

**Table S1** Management information for the three cropping patterns

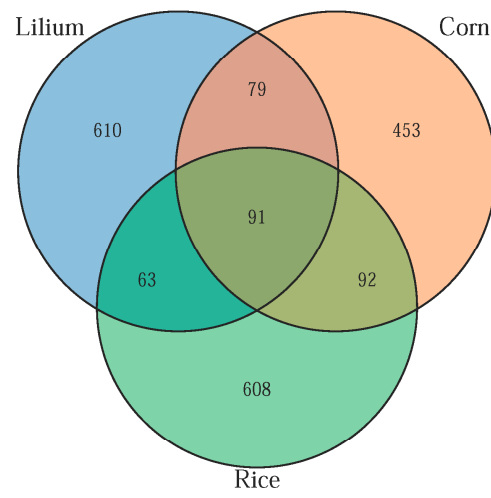
Cropping mode	<i>Lilium</i> continuous cropping	Corn- <i>Lilium</i> rotation	Rice- <i>Lilium</i> rotation
Life form	Annual	Annual	Annual
Crop species	<i>Lanceleaf Lilium</i>	<i>Lilium</i> : <i>Lanceleaf Lilium</i> Corn: Zhongyu 22 hao	<i>Lilium</i> : <i>Lanceleaf Lilium</i> Rice: Hybrid Rice Liangyou 1 Hao
Tillage	<i>Lilium</i> : tillage to a depth of 20 cm in January, May and June 2021, 2022.	<i>Lilium</i> : tillage to a depth of 20 cm in January, May and June 2021. Corn: tillage to a depth of 30 cm in March and May 2022.	<i>Lilium</i> : tillage to a depth of 20 cm in January, May and June 2021; Rice: tillage to a depth of 30 cm before transplant rice seedlings in 2022.
Plant	the bulb planting in October 2021, 2022.	<i>Lilium</i> : the bulb planting in October 2021; Corn: transplanting in March 2022.	<i>Lilium</i> : the bulb planting in October 2021; Rice: transplanting in June 2022.
Harvest	The underground biomass is harvested in July to October 2021, 2022.	<i>Lilium</i> : the underground biomass is harvested in July to October 2021; Corn: the aboveground biomass is harvested in July 2022.	<i>Lilium</i> : the underground biomass is harvested in July to October 2021; Rice: harvest happened in the middle of October 2022.
Fertilization	three times fertilizer 1) Bases fertilizer before seeding: compound fertilizer, 3750 kg/hm <sup>2</sup> (N:P:K=15:15:15); 2) In the middle of March every year, biological fertilizer, 750 kg/hm <sup>2</sup> (NY525-2012, total nutrient >6%) and compound fertilizer (600 kg/hm <sup>2</sup> ) was added at the seedling stage; 3) In late May of the annual bud period, compound fertilizer (600 kg/hm <sup>2</sup> ) was added.	<i>Lilium</i> : same to <i>Lilium</i> cropping; Corn: two times fertilizer 1) Bases fertilizer before seeding: compound fertilizer, N(120 kg/hm <sup>2</sup> ), P <sub>2</sub> O <sub>5</sub> (150 kg/hm <sup>2</sup> ), K <sub>2</sub> O(75 kg/hm <sup>2</sup> ); 2) In the middle of May N(120 kg/hm <sup>2</sup> ), K <sub>2</sub> O(75 kg/hm <sup>2</sup> ).	<i>Lilium</i> : same to <i>Lilium</i> cropping; Rice: two times fertilizer 1) Bases fertilizer before seeding: compound fertilizer, N(117 kg/hm <sup>2</sup> ), P <sub>2</sub> O <sub>5</sub> (75 kg/hm <sup>2</sup> ), K <sub>2</sub> O(81 kg/hm <sup>2</sup> ); 2) Tillering fertilizer: N(78 kg/hm <sup>2</sup> ), K <sub>2</sub> O(54 kg/hm <sup>2</sup> ).
Replanting frequency	Every year	Every two year	Every two year

**Table S2** Mantel test result for the correlation between soil fungal community composition and environmental variables.

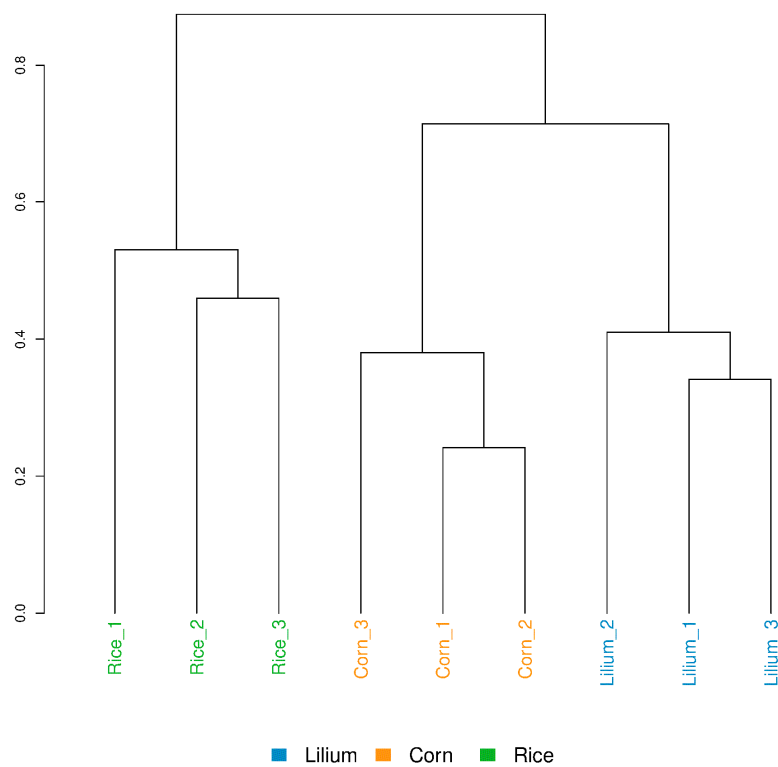
Variables	R value	<i>P</i> value
pH	0.7823	0.008
TK	0.1754	0.1613
TP	0.4798	0.0166
TN	0.5491	0.0068
SOC	0.4822	0.0164
C:N	0.2346	0.1054
C:P	0.5945	0.0145
N:P	0.4188	0.0172

**Table S3** The correlation between fungal phyla and soil properties variables.

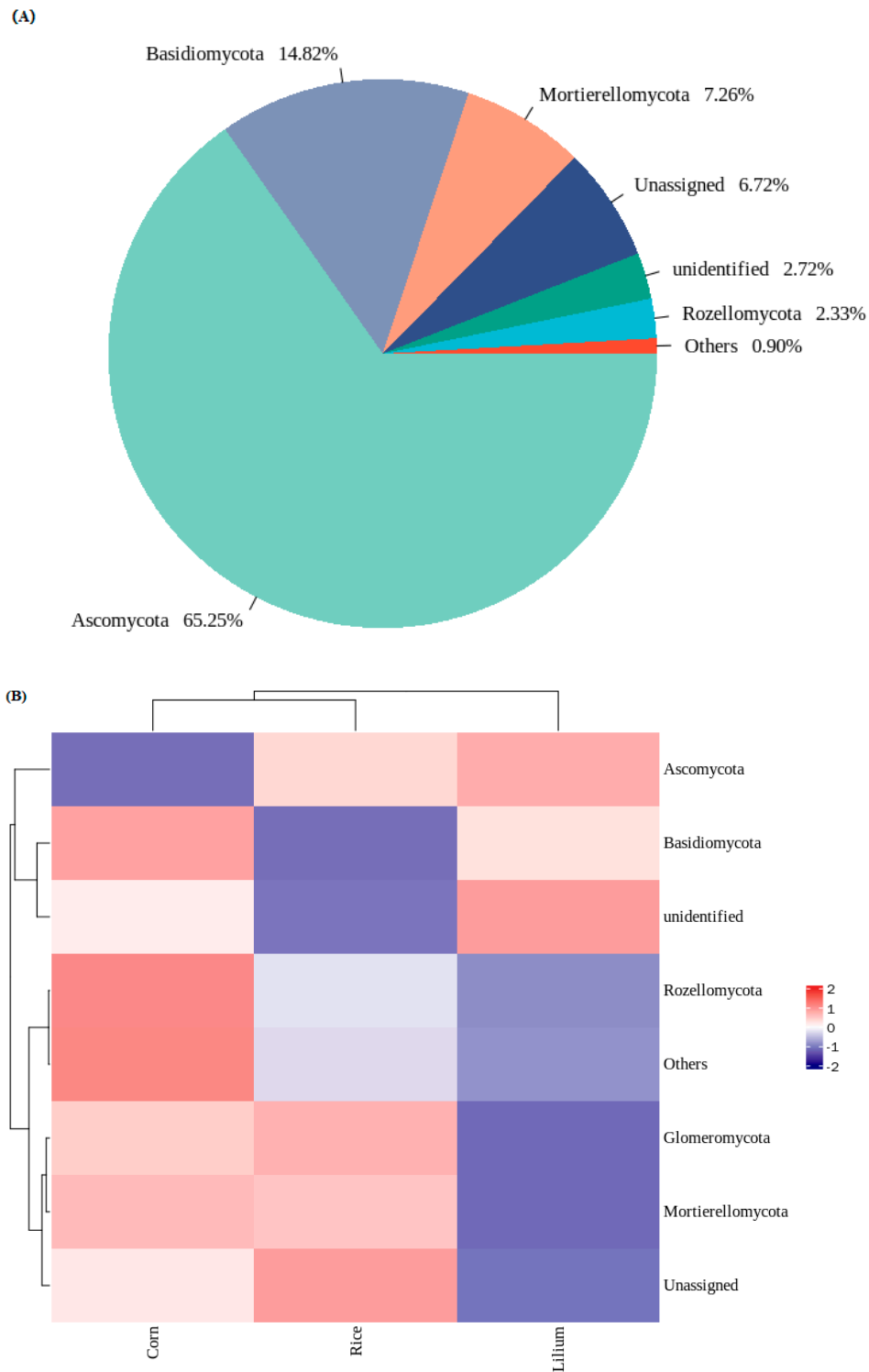
Taxon	Factor	Cor	<i>P</i> value
<i>Basidiomycota</i>	pH	-0.95	0.00
<i>Ascomycota</i>	TN	-0.78	0.02
<i>Aphelidiomycota</i>	TN	-0.82	0.01
<i>Zoopagomycota</i>	TN	-0.77	0.02
<i>Ascomycota</i>	TP	-0.78	0.01
<i>Olpidiomycota</i>	TP	-0.68	0.04
<i>Aphelidiomycota</i>	TP	-0.77	0.02
<i>Olpidiomycota</i>	TK	-0.89	0.00
<i>Aphelidiomycota</i>	TK	-0.84	0.00
<i>Kickxellomycota</i>	TK	-0.69	0.04
<i>Mortierellomycota</i>	C:P	-0.77	0.02
<i>Rozellomycota</i>	C:P	-0.70	0.04
<i>Chytridiomycota</i>	C:P	-0.87	0.00
<i>Mortierellomycota</i>	N:P	-0.83	0.01
<i>Chytridiomycota</i>	N:P	-0.85	0.00



**Figure S1** Venn of soil fungi under different cropping modes. Lilium: continuous cropping with *Lilium*, Corn: corn upland rotation with *Lilium*, Rice: paddy rotation with *Lilium*.



**Figure S2** Hierarchical clustering of fungal communities underlying three different cropping patterns. Lilium: continuous cropping with *Lilium*, Corn: corn upland rotation with *Lilium*, Rice: paddy rotation with *Lilium*.



**Figure S3** The barplot showed the relative abundance of the main fungal phyla(A) and the heatmap showed their variations among soil samples at phylum level (B) present in three cropping soils. Lilium: continuous cropping with *Lilium*, Corn: corn upland rotation with *Lilium*, Rice: paddy rotation with *Lilium*.