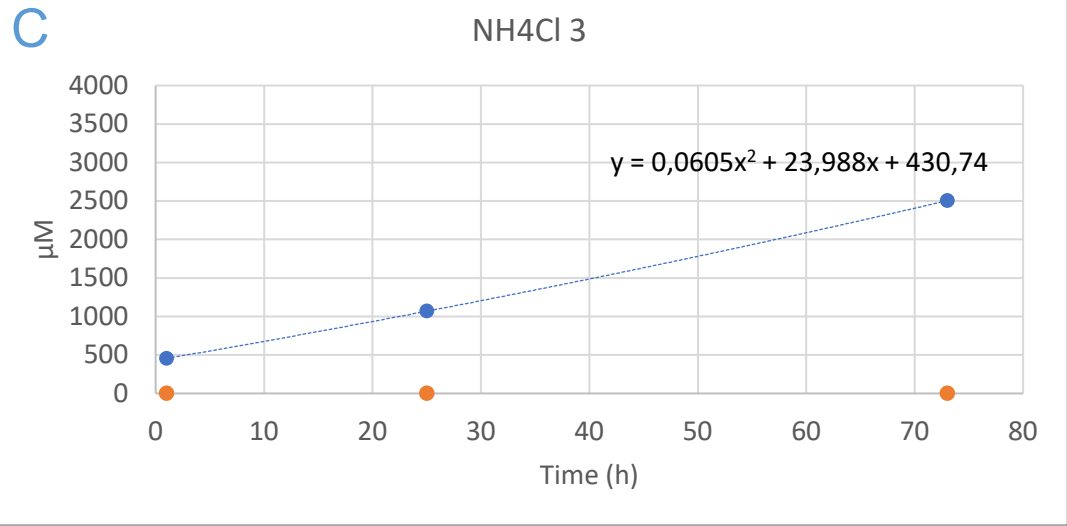
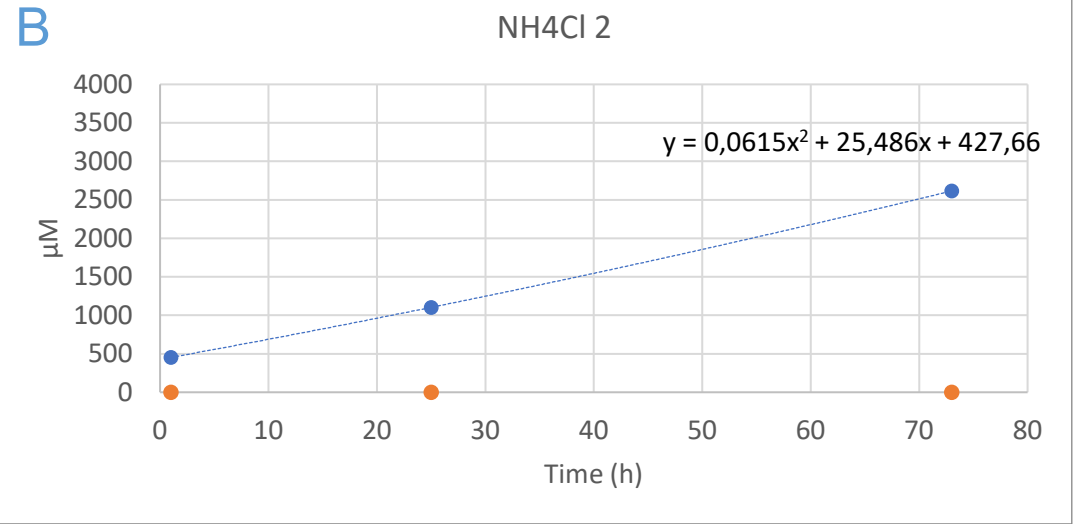
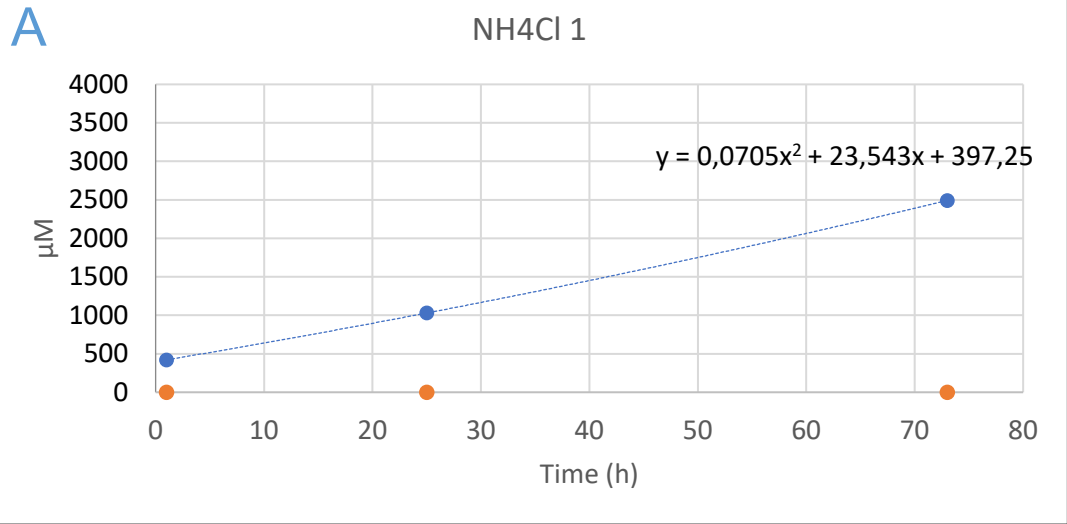


Table S 1 Effects of different fertilization treatments on the nitrification rates in different experiments. The Games-Howell pairwise comparison method compares the differences between means at a 95% confidence interval. Averages that do not share a letter are significantly different.

Field-fertilized soil (Cereal field)	$\mu\text{g (NO}_2\text{- + NO}_3\text{-)-N g DW soil}^{-1}\text{ day}^{-1}$	Grouping
No fertilizer	32.84	A
Mineral fertilizer	31.41	A
Organic fertilizer	31.37	A
NEO	31.16	A
Field-fertilized soil (Grass field)	$\mu\text{g (NO}_2\text{- + NO}_3\text{-)-N g DW soil}^{-1}\text{ day}^{-1}$	Grouping
Organic fertilizer	19.25	A
Mineral fertilizer	18.08	A
No fertilizer	17.44	A
NEO	15.94	A
Lab-fertilized soil incubated as agitated soil slurries (Cereal field)	$\mu\text{g (NO}_2\text{- + NO}_3\text{-)-N g DW soil}^{-1}\text{ day}^{-1}$	Grouping
NEO D	257.37	A
NEO S	108.49	B
Ammonium Chloride	54.016	C
Raw D	46.52	C
Raw S acidified	41.89	C
Raw S	34.98	C
Lab-fertilized soil incubated as agitated soil slurries (Grass field)	$\mu\text{g (NO}_2\text{- + NO}_3\text{-)-N g DW soil}^{-1}\text{ day}^{-1}$	Grouping
NEO D	253.751	A
NEO S	123.788	B
Ammonium Chloride	28.770	C
Raw D	20.327	C
Raw S	17.713	C
Raw S acidified	12.174	C
Lab-fertilized soil incubated as non-agitated loosely placed soil	$\mu\text{g (NO}_2\text{- + NO}_3\text{-)-N g DW soil}^{-1}\text{ day}^{-1}$	Grouping
NEO D	60.1540	A
Ammonium Chloride	24.5337	B
NEO S	20.5479	B
Raw D	12.9446	BC
Raw S	-1.5813	C