paddy fields as well as in the soils from single-cropped paddy field.

b. The effect of air drying on ammonium-nitrogen production is the greatest for soils from wet paddy fields having a high water table.

c. The ammonification coefficient of soil nitrogen seems to be related to some extent with the drying effect. The coefficient is high for soils of wet paddy fields and is low for soils of fields cropped during the winter.

d. Soils to which soybeans are planted as a green-manure crop between the harvesting of the wheat or barley crop and the planting of the rice crop show a high ammonification coefficient of soil nitrogen. This is evident in the samples from Oita, Nagasaki, and Kagoshima Prefectures.

3. Although the soils from paddy fields cropped with winter crops generally showed less ammonium-nitrogen production after air-drying in the laboratory than the soils from single-cropped fields, it cannot be concluded from these results that rice yields are lower on double-cropped paddy fields than on single-cropped paddy fields. Under actual field conditions, the paddy fields with winter crops generally are dried better before irrigation than the paddy fields without any winter crops. Consequently, in actual practice, the paddy fields with winter crops have more ammonium-nitrogen produced after irrigation, than the paddy fields which are left untilled during the winter. During mid-summer when the soil temperature is high, the roots of rice plants growing on a single-cropped paddy field often are injured because of the high production of ammonium-nitrogen and the accompanying high consumption of soil oxygen. Generally speaking, rice yields are higher on paddy fields planted with winter crops than on paddy fields without winter crops. This suggests an important relationship between tillage practice and the productivity of paddy fields.

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Table 1. Effect of Fertilizers on The Yields of Small Grain Crops[a]
(Yield of gain per hectare)

Crop	Fertilizer Applied: None Grain Yield (Kg)	None Relative Yield[b] (Percent)	NPK Grain Yield (Kg)	NPK Relative Yield[b] (Percent)	PK Grain Yield (Kg)	PK Relative Yield[b] (Percent)	NK Grain Yield (Kg)	NK Relative Yield[b] (Percent)	NP Grain Yield (Kg)	NP Relative Yield[b] (Percent)
Lowland rice[c]	2.521[e]	65	3.862[e]	100	2.801[e]	73	3.729[e]	97	3.803[e]	99
Lowland rice[d]	3.095[e]	73	4.230[e]	100	3.243[e]	77	4.112[e]	97	3.744[e]	89
Barley	1.681[f]	40	4.209[f]	100	2.170[f]	52	2.762[f]	66	3.036[f]	72
Naked barley	0.893	31	2.868	100	1.258	44	2.001	70	1.931	68
Wheat	0.970	33	2.904	100	1.328	46	1.992	69	2.075	72
Upland rice	0.886[e]	39	2.285[e]	100	1.047[e]	46	1.518	66	2.064	90

a Three-year averages of results of many field experiments conducted at prefectural agricultural experiment station.
b Yield from complete fertilization (NPK) is basis for comparison.
c Field uncropped during the winter.
d Field cropped during the winter.
e Brown grain.
f Unhulled grain.

Table 2. Effect of Nitrogen on The Grain Yeilds on Small Grain Crops[a]
(Kilograms)

Crop	Nitrogenous Fertilizers Added	Amount of Nitrogen Applied: NO Nitrogen Yield/Ha	Moderate Application Nitrogen/Ha	Moderate Application Yield/Ha	High Application Nitrogen/Ha	High Application Yield/Ha	Yield Increase per Kg Nitrogen Added: Moderate Application Yield	High Application Yield
Lawland rice	Ammonium sulfate	2.977[b]	58	3.832[b]	94	4.245[b]	14.4[b]	13.7[b]
Lawland rice	Soybean meal	3.228[b]	64	3.832[b]	93	4.363[b]	12.1[b]	14.0[b]
Lawland rice	Green manure	3.169[b]	53	3.965[b]	91	4.334[b]	14.8[b]	12.9[b]
Barley	Ammonium Sulfate	1.665[c]	66	3.277[c]	99	2.652[c]	26.1[c]	21.2[c]
Naked barley	Ammonium Sulfate	1.203	63	2.686	107	3.316	23.3	18.6
Wheat	Ammonium Sulfate	1.438	56	2.586	97	3.250	23.1	19.8

a Three-year averages of results of many field experiments conducted at prefectural agricultural experiment station.
b Brown Grain.
c Unhulled Grain.

Table 3. Effect of Drying and Flooding on The Hydrogen Ion Concentration and Oxidation-Reduction Potential of Paddy Rice and Upland Soils (1940)[a]

Soil Sample	No. of Days of Flooding	Treatment: Flooded without air-drying: Depth (cm)	pH	Eh[b] (volt)	Flooded after air-drying: Depth (cm)	pH	Eh[b] (volt)
A	0	0-7[c]	6.1	0.52	0-7	6.1	0.47
Paddy soil, unfertilized each year	9	(0-1[c]	5.7	0.45	(0-1	6.2	0.28
		(1-4[c]	6.2	0.45	(1-4	6.5	0.27
		(4-7[c]	6.1	0.43	(4-7	5.6	0.28
	33	(0-1[c]	6.1	0.43	(0-0.7[c]	6.4	0.32
		(1-4	6.7	0.29	(0.7-4	6.9	0.19
		(4-7	6.5	0.28	(4-7	6.8	0.18
B	0	0-7	5.1	0.51	0-7	5.3	0.47
Paddy soil, fertilized each year with organic fertilizer	9	(0-1[c]	5.3	0.52	(0-1	6.1	0.21
		(1-4[c]	5.5	0.35	(1-4	6.5	0.16
		(4-7[c]	5.5	0.33	(4-7	6.5	0.16
	33	(0-0.7[c]	5.5	0.40	(0-0.2[c]	6.4	0.35
		(0.7-4	6.0	0.16	(0.2-4	7.1	0.15
		(4-7	6.2	0.17	(4-7	7.6	0.17
C	0	0-7	6.1	0.55	0-7	6.1	0.50
Upland soil, unfertilized each year	9	(0-1[c]	5.7	0.52	(0-1[c]	5.9	0.50
		(1-4[c]	5.9	0.51	(1-4[c]	6.0	0.51
		(4-7[c]	5.9	0.50	(4-7[c]	6.1	0.48
	33	(0-1[c]	5.4	0.50	(0-1[c]	6.0	0.57
		(1-4[c]	5.8	0.50	(1-4[c]	6.1	0.48
		(4-7[c]	5.9	0.50	(4-7[c]	6.1	ND
D	0	0-7	5.4	0.53	0-7	5.2	ND
Upland soil, fertilized each year with inorganic fertilizer	9	(0-1[c]	5.5	0.55	(0-1[c]	5.8	0.52
		(1-4[c]	5.8	0.56	(1-4[c]	5.8	0.46
	33	(0-1[c]	5.4	0.54	(0-1[c]	6.0	0.56
		(1-4[c]	5.4	0.47	(1-4[c]	6.0	0.34
		(4-7[c]	5.6	0.46	(4-7[c]	6.0	0.34

ND: No data available.

a Samples from furrow slice of fields at Agricultural Experiment Station, Konosu, Saitama Pref.

b Eh recalculated to pH 6. Recalculation made under assumption that Eh value is lowered 0.06 volt for increase of pH 1.

c Oxidized layer.

Table 4. Effect of Drying and Flooding on The Exchange Acidity and Production of Ammonia and Sulfides in Paddy and Upland soils (1940)[a]

	Treatment							
	Flooded without Air-drying				Flooded after Air-drying			
Soil Samples	Depth (cm)	Change Acidity of wet soil(Y1)	Ammonium Nitrogen (mg/100g dry soil)	Presence of Sulfides	Depth (cm)	Change Acidity of wet soil(Y1)	Ammonium Nitrogen (mg/100g dry soil)	Presence of Sulfide
B	0-07	2.9	1.4	Abundant	0-0.2	ND	ND	ND
Paddy soil, fertilized each year with organic fertilizer	0.7-4	16.9	6.7	very abundant	0.2-4	26.8	11.7	very abundant
	4-7	15.2	7.0	very abundant	4-7	26.8	15.8	very abundant
C	0-1	0.7	1.0	None	0-1	0.7	0.7	None
Upland soil, unfertilized each year	1-4	0.7	1.5	None	1-4	0.7	1.0	None
	4-7	0.9	1.4	None	4-7	0.7	1.0	None
D								
Upland soil fertilized each year with inorganic fertilizer	0-1	2.3	1.1	None	0-1	2.1	1.5	None
	1-4	2.5	0.9	None	1-4	2.5	2.0	Trace
	4-7	2.5	1.4	None	4-7	2.5	2.0	Trace

ND: No data available.
a Samples from furrow slice of fields at Agricultural Experiment Station, Konosu, Saitama Prefecture Determination made after 33 days of flooding.