Sawah Technology(Statistics 1-2) SSA's paddy production ranking No.1 to No.16 countries and Egypt on rice production and related data during 1961 to 2016

T. Wakatsuki & N. Iwashima, Shimane Univ., 28th December 2018

1. No.1 to No.8 paddy production during 2011 to 2015 mean data
   Nigeria >Madagascar>UR Tanzania> Mali> Guinea> Cote d'Ivoire> Sierra Leone> Senegal
2. No.1 to No. 8 paddy production during 1961-1965 mean data
   Madagascar>Sierra Leone>Guinea>Cote d'Ivoire>Nigeria>Mali> Liberia>UR Tanzania
3. No.9 to No.16 paddy production during 2011 to 2015 mean data
   Ghana>DR Congo>Burkina Faso>Liberia>Chad>Benin> Mauritania>Uganda
4. No.9 to No.16 paddy production during 1961 to 1965 mean data
   Senegal>Mozambique>DR Congo>Guinea-Bissau>Ghana>Gambia> Burkina Faso>Chad

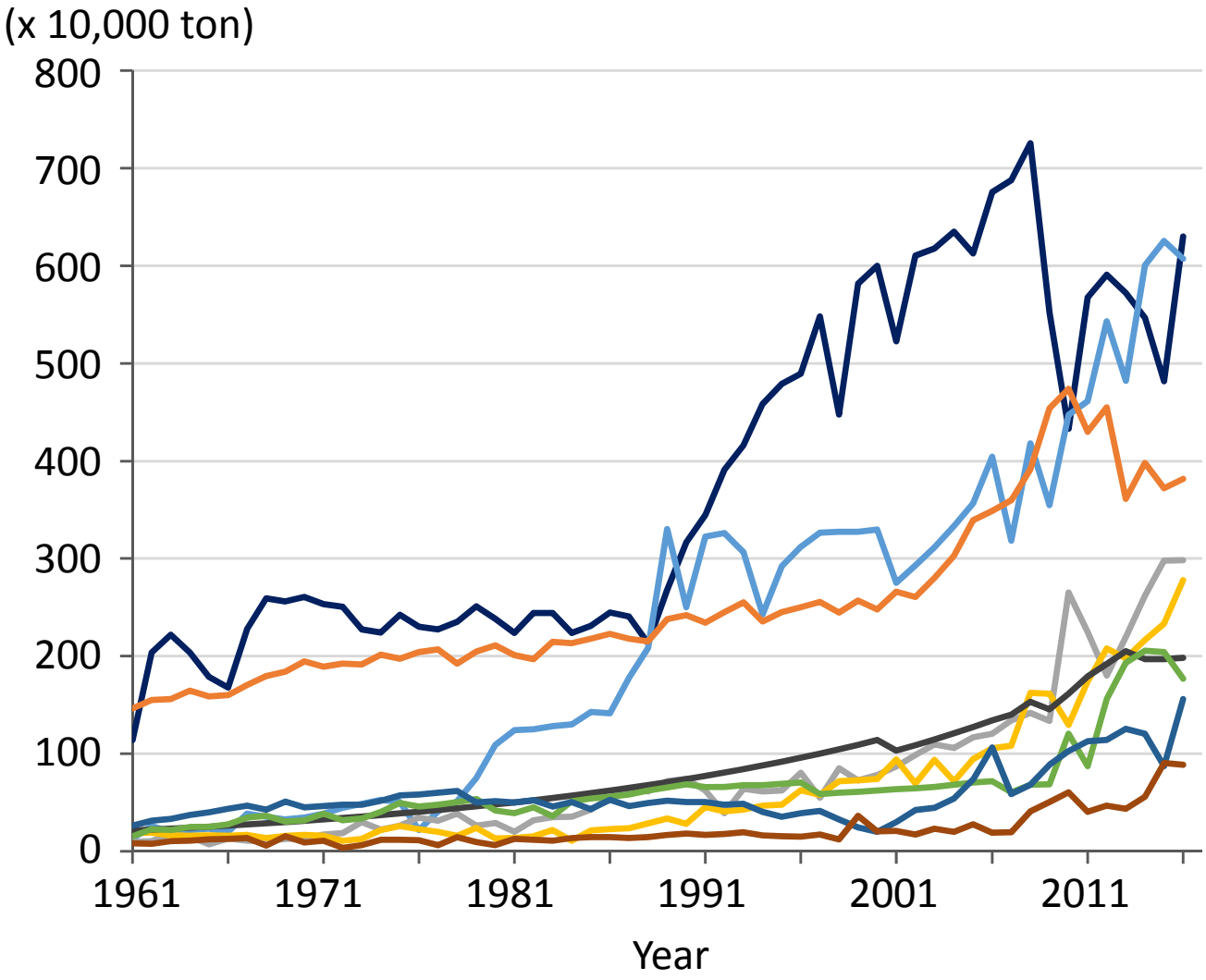


Fig. Paddy Production during 1961-2016（Egypt and Sub Saharan Africa Rank 1-8 countries of paddy production)

Data source: FAOSTAT 2018

Paddy productions have been increased explosively in Nigeria. The average paddy production index for 2011 - 2015 is 26 times when that of 1961 - 1965 is 1. These indices are 3.0 for Egypt, 2.6 for Madagascar, 20 for Tanzania, 12 for Mali, 8.4 for Guinea, 7.7 for Cote d'Ivoire, 3.3 for Sierra Leone, and 5.6 for Senegal.

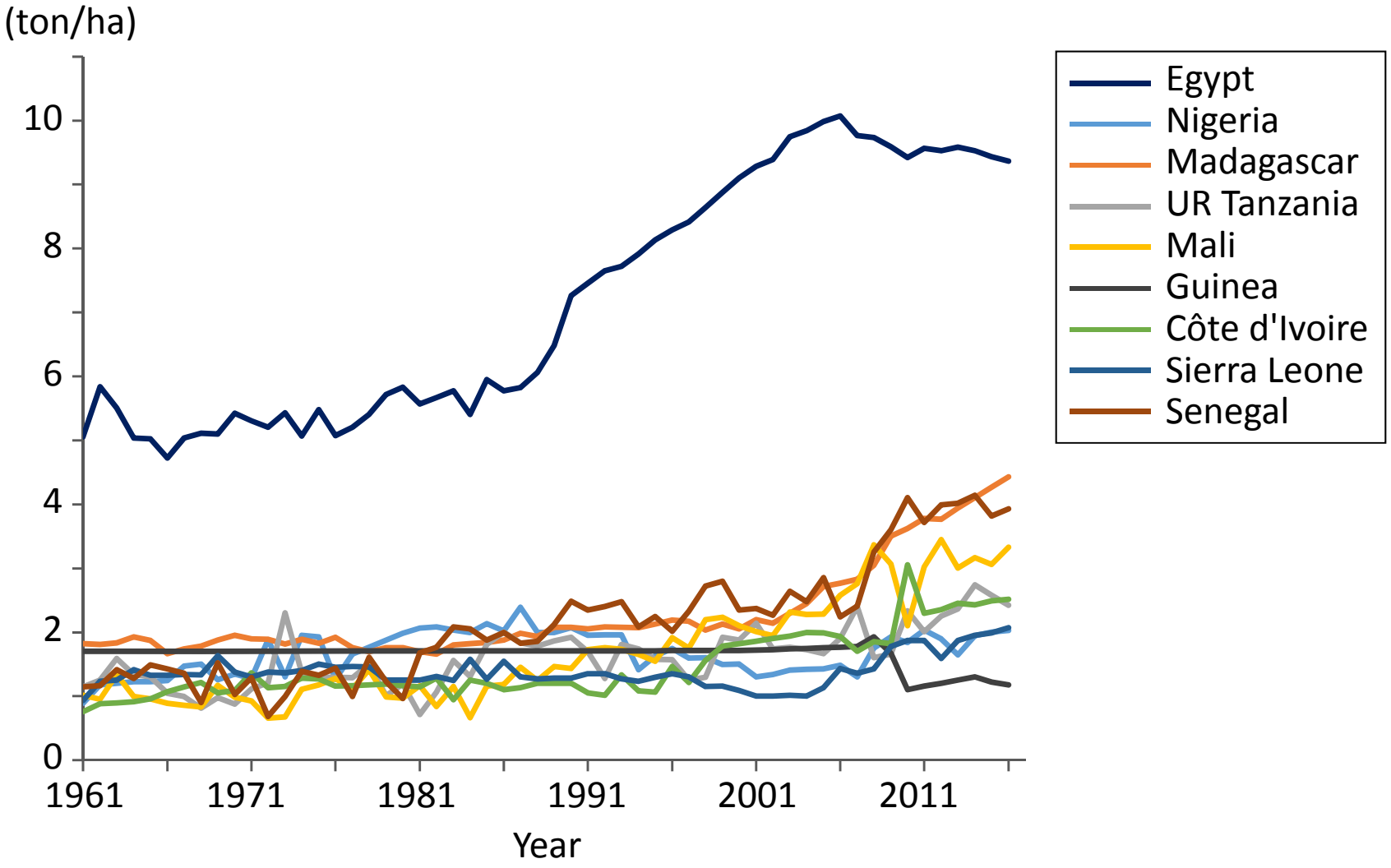


Fig. Paddy Yield during 1961-2016
（Egypt and Sub Saharan Africa Rank 1-8 rice production countries)

Data source: FAOSTAT 2018

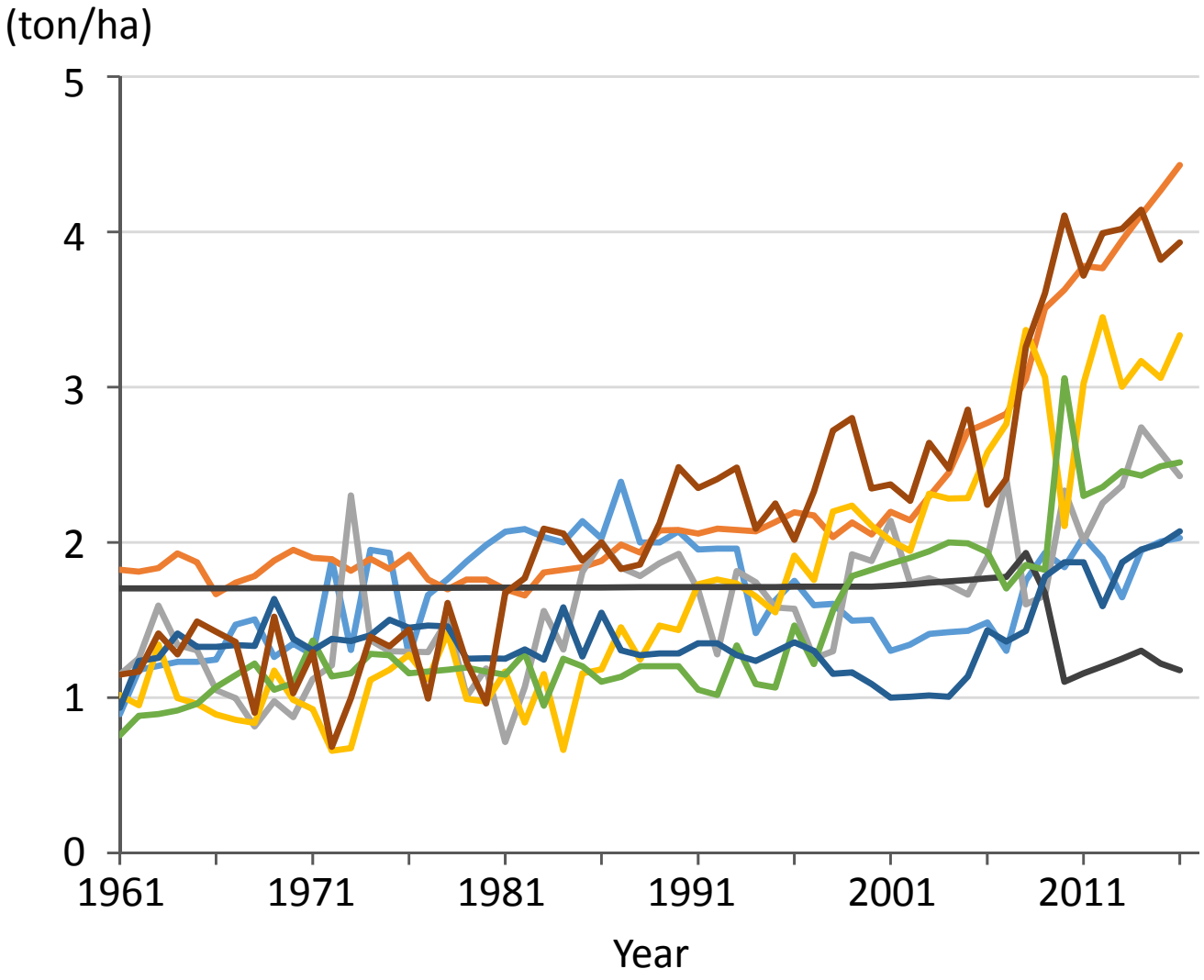
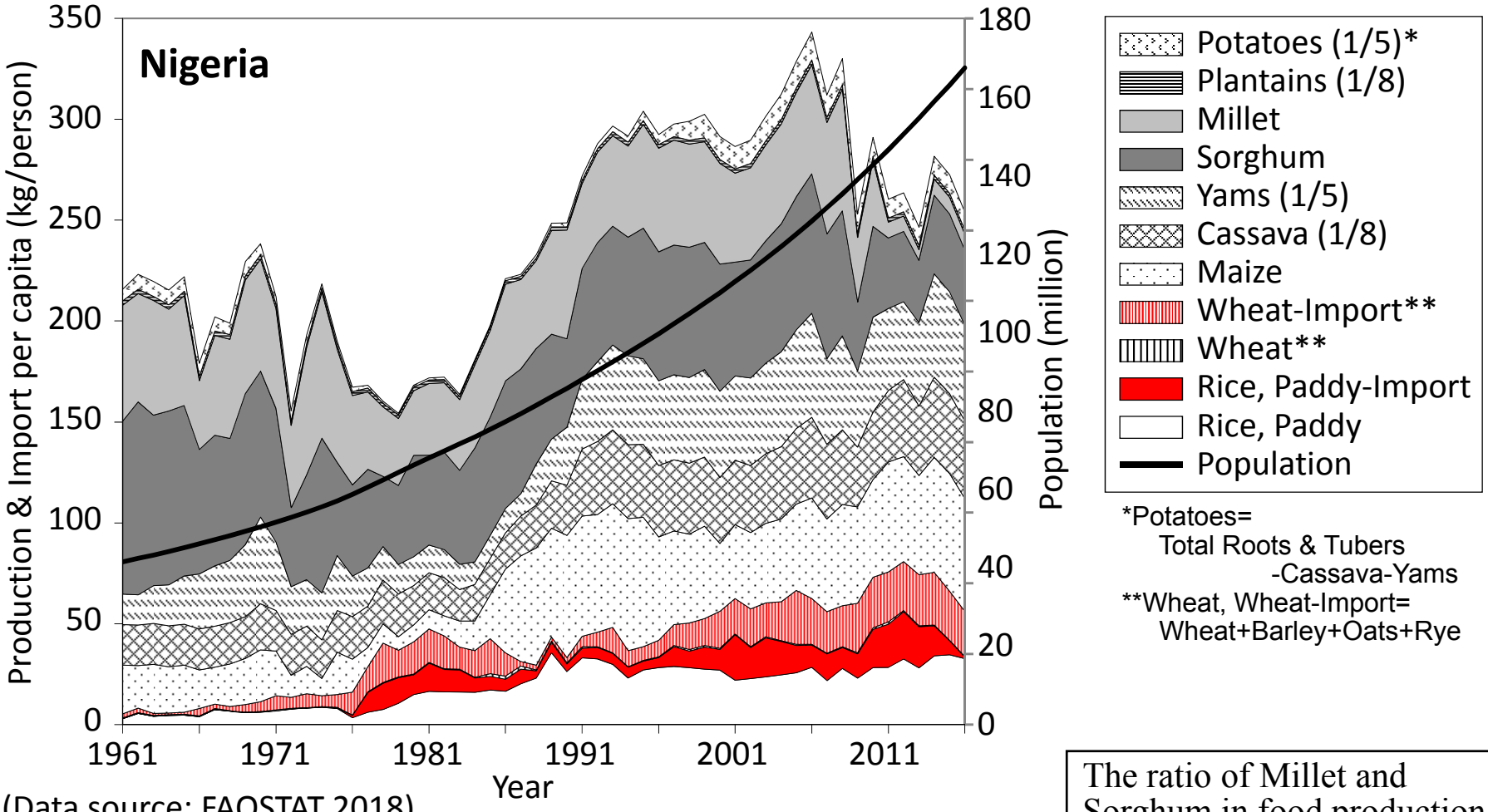


Fig. Paddy Yield during 1961-2016
（Sub Saharan Africa Rank 1-8 rice production countries）

Data source: FAOSTAT 2018

Recent (2011-2016) National Paddy yield No.1 was Madagascar (4t/ha, 3.8 million ton), No.2, Senegal (3.9t/ha, 0.6million ton) , No.3, Mali (3.2t/ha, 2.2 million ton), No. 4, Cote d'Ivoire (2.4t/ha, 1.7million ton), No.5, Tanzania (2.4t/ha, 2.5million ton), No.6, Nigeria (1.9t/ha, 5.5million ton), No. 7, Sierra Leone (1.9t/ha, 1.2million ton), and Guinea (1.2t/ha, 1.9million ton). Major determining factors of the paddy yield are quality and quantity of irrigated rice fields and their management.

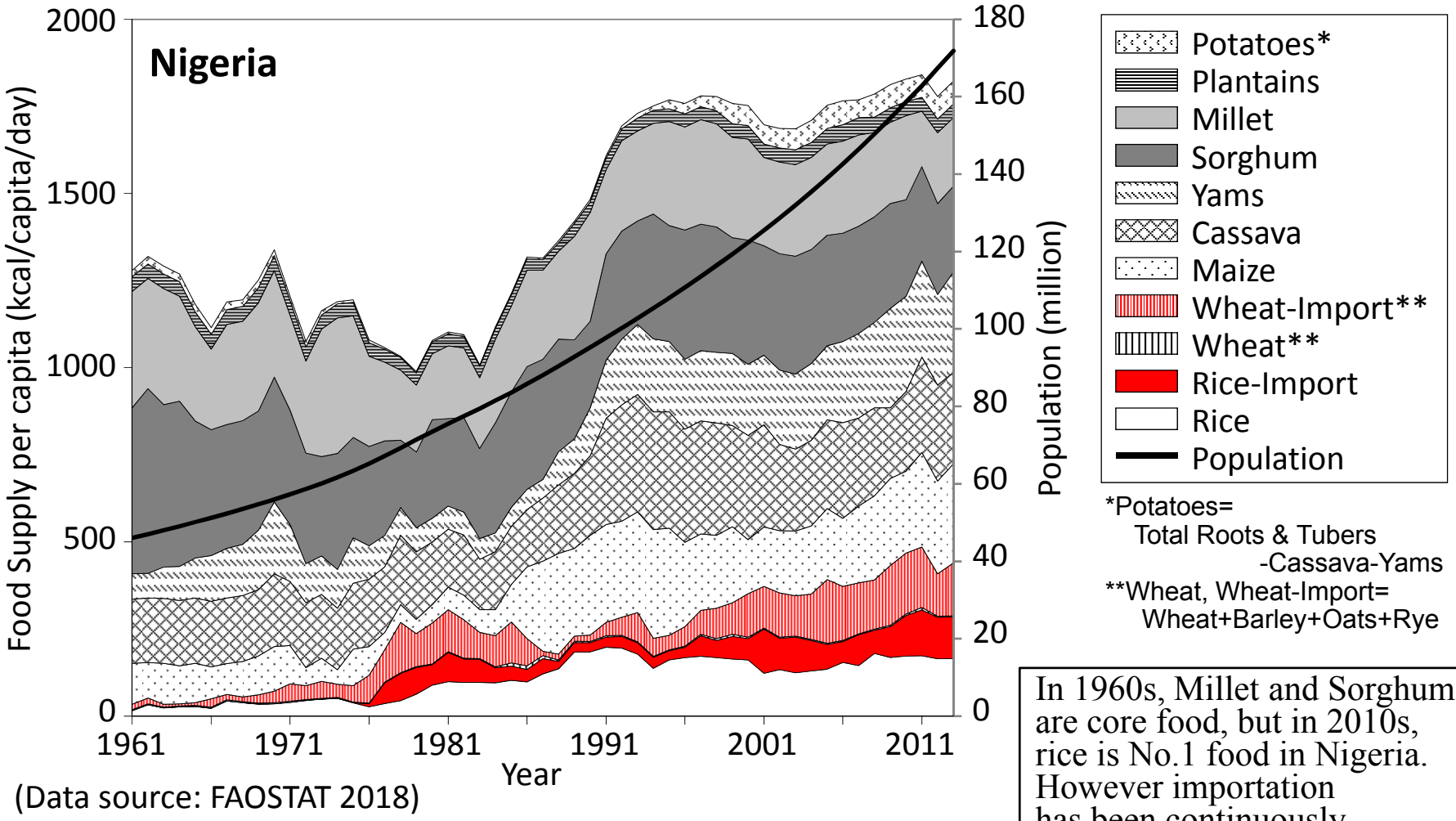


(Data source: FAOSTAT 2018)

Fig. Per Capita Various Food Production & Import (kg/person) in Nigeria (No.1 rice producing country in SSA) during 1961-2016.

Cereal equivalent amounts of calories per kg are one fifth for Potato & plantain, one fourth for Yam and cassava (FAO Food composition data). In addition to these, postharvest and storage losses are estimated 2 times bigger than cereals for Cassava, 1.6 times for plantain, 1.3 times for Yam, and 1.0 for potatoes. Thus the cereals conversion ratios of potatoes and Yams are 1/5 and 1/8 for Plantains and Cassava.

The ratio of Millet and Sorghum in food production decreased sharply from 70% to less than 20% in the 50 years. Yams, Cassava, Maize and especially Rice production and also the importation increased rapidly. Adding the imported amount to the production, Rice became No.1 staple food now.



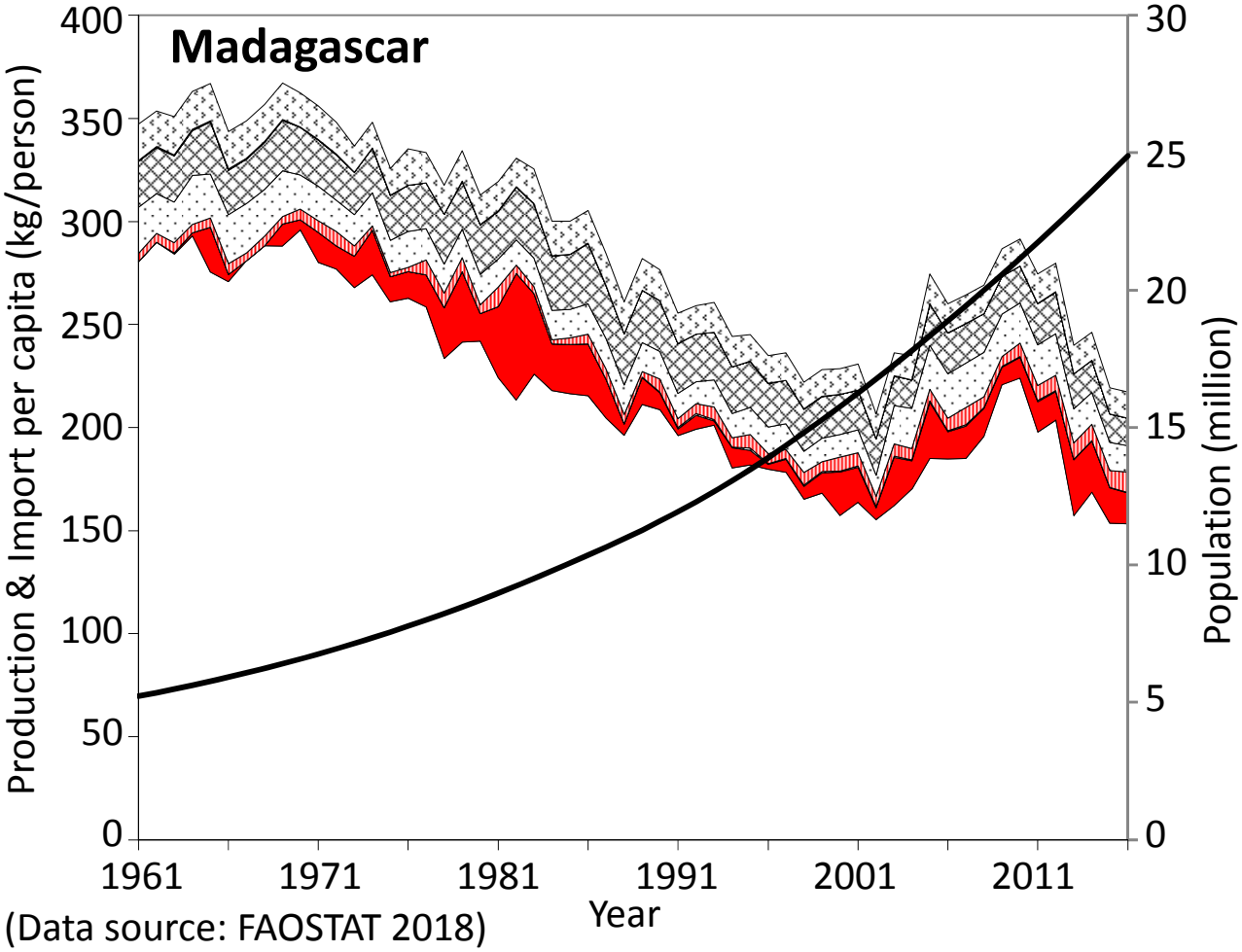
*Potatoes=
Total Roots & Tubers
-Cassava-Yams
**Wheat, Wheat-Import=
Wheat+Barley+Oats+Rye

(Data source: FAOSTAT 2018)

Fig. Per Capita Various Food Supply (kcal/capita/day) in Nigeria (No.1 rice producing country in SSA) during 1961-2013.

In 1960s, Millet and Sorghum are core food, but in 2010s, rice is No.1 food in Nigeria. However importation has been continuously increasing even though under very good and huge rice producing ecology.

We used that the cereals' equivalent coefficients of 1/8 for Cassava and Plantains as well as 1/5 for Yam and Potatoes. These conversion factors can be tentatively verified if we compare figure on per capita production and importation amounts in kg and per capita consumption in kcal.



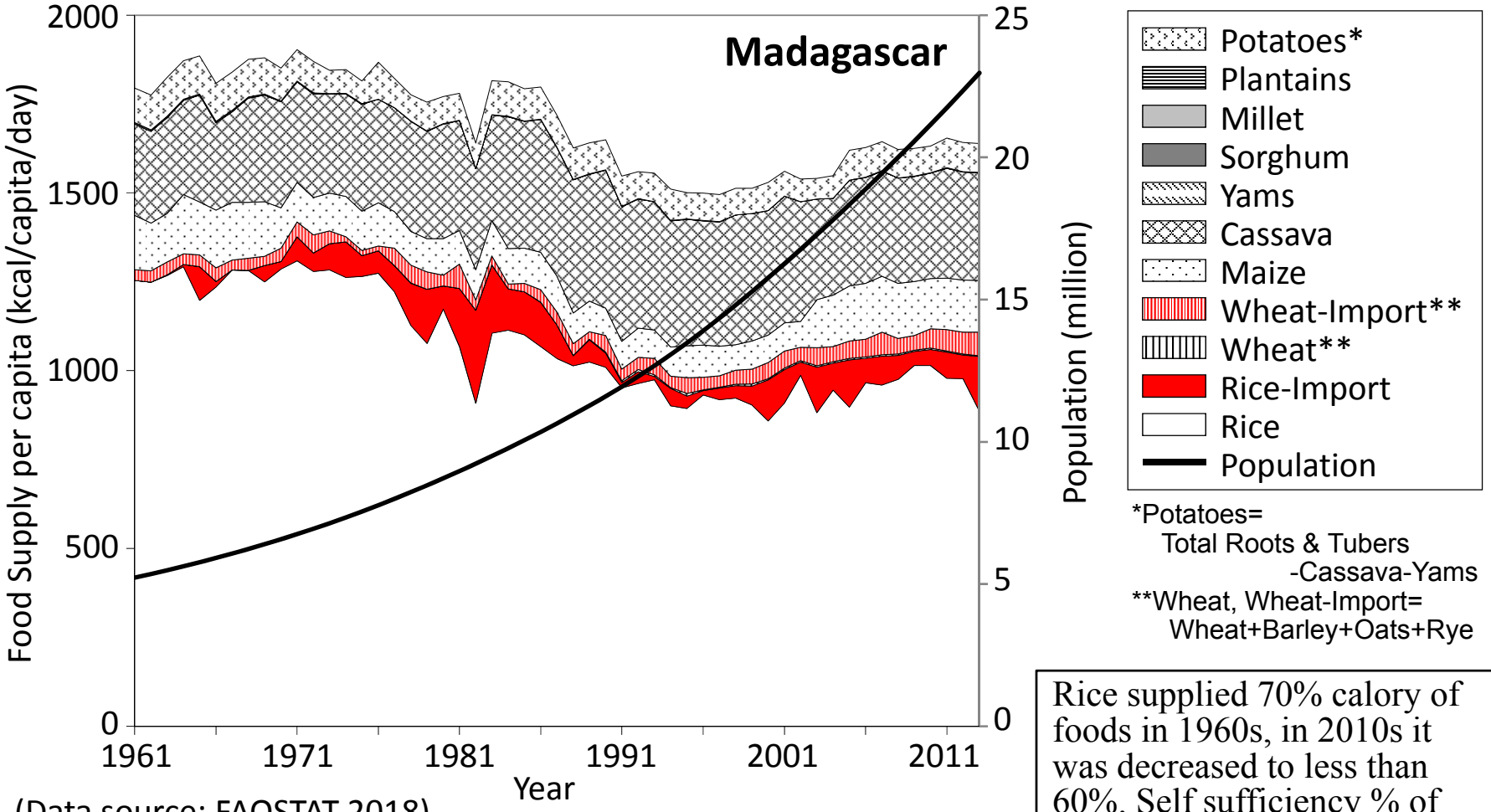
*Potatoes=
Total Roots & Tubers
-Cassava-Yams
**Wheat, Wheat-Import=
Wheat+Barley+Oats+Rye

(Data source: FAOSTAT 2018)

Fig. Per Capita Various Food Production & Import (kg/person) in Madagascar (No.2 rice producing country in SSA) during 1961-2016.

Cereal equivalent amounts of calories per kg are one fifth for Potato & plantain, one fourth for Yam and cassava (FAO Food composition data). In addition to these, postharvest and storage losses are estimated 2 times bigger than cereals for Cassava, 1.6 times for plantain, 1.3 times for Yam, and 1.0 for potatoes. Thus the cereals conversion ratios of potatoes and Yams are 1/5 and 1/8 for Plantains and Cassava.

Madagascar has rice-eating culture similar to majority of Asian countries, maybe because of immigrants of Malay- Indonesian origin 1000-2000? Years ago. More than 80% of food is rice. Although still sufficient, rice production per capita had been decreasing during past 40 years. However paddy production is expanding in last 10 years.



*Potatoes=
Total Roots & Tubers
-Cassava-Yams
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Wheat+Barley+Oats+Rye

(Data source: FAOSTAT 2018)

Fig. Per Capita Various Food Supply (kcal/capita/day) in Madagascar (No.2 rice producing country in SSA) during 1961-2013.

Rice supplied 70% calory of foods in 1960s, in 2010s it was decreased to less than 60%. Self sufficiency % of rice has been sustaining higher than 90% during 1960-2013. However is had dropped to 85% in 2014.

We used that the cereals' equivalent coefficients of 1/8 for Cassava and Plantains as well as 1/5 for Yam and Potatoes. These conversion factors can be tentatively verified if we compare figure on per capita production and importation amounts in kg and per capita consumption in kcal.

Table. Rice Value Trends in Egypt (No.1 rice producing country in Africa during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

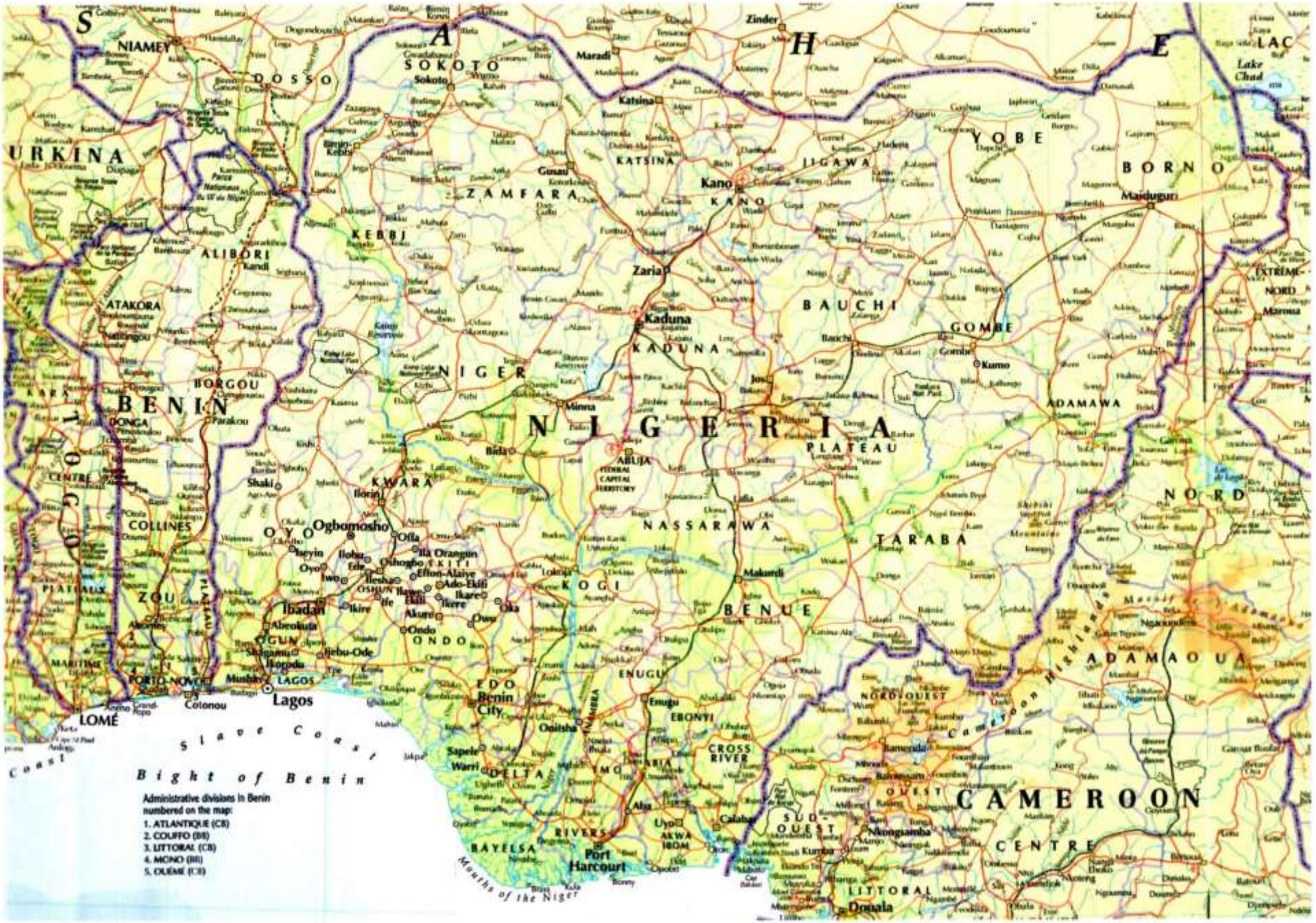
	1961 -1965	1966 -1970	1971 -1975	1976 -1980	1981 -1985	1986 -1990	1991 -1995	1996 -2000	2001 -2005	2008	2006 -2010	2011 -2015	2016
Population (million)	29.3	33.4	37.5	42.0	47.7	54.5	61.3	67.4	74.0	81.0	81.0	89.8	95.7
Area harvested (1,000 ha)	348	459	452	434	412	407	536	615	621	745	631	579	673
Index (%) of area harvested (100 for mean of 1971-1980)	78.4	104	102	98.0	92.8	91.9	121	139	140	168	142	131	152
Irrigated rice area harvested (1,000 ha)	346	457	450	434	411	407	536	615	621	733	621	570	
Index (%) of irrigated area (100 for mean of 1971-1980)	78.3	103	102	98.1	93.0	92.2	121	139	140	166	140	129	
Percent of Irrigated rice area harvested (%)	99.5	99.5	99.5	99.8	99.9	100	100	100	100	98.4	98.4	98.4	
Paddy production (1,000 ton)	1845	2342	2396	2363	2333	2566	4178	5333	5997	7253	6147	5519	6300
Index (%) of paddy production (100 for mean of 1971-1980)	77.5	98.4	101	99.3	98.1	108	176	224	252	305	258	232	265
Production (1,000 ton, milled rice)	1153	1464	1498	1477	1458	1604	2611	3333	3748	4533	3842	3449	3938
Paddy yield (ton/ha)	5.29	5.08	5.30	5.45	5.67	6.28	7.77	8.67	9.65	9.73	9.72	9.53	9.37
Index (%) of paddy yield (100 for mean of 1971-1980)	98.5	94.6	98.6	101	106	117	145	161	180	181	181	177	174
Yield (ton/ha, milled rice)	3.31	3.18	3.31	3.41	3.54	3.93	4.86	5.42	6.03	6.08	6.07	5.96	5.85
Imported quantity (1,000 ton, milled rice)	0.00	0.01	0.01	0.00	0.03	11.5	2.20	1.80	21.8	42.7	59.9	93.0	30.2
Self-Sufficiency ratio (%)	100	100	100	100	100	99.2	99.9	99.9	99.4	99.1	98.6	97.5	99.2
Imported rice price ($/ton, milled rice)	150	317	280	-	1457	268	392	547	524	186	385	691	1247
Consumption per capita (kg/person, milled rice)	39.3	43.7	40.0	35.1	30.6	29.6	42.6	49.4	50.9	56.5	48.4	39.6	41.5

Table. Rice Value Trends in Nigeria (No.1 rice producing country in SSA during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

	1961 -1965	1966 -1970	1971 -1975	1976 -1980	1981 -1985	1986 -1990	1991 -1995	1996 -2000	2001 -2005	2008	2006 -2010	2011 -2015	2016
Population (million)	48.1	53.6	60.2	69.3	79.5	90.5	103	116	132	150	150	172	186
Area harvested (1,000 ha)	179	234	289	332	630	1069	1678	2053	2271	2382	2366	2854	2996
Index (%) of area harvested (100 for mean of 1971-1980)	57.7	75.4	93.0	107	203	344	541	661	732	767	762	919	965
Irrigated rice area harvested (1,000 ha)	98.0	98.0	98.0	98.0	98.0	171	261	315	313	266	266	219	
Index (%) of irrigated area (100 for mean of 1971-1980)	100	100	100	100	100	175	266	322	319	272	272	223	
Percent of Irrigated rice area harvested (%)	54.7	41.9	33.9	29.5	15.6	16.0	15.5	15.4	13.8	11.2	11.3	7.67	
Paddy production (1,000 ton)	207	321	470	596	1300	2216	2980	3248	3139	4179	3885	5426	6071
Index (%) of paddy production (100 for mean of 1971-1980)	38.9	60.2	88.2	112	244	416	559	609	589	784	729	1018	1139
Production (1,000 ton, milled rice)	130	201	294	373	813	1385	1862	2030	1962	2612	2428	3391	3794
Paddy yield (ton/ha)	1.15	1.36	1.67	1.71	2.06	2.10	1.78	1.59	1.38	1.75	1.66	1.91	2.03
Index (%) of paddy yield (100 for mean of 1971-1980)	67.9	80.7	98.8	101	122	124	106	94.0	81.7	104	98.3	113	120
Yield (ton/ha, milled rice)	0.72	0.85	1.04	1.07	1.29	1.31	1.11	0.99	0.86	1.10	1.04	1.19	1.27
Imported quantity (1,000 ton, milled rice)	1.28	1.09	3.73	408	492	289	329	647	1436	971	1241	1851	90.5
Self-Sufficiency ratio (%)	99.0	99.4	98.8	51.0	62.7	81.7	84.8	76.2	57.8	72.9	66.5	65.1	97.7
Imported rice price ($/ton, milled rice)	220	197	404	565	463	258	275	337	222	795	512	550	439
Consumption per capita (kg/person, milled rice)	2.71	3.76	4.93	11.1	16.5	18.4	21.4	23.0	25.7	23.8	24.3	30.6	20.9

Table. Rice Value Trends in Madagascar (No.2 rice producing country in SSA during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

	1961 -1965	1966 -1970	1971 -1975	1976 -1980	1981 -1985	1986 -1990	1991 -1995	1996 -2000	2001 -2005	2008	2006 -2010	2011 -2015	2016
Population (million)	5.49	6.24	7.15	8.24	9.51	11.0	12.7	14.8	17.3	20.0	20.0	23.0	24.9
Area harvested (1,000 ha)	843	986	1042	1147	1183	1142	1166	1187	1227	1284	1284	1020	862
Index (%) of area harvested (100 for mean of 1971-1980)	77.0	90.1	95.2	105	108	104	107	108	112	117	117	93.2	78.7
Irrigated rice area harvested (1,000 ha)	375	438	463	510	526	507	675	793	909	1044	1044	793	
Index (%) of irrigated area (100 for mean of 1971-1980)	77.0	90.1	95.2	105	108	104	139	163	187	215	215	163	
Percent of Irrigated rice area harvested (%)	44.4	44.4	44.4	44.4	44.4	44.4	57.9	66.8	74.1	81.3	81.3	77.70	
Paddy production (1,000 ton)	1563	1779	1943	2037	2087	2271	2430	2511	2898	3914	4055	4032	3816
Index (%) of paddy production (100 for mean of 1971-1980)	78.5	89.4	97.6	102	105	114	122	126	146	197	204	203	192
Production (1,000 ton, milled rice)	977	1112	1214	1273	1305	1420	1519	1569	1811	2446	2535	2520	2385
Paddy yield (ton/ha)	1.85	1.80	1.87	1.78	1.76	1.99	2.08	2.12	2.36	3.05	3.15	3.97	4.43
Index (%) of paddy yield (100 for mean of 1971-1980)	102	99.0	102	97.6	96.8	109	114	116	129	167	173	218	243
Yield (ton/ha, milled rice)	1.16	1.13	1.17	1.11	1.10	1.24	1.30	1.32	1.47	1.91	1.97	2.48	2.77
Imported quantity (1,000 ton, milled rice)	17.0	15.1	67.1	104	214	94.8	46.2	87.5	190	169	151	282	233
Self-Sufficiency ratio (%)	98.4	98.7	94.8	92.5	86.1	93.8	97.1	94.9	90.8	93.6	94.2	89.8	91.1
Imported rice price ($/ton, milled rice)	127	129	236	293	263	302	315	288	198	473	387	438	385
Consumption per capita (kg/person, milled rice)	181	180	179	167	160	138	123	112	115	131	134	122	105



Source: The Times Comprehensive Atlas of the World, 12th edition 2007


MOZ
INHAMBANE
GAZA
MAPUTO
MAPUTO
MAHAJANGA
TOAMASINA
Toamasina
ANTANANARIVO
ANTSIRANANA
FIANARANTSOA
TOLIARA
MADAGASCAR
INDIAN OCEAN
MADAGASCAR
CONTINUATION AT THE SAME SCALE
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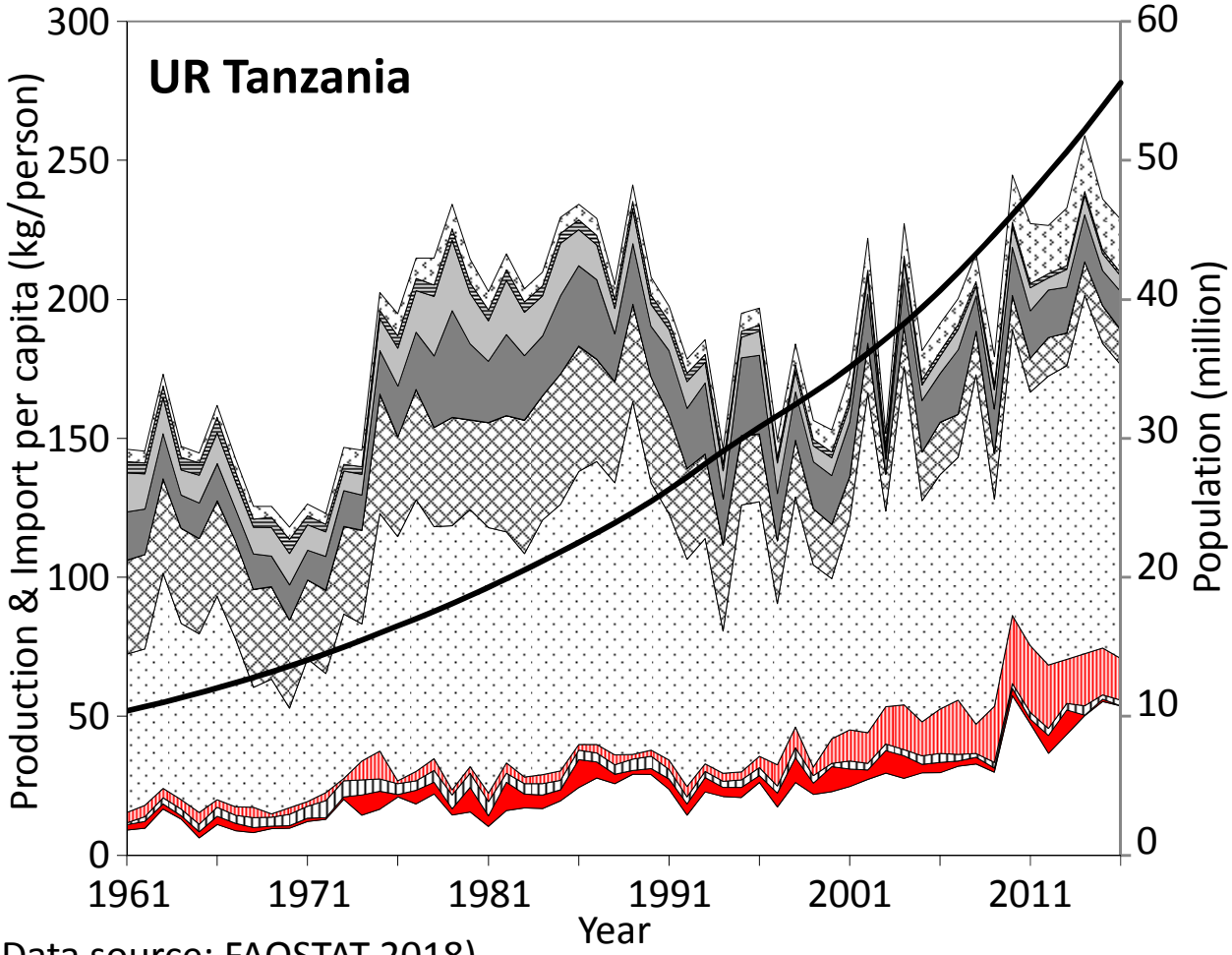


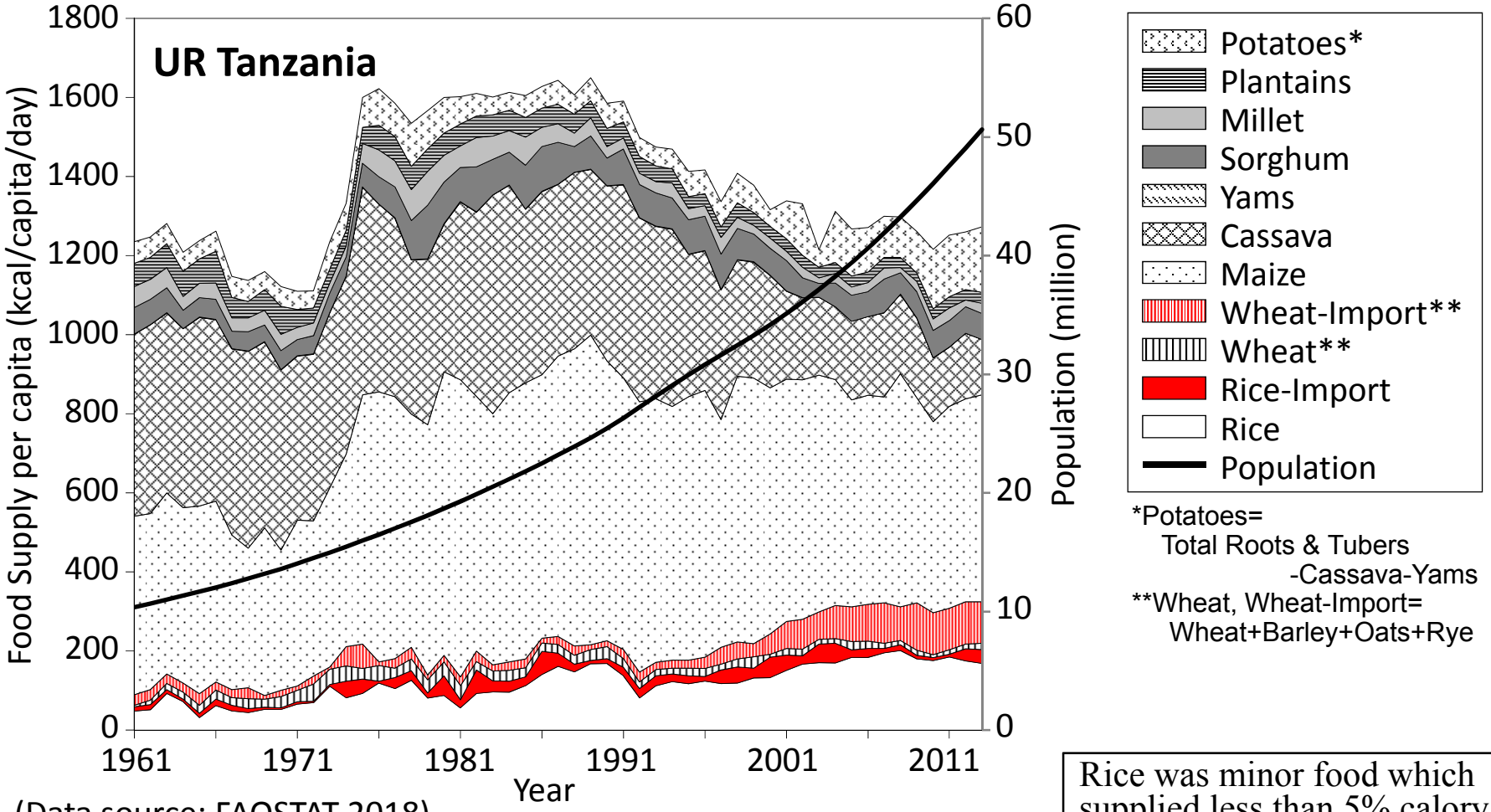
*Potatoes=
Total Roots & Tubers
-Cassava-Yams
**Wheat, Wheat-Import=
Wheat+Barley+Oats+Rye

(Data source: FAOSTAT 2018)

Fig. Various Food Production & Import (kg/person) UR Tanzania (No.3 rice producing country in SSA) during 1961-2016.

Cereal equivalent amounts of calories per kg are one fifth for Potato & plantain, one fourth for Yam and cassava (FAO Food composition data). In addition to these, postharvest and storage losses are estimated 2 times bigger than cereals for Cassava, 1.6 times for plantain, 1.3 times for Yam, and 1.0 for potatoes. Thus the cereals conversion ratios of potatoes and Yams are 1/5 and 1/8 for Plantains and Cassava.

There are many points of contact with Asia including Zanzibar, and therefore the evolution to Sawah rice cultivation is in progress, and rice production is increasing well. Although Maize is staple food traditionally, rice diet may become No. 1 in before 2050.



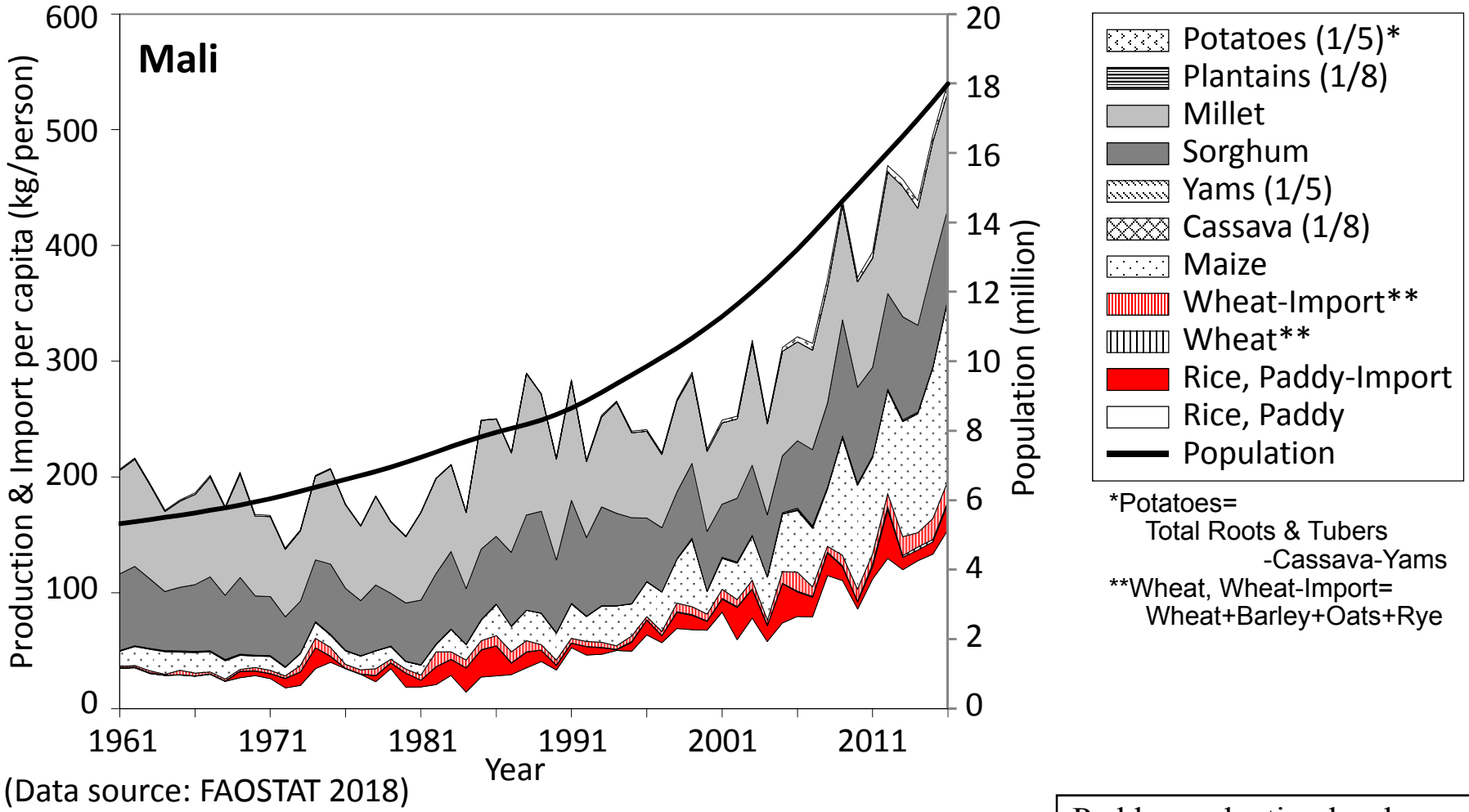
*Potatoes=
Total Roots & Tubers
-Cassava-Yams
**Wheat, Wheat-Import=
Wheat+Barley+Oats+Rye

(Data source: FAOSTAT 2018)

Fig. Various Food Supply (kcal/capita/day) in UR Tanzania (No.3 rice producing country in SSA) during 1961-2013.

Rice was minor food which supplied less than 5% calory in 1960s.
In 2010s rice supplied 15% calory, No.2, after Maize.

We used that the cereals' equivalent coefficients of 1/8 for Cassava and Plantains as well as 1/5 for Yam and Potatoes. These conversion factors can be tentatively verified if we compare figure on per capita production and importation amounts in kg and per capita consumption in kcal.

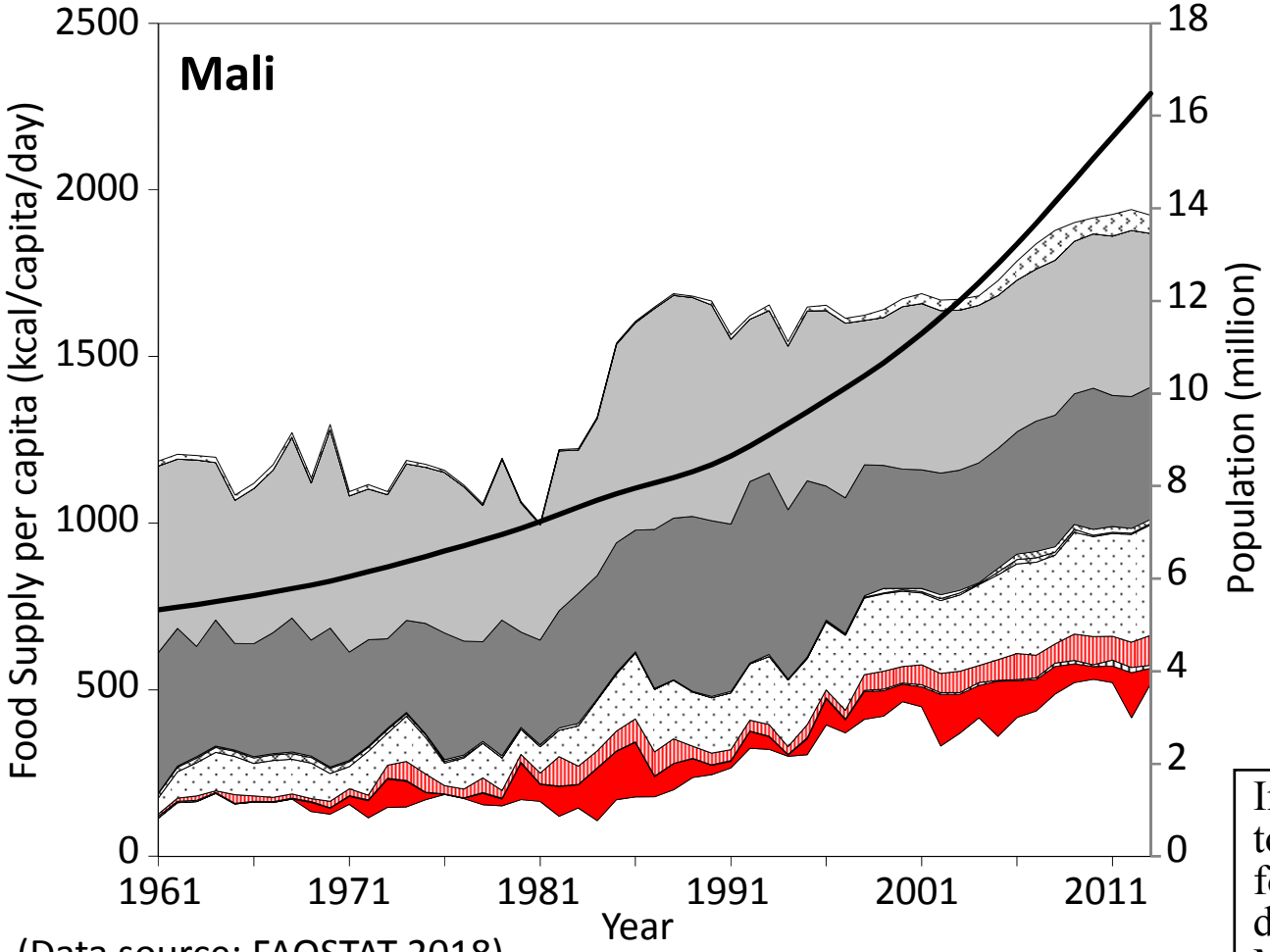


(Data source: FAOSTAT 2018)

Fig. Various Food Production & Import (kg/person) in Mali (No.4 rice producing country in SSA) during 1961-2016.

Cereal equivalent amounts of calories per kg are one fifth for Potato & plantain, one fourth for Yam and cassava (FAO Food composition data). In addition to these, postharvest and storage losses are estimated 2 times bigger than cereals for Cassava, 1.6 times for plantain, 1.3 times for Yam, and 1.0 for potatoes. Thus the cereals conversion ratios of potatoes and Yams are 1/5 and 1/8 for Plantains and Cassava.

Paddy production has been expanding dramatically last 30years. Now rice is No.1 food. Per capita consumption is more than 100kg per year now, which is similar level to Asian country. Maize production has increased recently.



(Data source: FAOSTAT 2018)

*Potatoes=
Total Roots & Tubers
-Cassava-Yams
**Wheat, Wheat-Import=
Wheat+Barley+Oats+Rye

Fig. Various Food Supply (kcal/capita/day) in Mali (No.4 rice producing country in SSA) during 1961-2013.

In contrast to Senegal, thanks to Niger river and inland delta, food production has been developed and sustained in Mali. The amount of importation of both wheat and rice have not been visible, which as partly because of land locked country.

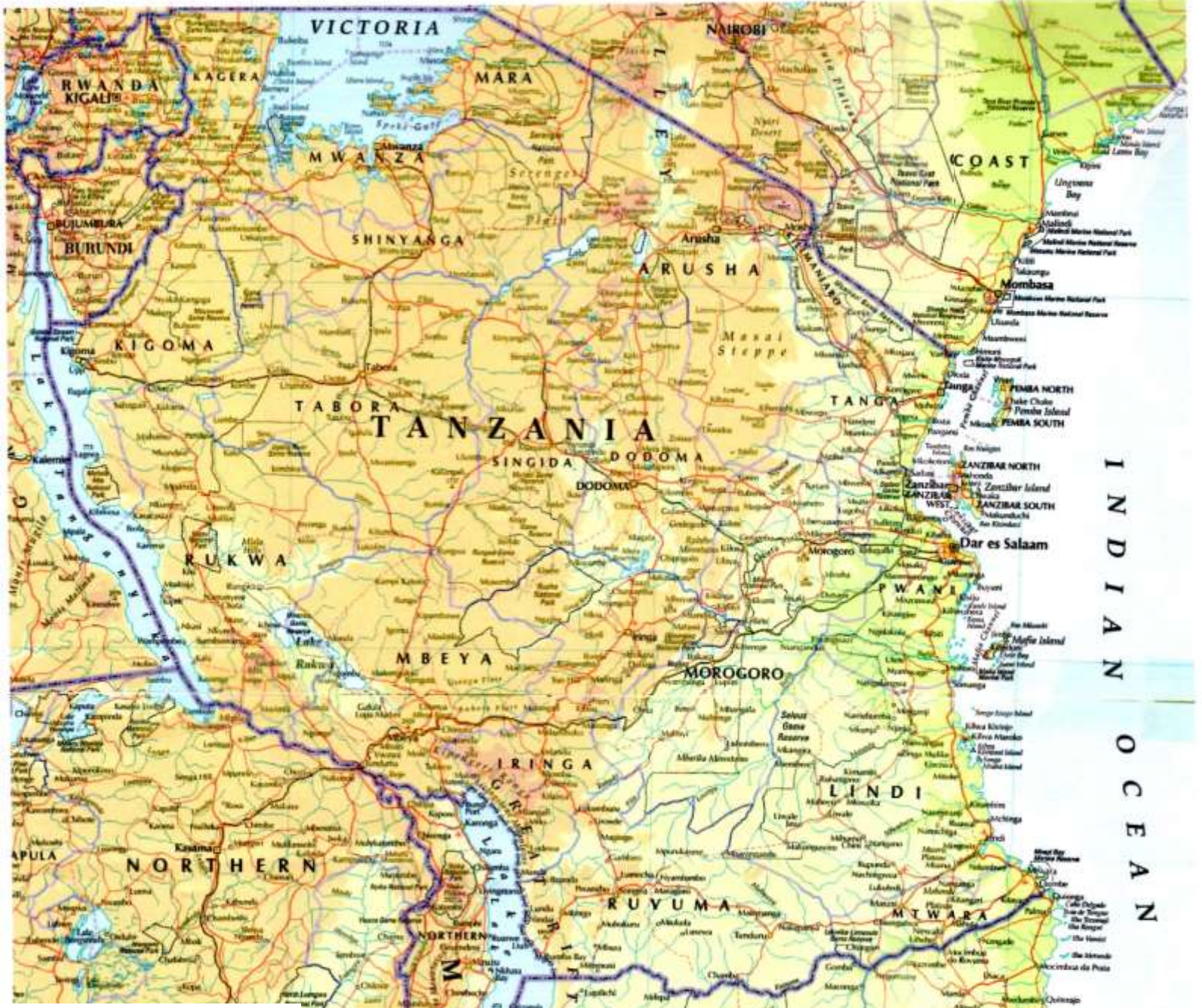
We used that the cereals' equivalent coefficients of 1/8 for Cassava and Plantains as well as 1/5 for Yam and Potatoes. These conversion factors can be tentatively verified if we compare figure on per capita production and importation amounts in kg and per capita consumption in kcal.

Table. Rice Value Trends in United Republic of Tanzania (No.3 rice producing country in SSA during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

	1961 -1965	1966 -1970	1971 -1975	1976 -1980	1981 -1985	1986 -1990	1991 -1995	1996 -2000	2001 -2005	2008	2006 -2010	2011 -2015	2016
Population (million)	11.0	12.8	15.0	17.6	20.5	23.9	28.1	32.5	37.2	43.3	43.3	50.7	55.6
Area harvested (1,000 ha)	89.2	129	161	255	262	348	355	480	581	888	804	992	1231
Index (%) of area harvested (100 for mean of 1971-1980)	42.9	62.1	77.5	122	126	167	171	231	280	427	387	477	592
Irrigated rice area harvested (1,000 ha)	3.72	5.27	7.26	14.6	20.0	34.8	15.6	49.8	104	367	369	442	
Index (%) of irrigated area (100 for mean of 1971-1980)	34.1	48.3	66.5	134	183	319	143	456	952	3365	3377	4051	
Percent of Irrigated rice area harvested (%)	4.17	4.09	4.50	5.72	7.62	10.0	4.40	10.4	17.9	41.4	45.8	44.6	
Paddy production (1,000 ton)	120	121	229	320	330	653	579	743	1035	1421	1591	2369	2986
Index (%) of paddy production (100 for mean of 1971-1980)	43.8	44.0	83.5	116	120	238	211	271	377	517	579	862	1087
Production (1,000 ton, milled rice)	75.2	75.6	143	200	207	408	362	464	647	888	994	1481	1866
Paddy yield (ton/ha)	1.33	0.94	1.46	1.26	1.29	1.88	1.62	1.58	1.81	1.60	1.98	2.39	2.43
Index (%) of paddy yield (100 for mean of 1971-1980)	97.7	69.4	107	92.6	95.1	139	119	117	133	118	146	176	179
Yield (ton/ha, milled rice)	0.83	0.59	0.91	0.79	0.81	1.18	1.01	0.99	1.13	1.00	1.24	1.49	1.52
Imported quantity (1,000 ton, milled rice)	13.2	14.7	31.8	47.4	70.6	66.1	69.7	121	135	64.2	64.3	114	0.91
Self-Sufficiency ratio (%)	83.6	83.9	84.2	81.8	74.6	86.1	83.5	79.9	83.0	93.3	93.6	92.5	100
Imported rice price ($/ton, milled rice)	150	171	303	364	446	304	296	341	203	255	270	409	791
Consumption per capita (kg/person, milled rice)	8.03	7.08	11.6	14.1	13.4	19.8	15.3	18.0	21.0	22.0	24.2	31.4	33.6

Table. Rice Value Trends in Mali (No.4 rice producing country in SSA during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

	1961 -1965	1966 -1970	1971 -1975	1976 -1980	1981 -1985	1986 -1990	1991 -1995	1996 -2000	2001 -2005	2008	2006 -2010	2011 -2015	2016
Population (million)	5.44	5.79	6.26	6.84	7.54	8.20	9.12	10.4	12.0	14.1	14.1	16.5	18.0
Area harvested (1,000 ha)	167	169	188	169	167	202	267	332	392	483	485	657	835
Index (%) of area harvested (100 for mean of 1971-1980)	93.3	94.4	105	94.7	93.6	113	149	186	220	270	272	368	468
Irrigated rice area harvested (1,000 ha)	57.8	58.0	57.8	57.8	57.8	50.6	64.2	125	187	224	225	256	
Index (%) of irrigated area (100 for mean of 1971-1980)	100	100	100	100	100	87.6	111	216	323	387	390	443	
Percent of Irrigated rice area harvested (%)	34.7	34.4	30.8	34.2	34.6	25.0	24.1	37.6	47.6	46.4	46.5	39.01	
Paddy production (1,000 ton)	172	158	174	191	165	274	447	678	847	1624	1334	2059	2781
Index (%) of paddy production (100 for mean of 1971-1980)	94.1	86.4	95.3	105	90.5	150	245	371	464	889	730	1127	1522
Production (1,000 ton, milled rice)	107	98.6	109	119	103	171	280	424	530	1015	834	1287	1738
Paddy yield (ton/ha)	1.05	0.95	0.91	1.15	0.99	1.35	1.68	2.04	2.17	3.37	2.78	3.14	3.33
Index (%) of paddy yield (100 for mean of 1971-1980)	102	91.9	88.1	112	96.4	131	163	198	210	326	269	304	323
Yield (ton/ha, milled rice)	0.66	0.59	0.57	0.72	0.62	0.85	1.05	1.28	1.35	2.10	1.73	1.96	2.08
Imported quantity (1,000 ton, milled rice)	0.03	6.95	36.4	19.1	75.2	64.0	28.4	68.2	169	172	132	169	250
Self-Sufficiency ratio (%)	100	94.1	74.8	86.1	59.2	73.9	90.9	86.3	76.3	85.5	86.0	88.9	87.4
Imported rice price ($/ton, milled rice)	200	135	329	377	367	285	342	222	194	384	369	391	347
Consumption per capita (kg/person, milled rice)	19.8	18.2	23.1	20.3	23.6	28.7	33.8	47.3	58.0	84.0	68.3	88.2	110



Source: The Times Comprehensive Atlas of the World, 12th edition 2007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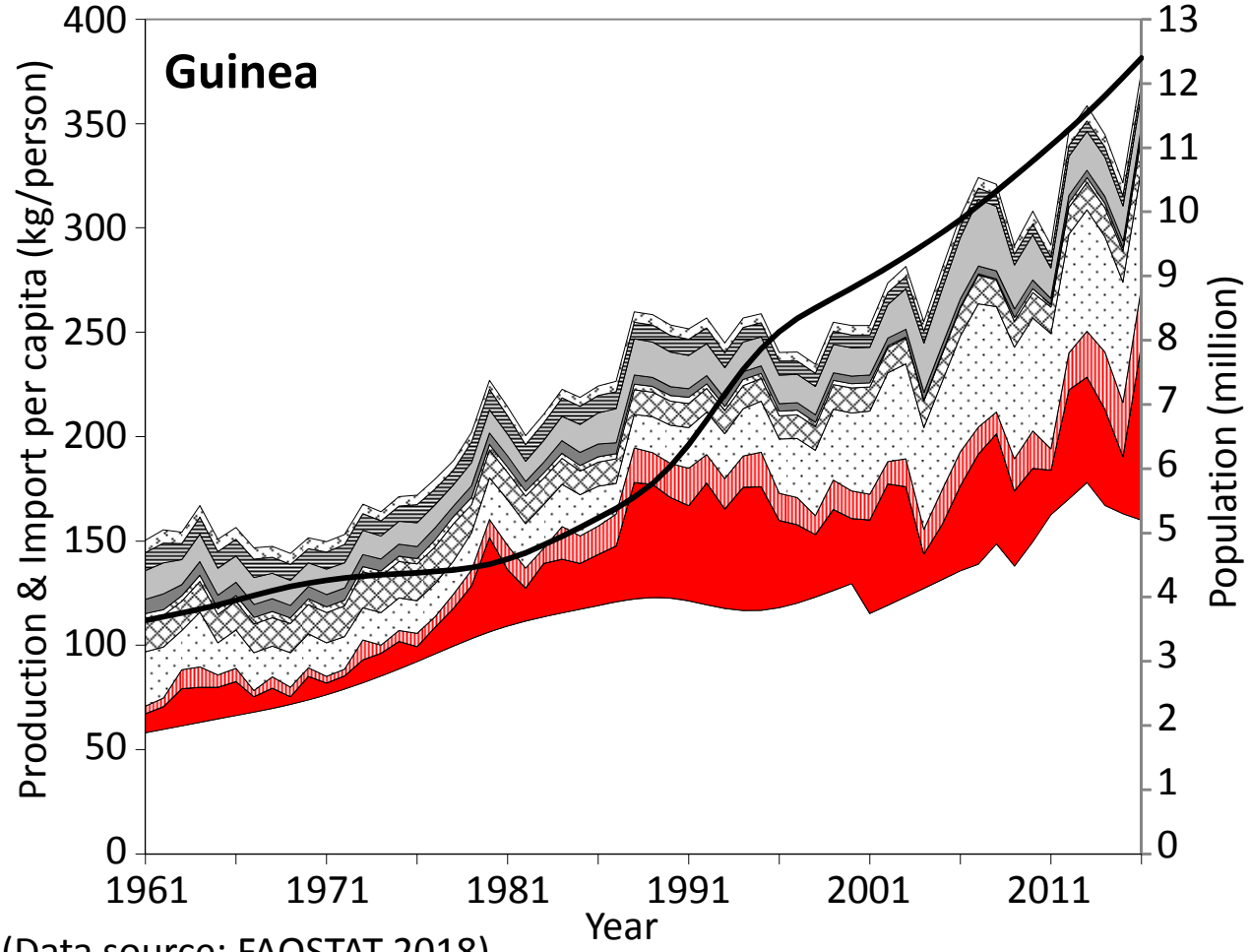


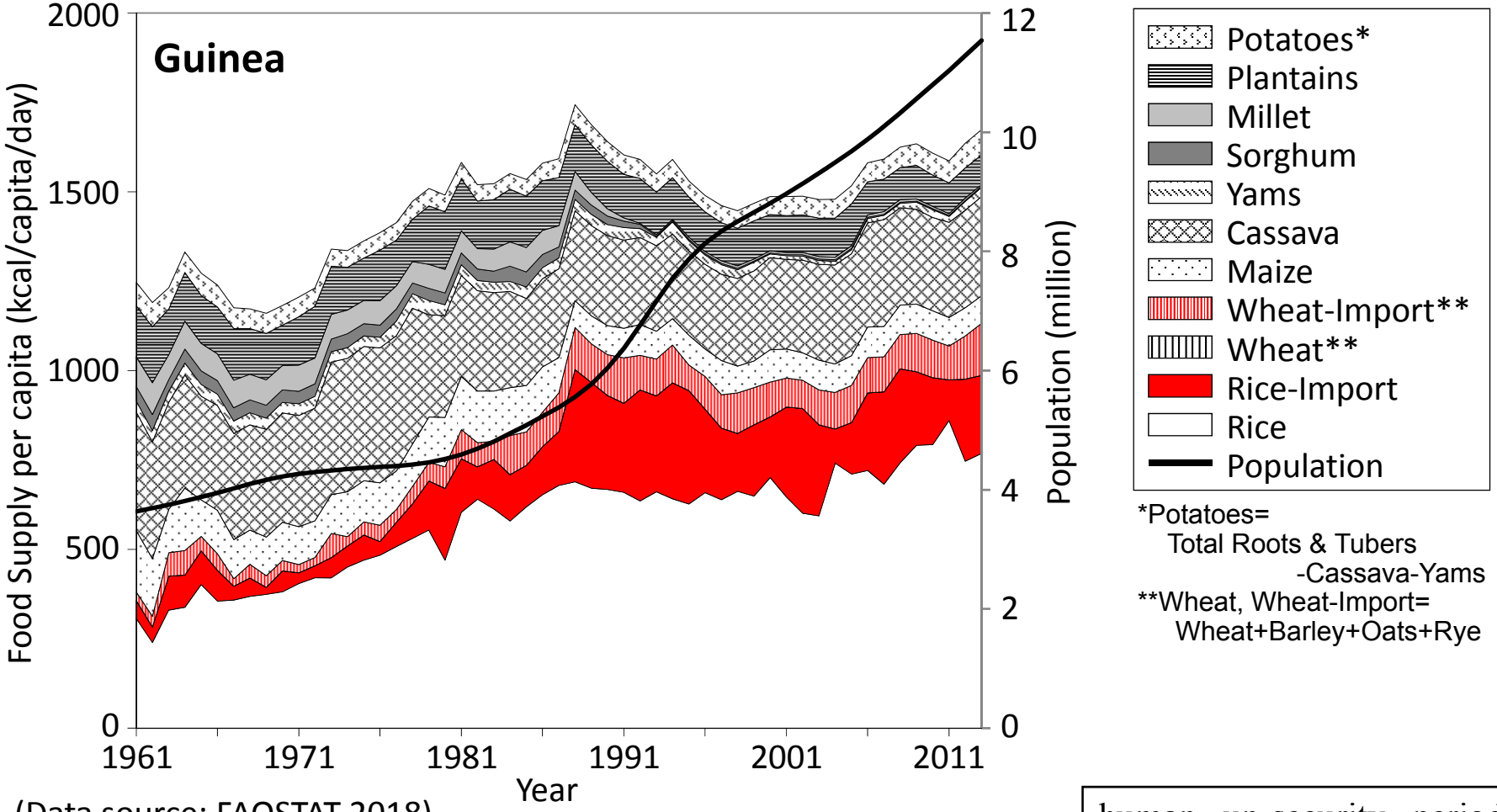
*Potatoes=
Total Roots & Tubers
-Cassava-Yams
**Wheat, Wheat-Import=
Wheat+Barley+Oats+Rye

(Data source: FAOSTAT 2018)

Fig. Various Food Production & Import (kg/person) in Guinea (No.5 rice producing country in SSA) during 1961-2016.

Cereal equivalent amounts of calories per kg are one fifth for Potato & plantain, one fourth for Yam and cassava (FAO Food composition data). In addition to these, postharvest and storage losses are estimated 2 times bigger than cereals for Cassava, 1.6 times for plantain, 1.3 times for Yam, and 1.0 for potatoes. Thus the cereals conversion ratios of potatoes and Yams are 1/5 and 1/8 for Plantains and Cassava.

Guinea is traditional rice-eating country. Although data reliability is low, rice production and import have been increasing during 1960-2013. Low credibility of rice data can be confirmed straight line of paddy production and the ratio of rice paddy production amount to production area (i.e. yield) does not change at fixed 1.7t/ha in the past 50years.

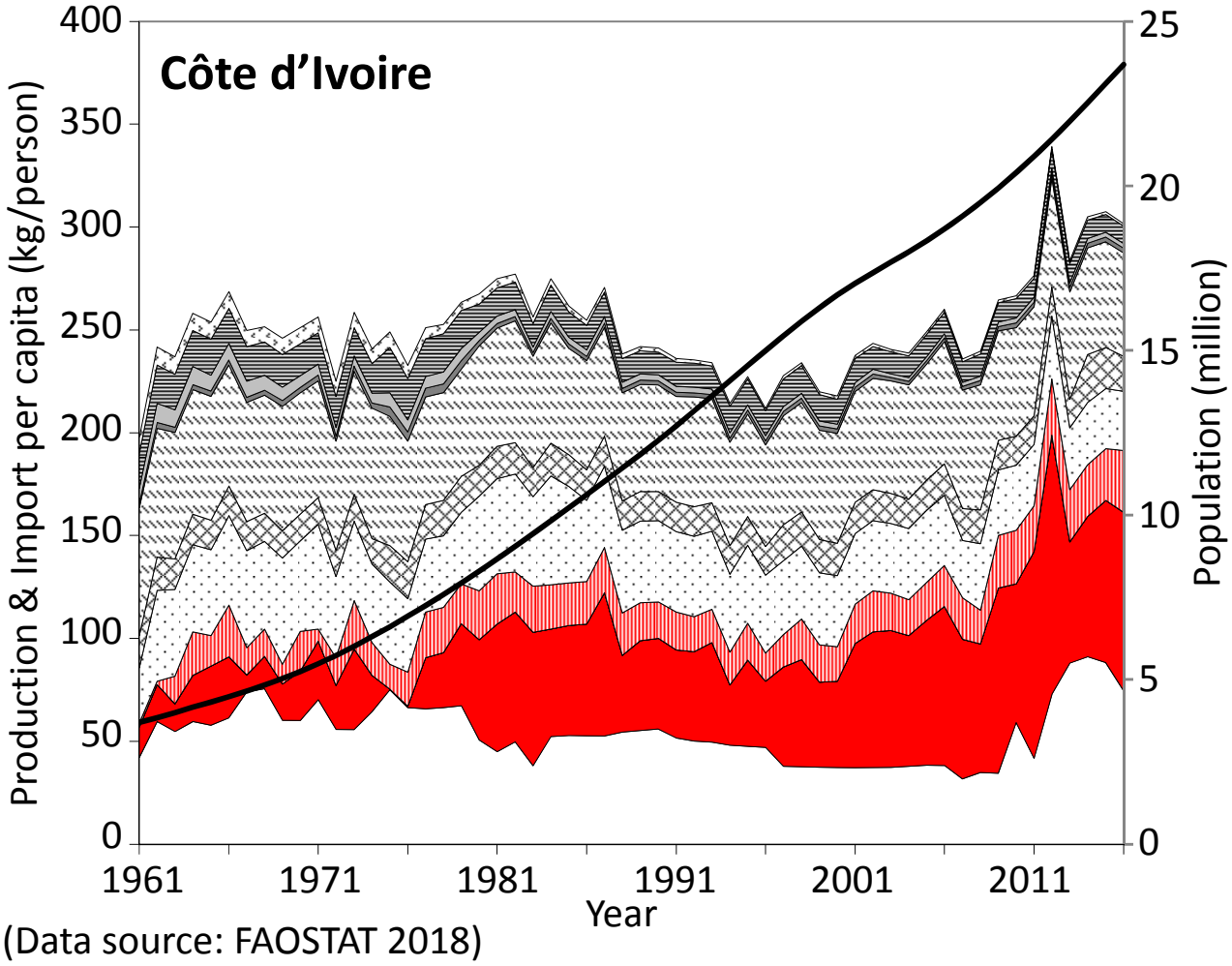


(Data source: FAOSTAT 2018)

Fig. Various Food Supply (kcal/capita/day) in Guinea (No.5 rice producing country in SSA) during 1961-2013.

human un-security periods have been clearly shown on the population curve during 1970-1985 and 1995-2005.

We used that the cereals' equivalent coefficients of 1/8 for Cassava and Plantains as well as 1/5 for Yam and Potatoes. These conversion factors can be tentatively verified if we compare figure on per capita production and importation amounts in kg and per capita consumption in kcal.



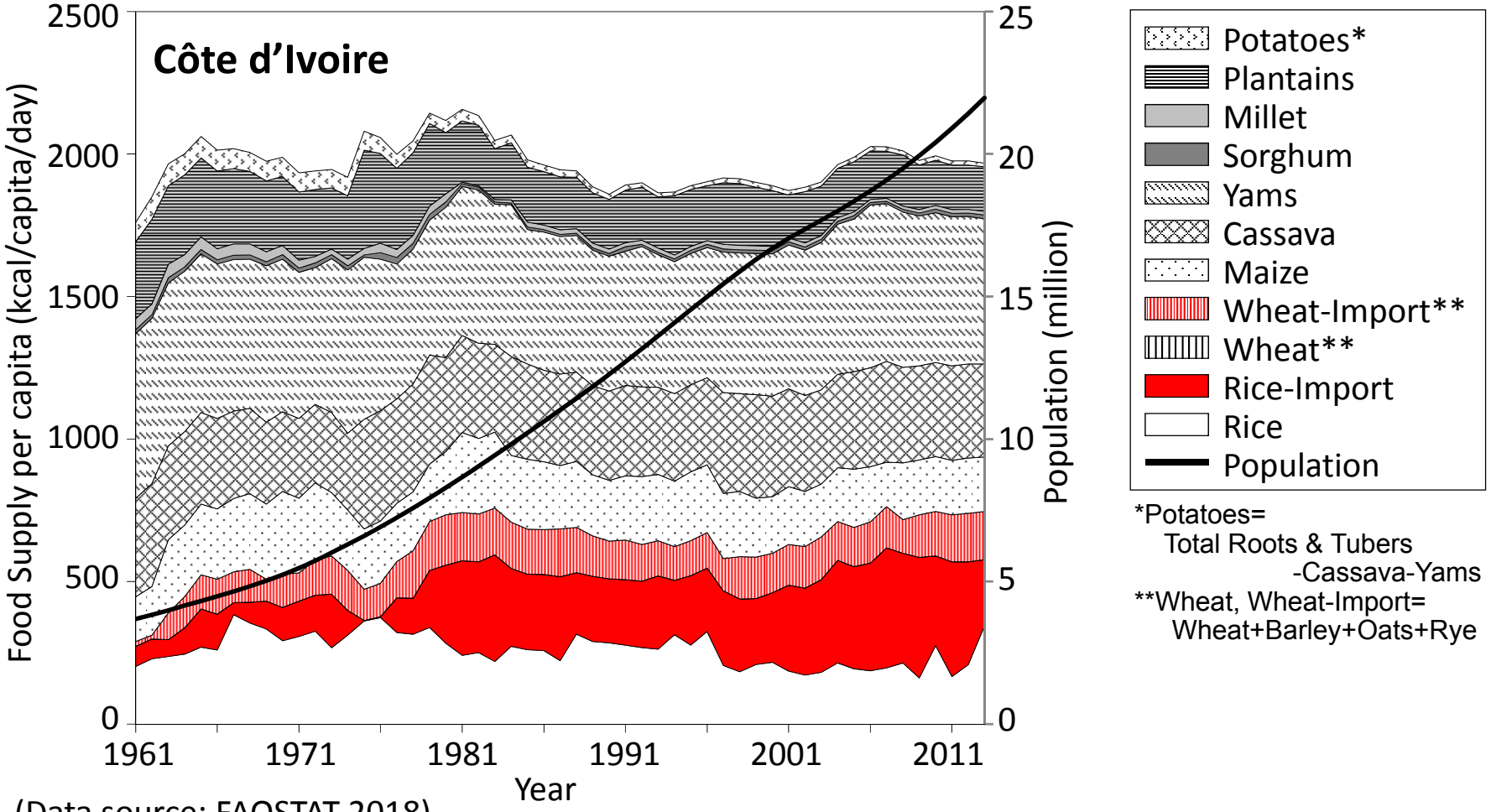
(Data source: FAOSTAT 2018)

*Potatoes=
Total Roots & Tubers
-Cassava-Yams
**Wheat, Wheat-Import=
Wheat+Barley+Oats+Rye

Fig. Various Food Production & Import (kg/person) in Côte d'Ivoire (No.6 rice producing country in SSA) during 1961-2016.

Cereal equivalent amounts of calories per kg are one fifth for Potato & plantain, one fourth for Yam and cassava (FAO Food composition data). In addition to these, postharvest and storage losses are estimated 2 times bigger than cereals for Cassava, 1.6 times for plantain, 1.3 times for Yam, and 1.0 for potatoes. Thus the cereals conversion ratios of potatoes and Yams are 1/5 and 1/8 for Plantains and Cassava.

Because the technology of Sawah rice cultivation was transferred by Taiwan, Rice production was high until 1975. But after that it decreased. Rice import sharply increased from 2002 because of civil war. Furthermore, the import amount increased sharply after civil war which was ended in 2011. But, the data lacked credibility.



(Data source: FAOSTAT 2018)

Fig. Various Food Supply (kcal/capita/day) in Côte d'Ivoire (No.6 rice producing country in SSA) during 1961-2013.

We used that the cereals' equivalent coefficients of 1/8 for Cassava and Plantains as well as 1/5 for Yam and Potatoes. These conversion factors can be tentatively verified if we compare figure on per capita production and importation amounts in kg and per capita consumption in kcal.

Table. Rice Value Trends in Guinea (No.5 rice producing country in SSA during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

	1961 -1965	1966 -1970	1971 -1975	1976 -1980	1981 -1985	1986 -1990	1991 -1995	1996 -2000	2001 -2005	2008	2006 -2010	2011 -2015	2016
Population (million)	3.75	4.09	4.32	4.43	4.82	5.60	7.14	8.49	9.32	10.3	10.3	11.6	12.4
Area harvested (1,000 ha)	135	168	208	258	321	398	493	612	661	795	936	1584	1685
Index (%) of area harvested (100 for mean of 1971-1980)	58.0	72.0	89.3	111	137	170	211	262	283	340	401	679	722
Irrigated rice area harvested (1,000 ha)	6.00	7.80	15.0	22.2	27.0	25.8	27.0	15.2	15.1	40.9	40.9	40.9	
Index (%) of irrigated area (100 for mean of 1971-1980)	32.3	41.9	80.6	119	145	139	145	81.7	81.2	220	220	220	
Percent of Irrigated rice area harvested (%)	4.43	4.64	7.20	8.59	8.42	6.50	5.47	2.48	2.28	5.15	4.37	2.58	
Paddy production (1,000 ton)	230	286	355	441	548	680	844	1048	1150	1534	1469	1941	1983
Index (%) of paddy production (100 for mean of 1971-1980)	57.9	71.9	89.2	111	138	171	212	263	289	385	369	488	498
Production (1,000 ton, milled rice)	144	179	222	276	342	425	528	655	719	959	918	1213	1239
Paddy yield (ton/ha)	1.70	1.70	1.71	1.71	1.71	1.71	1.71	1.71	1.74	1.93	1.65	1.23	1.18
Index (%) of paddy yield (100 for mean of 1971-1980)	99.8	99.9	100	100	100	100	100	100	102	113	96.7	71.8	69.0
Yield (ton/ha, milled rice)	1.06	1.06	1.07	1.07	1.07	1.07	1.07	1.07	1.09	1.21	1.03	0.77	0.74
Imported quantity (1,000 ton, milled rice)	32.9	24.7	25.6	60.9	70.2	148	242	190	230	339	280	286	654
Self-Sufficiency ratio (%)	81.7	88.0	89.9	83.1	83.0	74.9	68.7	77.5	76.2	73.9	76.7	81.3	65.4
Imported rice price ($/ton, milled rice)	160	162	288	318	300	199	220	216	189	451	357	464	374
Consumption per capita (kg/person, milled rice)	47.1	49.8	57.3	75.8	85.4	102	108	99.6	102	126	116	130	153

Table. Rice Value Trends in Côte d'Ivoire (No.6 rice producing country in SSA during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

	1961 -1965	1966 -1970	1971 -1975	1976 -1980	1981 -1985	1986 -1990	1991 -1995	1996 -2000	2001 -2005	2008	2006 -2010	2011 -2015	2016
Population (million)	4.00	4.85	6.03	7.60	9.44	11.4	13.6	15.9	17.7	19.5	19.5	22.0	23.7
Area harvested (1,000 ha)	249	287	312	409	386	531	611	406	343	367	373	699	703
Index (%) of area harvested (100 for mean of 1971-1980)	69.0	79.7	86.6	113	107	147	169	113	95.2	102	104	194	195
Irrigated rice area harvested (1,000 ha)	2.12	6.35	12.3	17.6	22.0	31.9	34.4	29.7	23.1	16.5	16.5	16.5	
Index (%) of irrigated area (100 for mean of 1971-1980)	14.2	42.5	82.0	118	147	213	230	199	155	110	110	110	
Percent of Irrigated rice area harvested (%)	0.85	2.21	3.92	4.31	5.71	6.00	5.63	7.32	6.73	4.49	4.42	2.36	
Paddy production (1,000 ton)	220	321	388	479	451	621	673	624	665	680	779	1693	1768
Index (%) of paddy production (100 for mean of 1971-1980)	50.8	74.0	89.6	110	104	143	155	144	153	157	180	390	408
Production (1,000 ton, milled rice)	138	201	243	299	282	388	420	390	416	425	487	1058	1105
Paddy yield (ton/ha)	0.88	1.11	1.24	1.17	1.17	1.17	1.11	1.57	1.94	1.85	2.07	2.41	2.51
Index (%) of paddy yield (100 for mean of 1971-1980)	73.0	92.4	103	97.1	96.6	96.7	92.1	130	161	154	172	199	208
Yield (ton/ha, milled rice)	0.55	0.70	0.78	0.73	0.73	0.73	0.69	0.98	1.21	1.16	1.30	1.50	1.57
Imported quantity (1,000 ton, milled rice)	49.4	57.8	78.6	138	348	353	350	429	723	762	891	1181	1283
Self-Sufficiency ratio (%)	74.1	77.8	76.0	71.4	44.6	52.7	54.8	48.0	36.6	35.8	35.1	47.2	46.3
Imported rice price ($/ton, milled rice)	126	137	314	418	269	269	304	268	244	619	490	569	403
Consumption per capita (kg/person, milled rice)	46.4	53.3	53.5	57.2	66.7	65.0	56.6	51.6	64.4	60.9	70.4	102	101

Source: The Times Comprehensive Atlas of the World, 12th edition 2007

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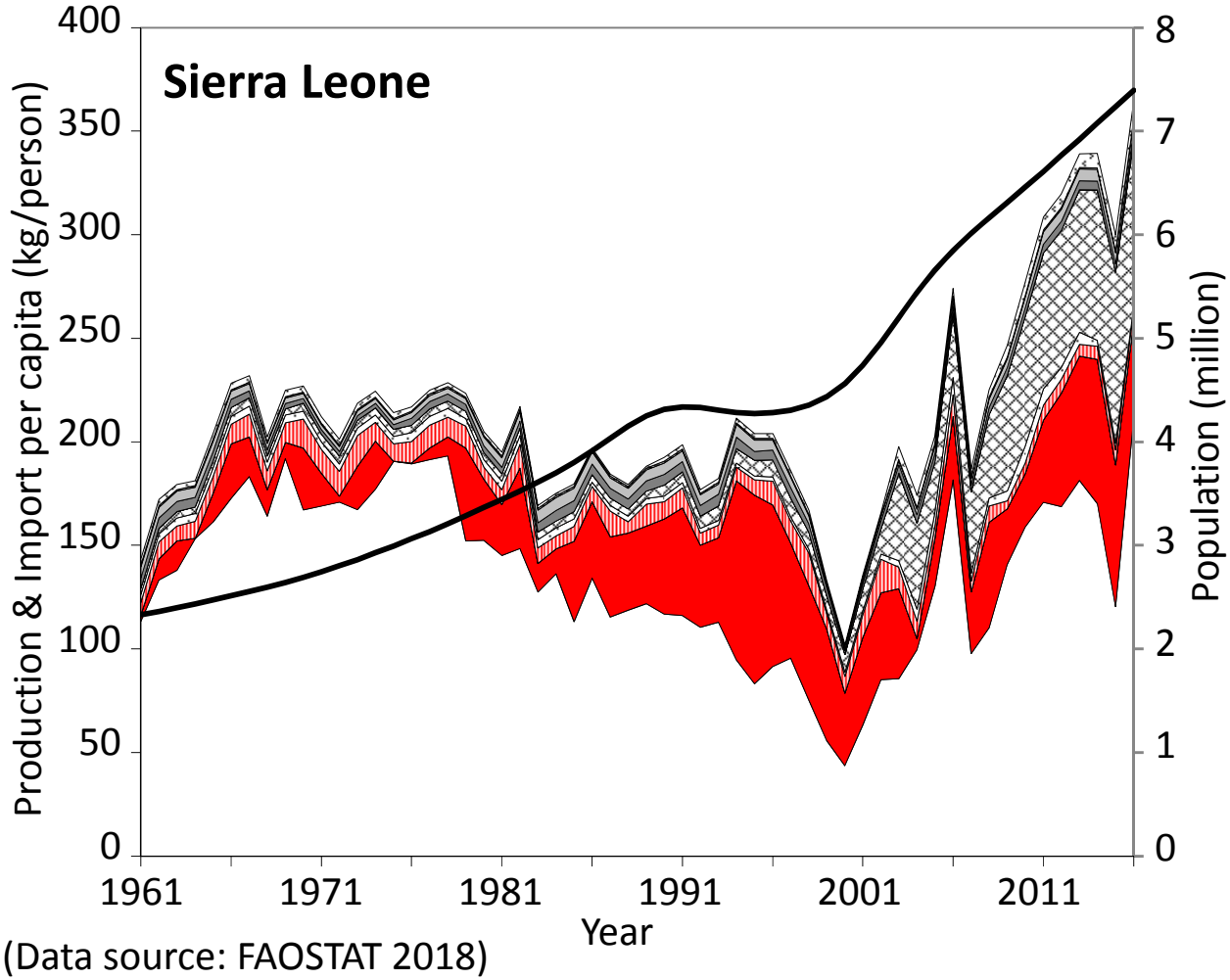


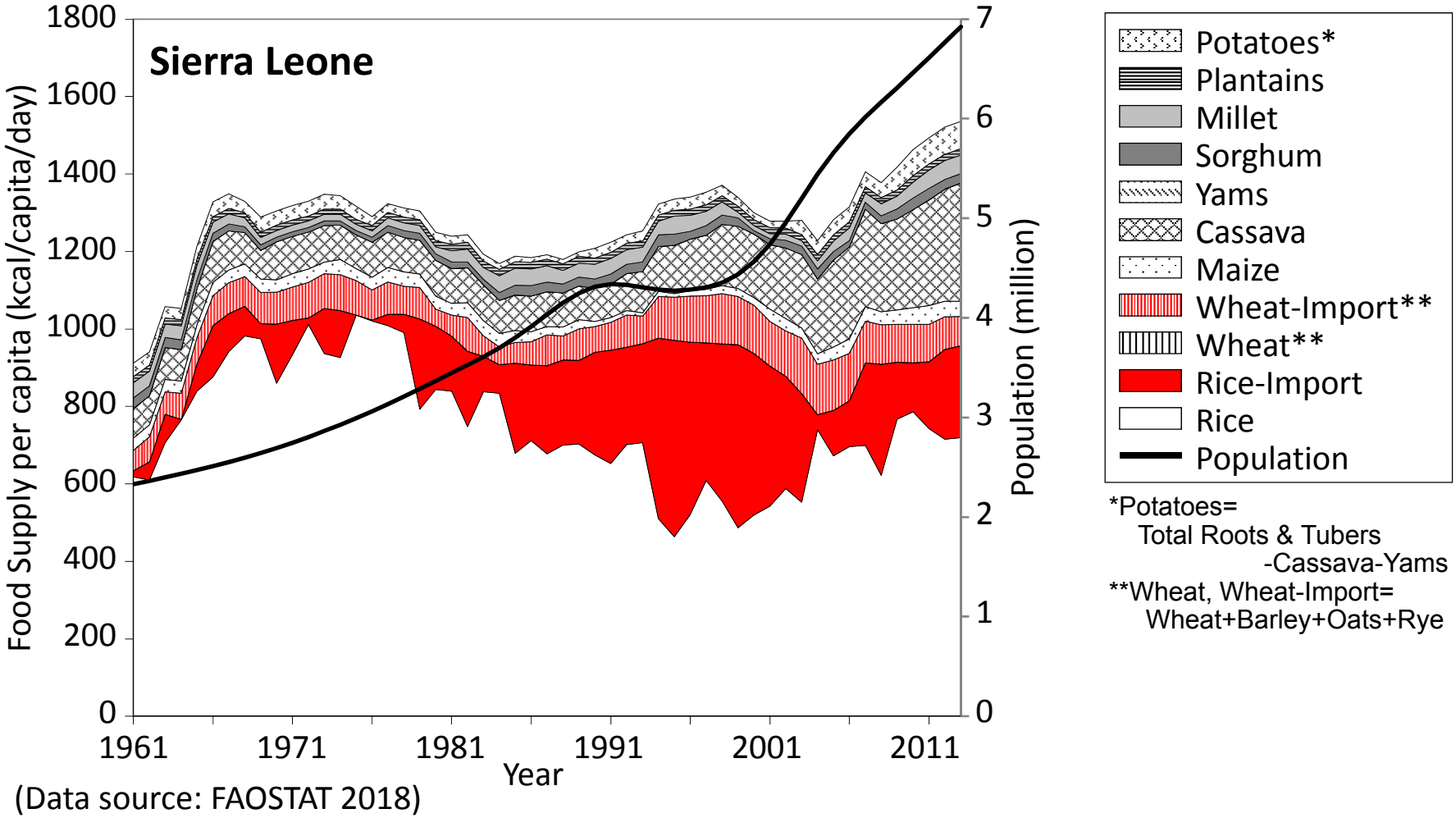
*Potatoes=
Total Roots & Tubers
-Cassava-Yams
**Wheat, Wheat-Import=
Wheat+Barley+Oats+Rye

(Data source: FAOSTAT 2018)

Fig. Various Food Production & Import (kg/person) in Sierra Leone (No.7 rice producing country in SSA) during 1961-2016.

Cereal equivalent amounts of calories per kg are one fifth for Potato & plantain, one fourth for Yam and cassava (FAO Food composition data). In addition to these, postharvest and storage losses are estimated 2 times bigger than cereals for Cassava, 1.6 times for plantain, 1.3 times for Yam, and 1.0 for potatoes. Thus the cereals conversion ratios of potatoes and Yams are 1/5 and 1/8 for Plantains and Cassava.

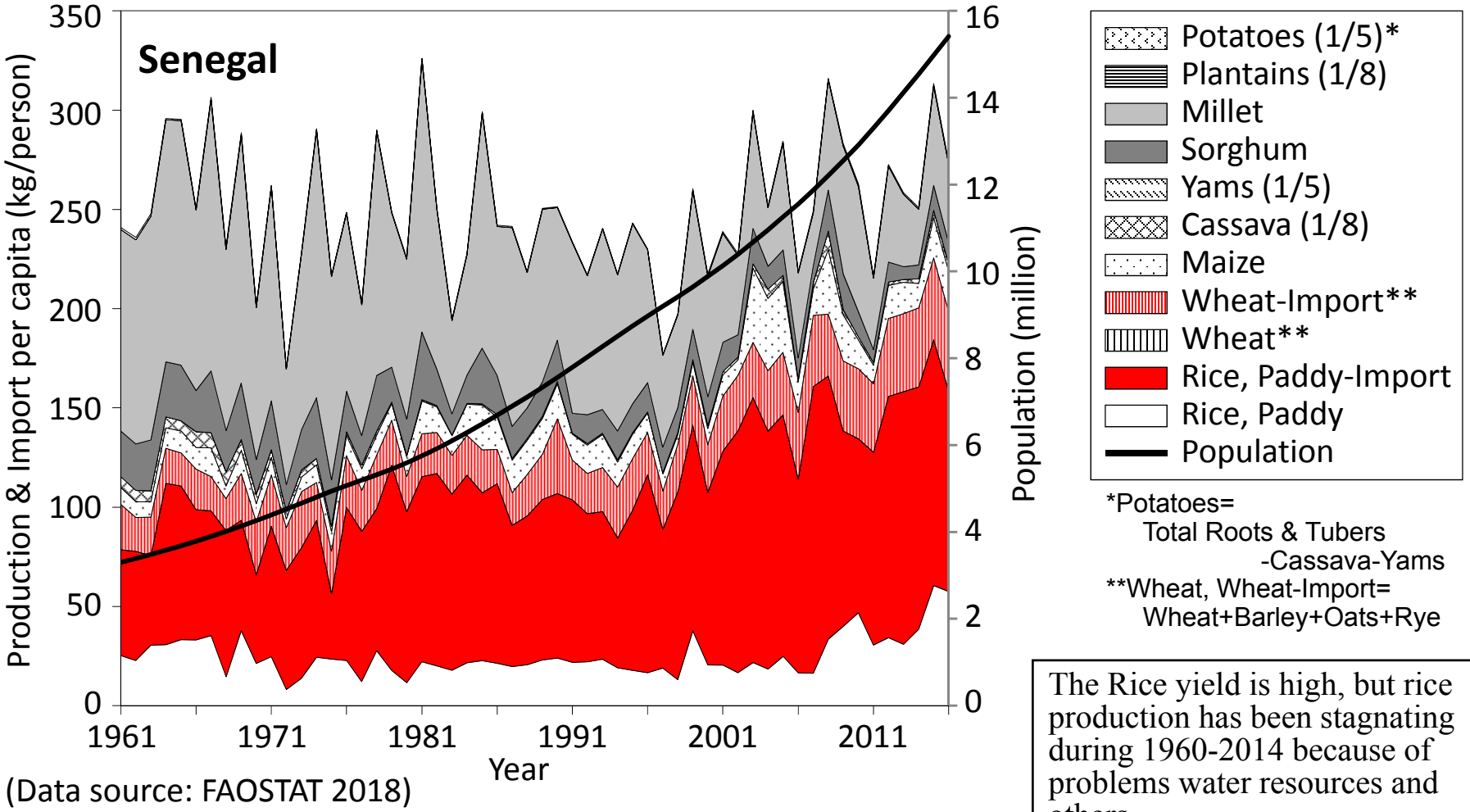
Rice is staple food. Rice consumption per capita is the same level as Asian countries. Rice production had been decreased sharply during 1970's to 2000, particularly during 1989-1998, Population also decreased during this decade. But, Rice production is rapidly recovering in recent years.



(Data source: FAOSTAT 2018)

Fig. Various Food Supply (kcal/capita/day) in Sierra Leone (No.7 rice producing country in SSA) during 1961-2013.

We used that the cereals' equivalent coefficients of 1/8 for Cassava and Plantains as well as 1/5 for Yam and Potatoes. These conversion factors can be tentatively verified if we compare figure on per capita production and importation amounts in kg and per capita consumption in kcal.



*Potatoes=
Total Roots & Tubers
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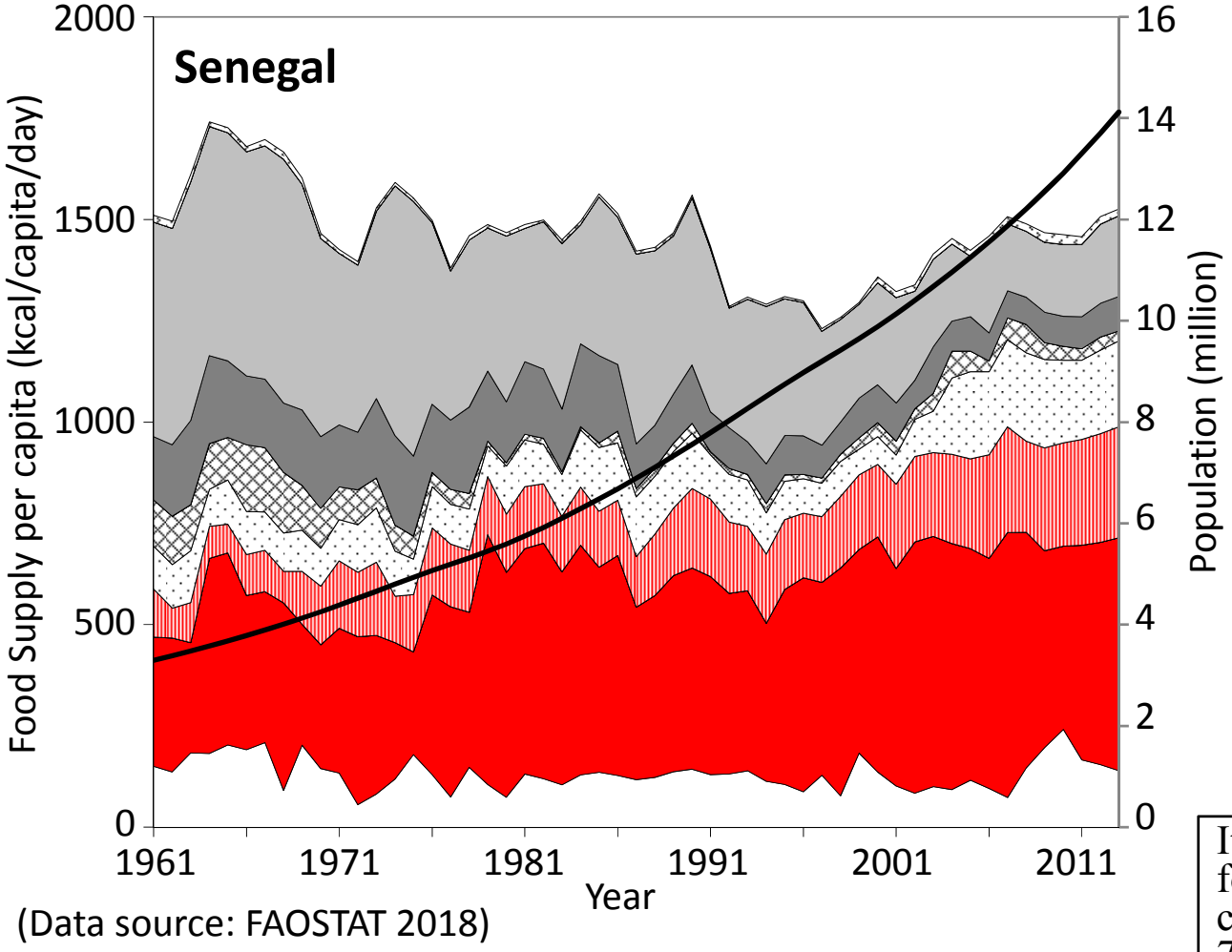
**Wheat, Wheat-Import=
Wheat+Barley+Oats+Rye

(Data source: FAOSTAT 2018)

Fig. Per Capita Various Food Production & Import (kg/person) in Senegal (No.8 rice producing country in SSA) during 1961-2016.

Cereal equivalent amounts of calories per kg are one fifth for Potato & plantain, one fourth for Yam and cassava (FAO Food composition data). In addition to these, postharvest and storage losses are estimated 2 times bigger than cereals for Cassava, 1.6 times for plantain, 1.3 times for Yam, and 1.0 for potatoes. Thus the cereals conversion ratios of potatoes and Yams are 1/5 and 1/8 for Plantains and Cassava.

The Rice yield is high, but rice production has been stagnating during 1960-2014 because of problems water resources and others.
Self-sufficiency ratio decreased from 30% level to 20% level and other food productions also are stagnating. Judging from the data, the agriculture of Senegal is in a devastating state. Thus it is strange Senegal is said as one of the leading countries for African Green Revolution.



(Data source: FAOSTAT 2018)

Fig. Per Capita Various Food Supply (kcal/capita/day) in Senegal (No.8 rice producing country in SSA) during 1961-2013.

It is strange, the calory based food self sufficiency has been continuously decreased from 71% in 1960s to 45% in 2010s. How the economy can survive without any significant industry?

We used that the cereals' equivalent coefficients of 1/8 for Cassava and Plantains as well as 1/5 for Yam and Potatoes. These conversion factors can be tentatively verified if we compare figure on per capita production and importation amounts in kg and per capita consumption in kcal.

Table. Rice Value Trends in Sierra Leone (No.7 rice producing country in SSA during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

	1961 -1965	1966 -1970	1971 -1975	1976 -1980	1981 -1985	1986 -1990	1991 -1995	1996 -2000	2001 -2005	2008	2006 -2010	2011 -2015	2016
Population (million)	2.40	2.60	2.87	3.21	3.62	4.13	4.31	4.39	5.20	6.17	6.16	6.92	7.40
Area harvested (1,000 ha)	273	327	361	409	366	376	342	257	470	476	540	610	754
Index (%) of area harvested (100 for mean of 1971-1980)	71.0	84.9	93.8	106	95.0	97.7	88.9	66.8	122	124	140	158	196
Irrigated rice area harvested (1,000 ha)	0.00	0.00	0.00	0.00	0.00	1.88	0.00	5.78	2.97	0.00	0.00	0.00	
Index (%) of irrigated area (100 for mean of 1986-1995)	0.00	0.00	0.00	0.00	0.00	200	0.00	614	316	0.00	0.00	0.00	
Percent of Irrigated rice area harvested (%)	0.00	0.00	0.00	0.00	0.00	0.50	0.00	2.24	0.63	0.00	0.00	0.00	
Paddy production (1,000 ton)	336	457	502	563	484	501	446	316	490	680	849	1120	1560
Index (%) of paddy production (100 for mean of 1971-1980)	63.2	85.8	94.3	106	90.8	94.1	83.7	59.3	91.9	128	159	210	293
Production (1,000 ton, milled rice)	210	286	314	352	302	313	279	197	306	425	531	700	975
Paddy yield (ton/ha)	1.23	1.40	1.39	1.37	1.33	1.34	1.30	1.21	1.03	1.43	1.57	1.85	2.07
Index (%) of paddy yield (100 for mean of 1971-1980)	89.1	101	101	99.5	96.2	96.8	94.1	87.6	74.6	103	114	134	150
Yield (ton/ha, milled rice)	0.77	0.88	0.87	0.86	0.83	0.84	0.81	0.76	0.64	0.89	0.98	1.16	1.29
Imported quantity (1,000 ton, milled rice)	12.5	31.1	22.4	36.9	58.0	102	167	152	99.0	196	126	254	218
Self-Sufficiency ratio (%)	94.6	90.2	93.4	90.7	84.3	75.5	63.2	56.2	74.7	68.4	80.1	73.3	81.7
Imported rice price ($/ton, milled rice)	153	138	433	316	330	339	305	471	441	435	372	411	362
Consumption per capita (kg/person, milled rice)	92.6	122	117	121	99.8	100	103	80.0	77.5	101	107	138	161

Table. Rice Value Trends in Senegal (No.8 rice producing country in SSA during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

	1961 -1965	1966 -1970	1971 -1975	1976 -1980	1981 -1985	1986 -1990	1991 -1995	1996 -2000	2001 -2005	2008	2006 -2010	2011 -2015	2016
Population (million)	3.49	4.02	4.66	5.32	6.11	7.11	8.27	9.42	10.7	12.2	12.2	14.1	15.4
Area harvested (1,000 ha)	76.3	88.9	74.6	76.2	67.8	75.4	74.1	82.0	86.1	125	115	142	225
Index (%) of area harvested (100 for mean of 1971-1980)	101	118	99.0	101	90.0	100	98.3	109	114	166	153	188	299
Irrigated rice area harvested (1,000 ha)	20.7	20.3	19.3	18.3	17.5	18.8	30.3	41.6	80.7	71.6	71.6	71.6	
Index (%) of irrigated area (100 for mean of 1971-1980)	110	108	103	97.5	93.0	100	161	221	429	381	381	381	
Percent of Irrigated rice area harvested (%)	27.1	22.8	25.8	24.0	25.8	25.0	40.9	50.7	93.7	57.1	62.0	50.6	
Paddy production (1,000 ton)	99.7	114	88.4	97.3	127	155	172	202	218	408	380	555	885
Index (%) of paddy production (100 for mean of 1971-1980)	107	122	95.2	105	137	167	185	218	235	440	409	598	954
Production (1,000 ton, milled rice)	62.3	70.9	55.2	60.8	79.6	96.8	107	127	137	255	237	347	553
Paddy yield (ton/ha)	1.30	1.25	1.14	1.25	1.89	2.06	2.31	2.44	2.52	3.26	3.12	3.94	3.93
Index (%) of paddy yield (100 for mean of 1971-1980)	109	105	95.5	104	159	173	194	205	212	273	262	330	330
Yield (ton/ha, milled rice)	0.81	0.78	0.71	0.78	1.18	1.29	1.45	1.53	1.58	2.04	1.95	2.46	2.46
Imported quantity (1,000 ton, milled rice)	137	151	170	276	349	356	390	536	808	1012	854	1049	974
Self-Sufficiency ratio (%)	31.8	31.7	24.8	18.2	18.5	21.4	21.7	18.7	14.4	20.1	21.7	24.4	36.2
Imported rice price ($/ton, milled rice)	105	127	211	217	232	219	209	256	250	637	420	402	334
Consumption per capita (kg/person, milled rice)	56.8	55.6	48.5	63.2	70.3	63.6	60.2	70.2	88.3	104	89.2	98.3	99.1

Source: The Times Comprehensive Atlas of the World, 12th edition 2007

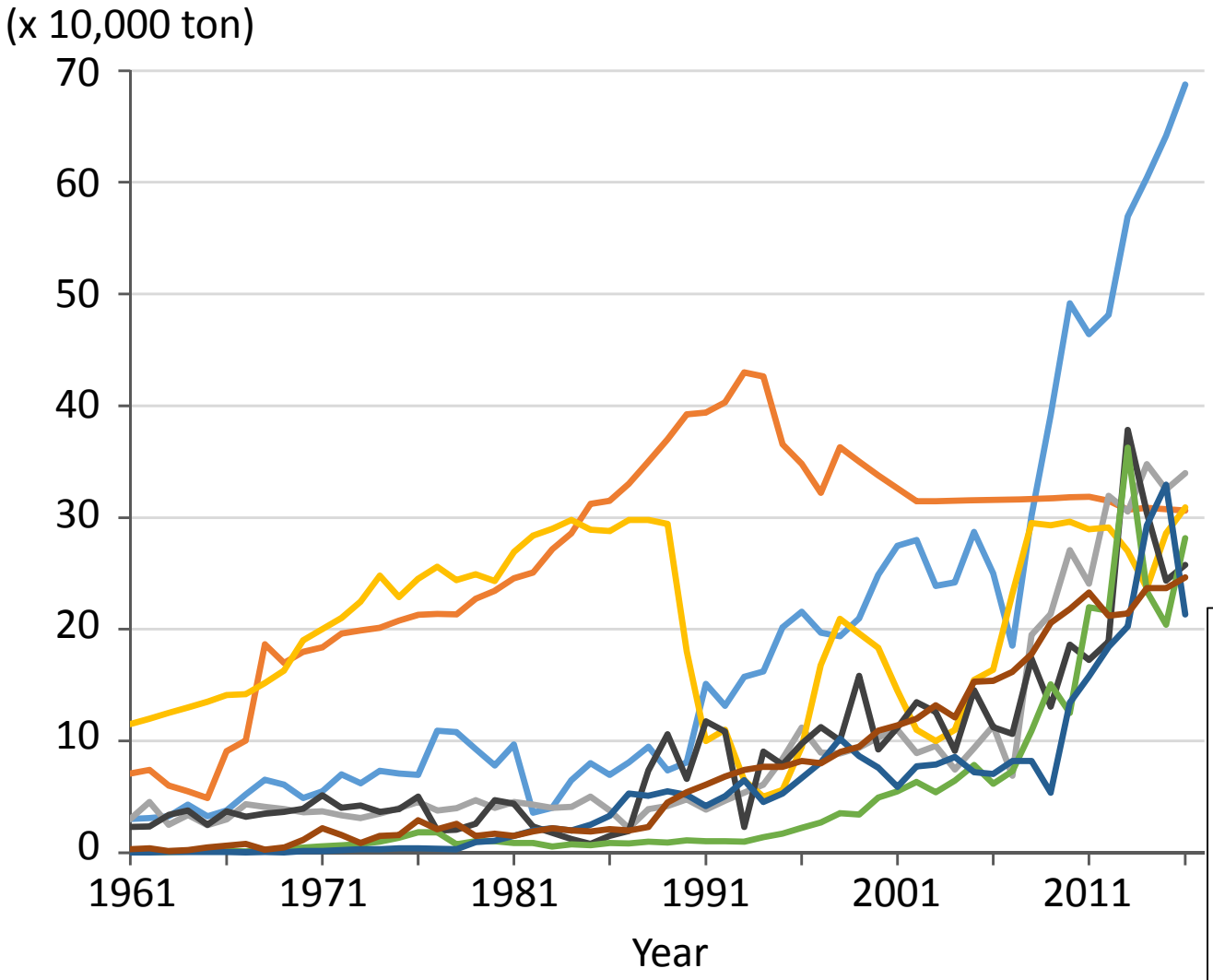
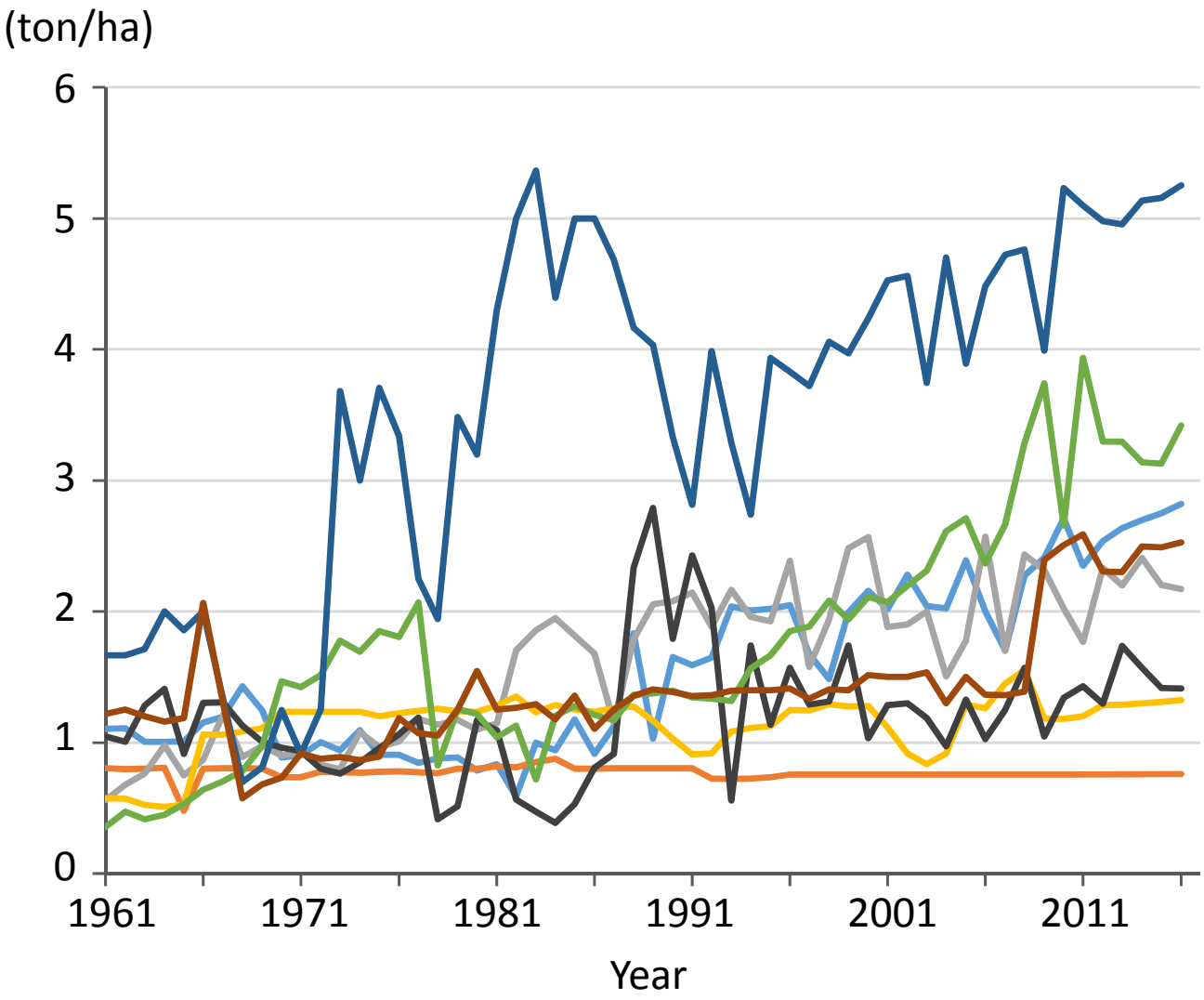


Fig. Paddy Production during 1961-2016 (Sub Saharan Africa Rank 9-16 rice production countries).

Data source: FAOSTAT 2018

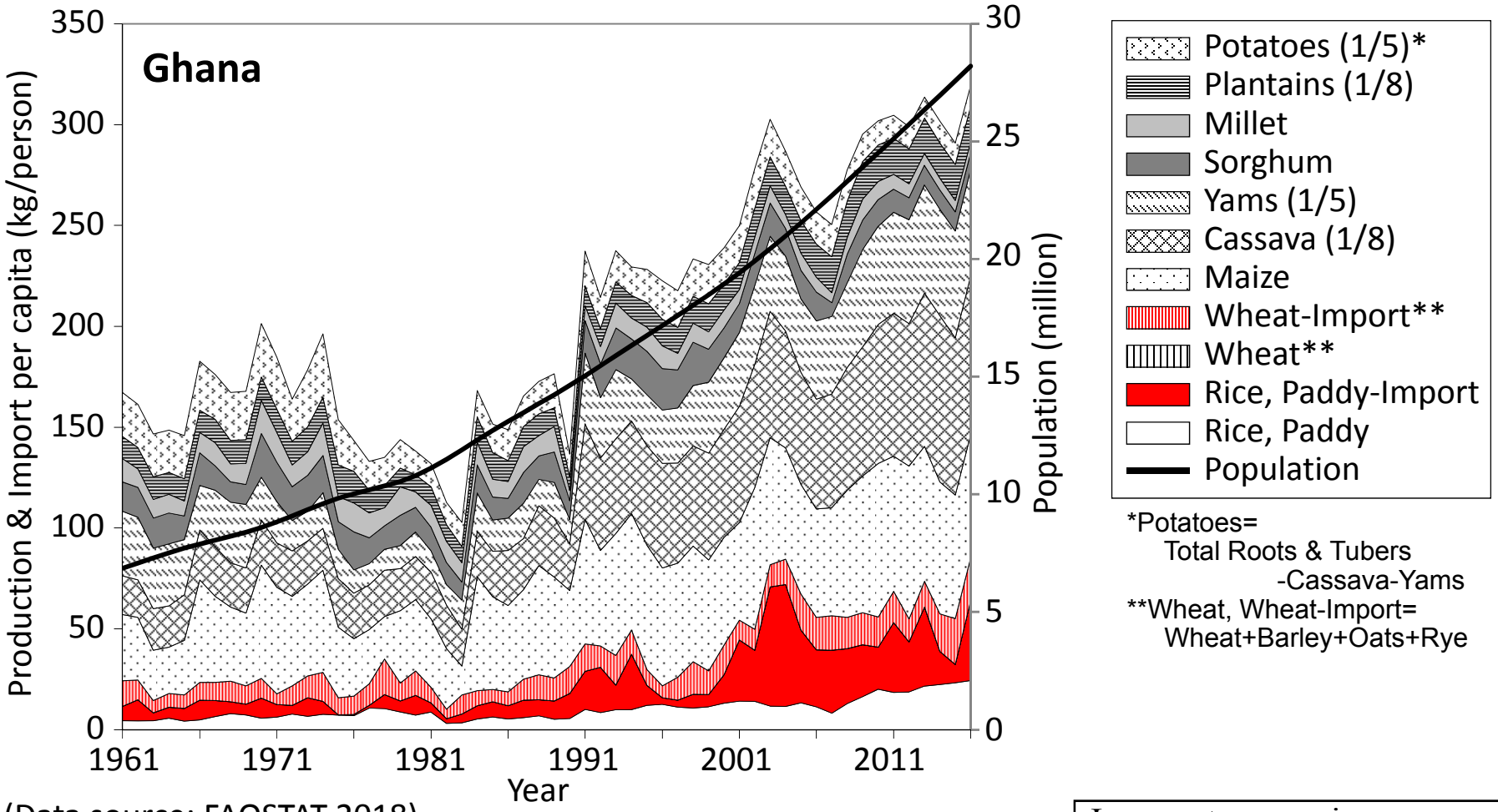
Rice productions has been increased rapidly in Ghana, Burkina Faso, Chad, Uganda, Benin and Mauritania recently since 2005. Whereas in DR Congo and Liberia, the rice productions are stagnating or decreasing by civil war and other reasons.
Chad has huge potential for developing irrigated Sawah systems, equal to or higher than Nigeria.



The ratio of irrigated rice fields is 100% along the Senegal river flood plain in Mauritania. Irrigated Sawah fields are developing and improving in Benin, Burkina Faso and Uganda. In these countries, paddy yield are increasing recently since 2005.

Fig. Paddy Yield during 1961-2016 (Sub Saharan Africa Rank 9-16 rice production countries).

Data source: FAOSTAT 2018



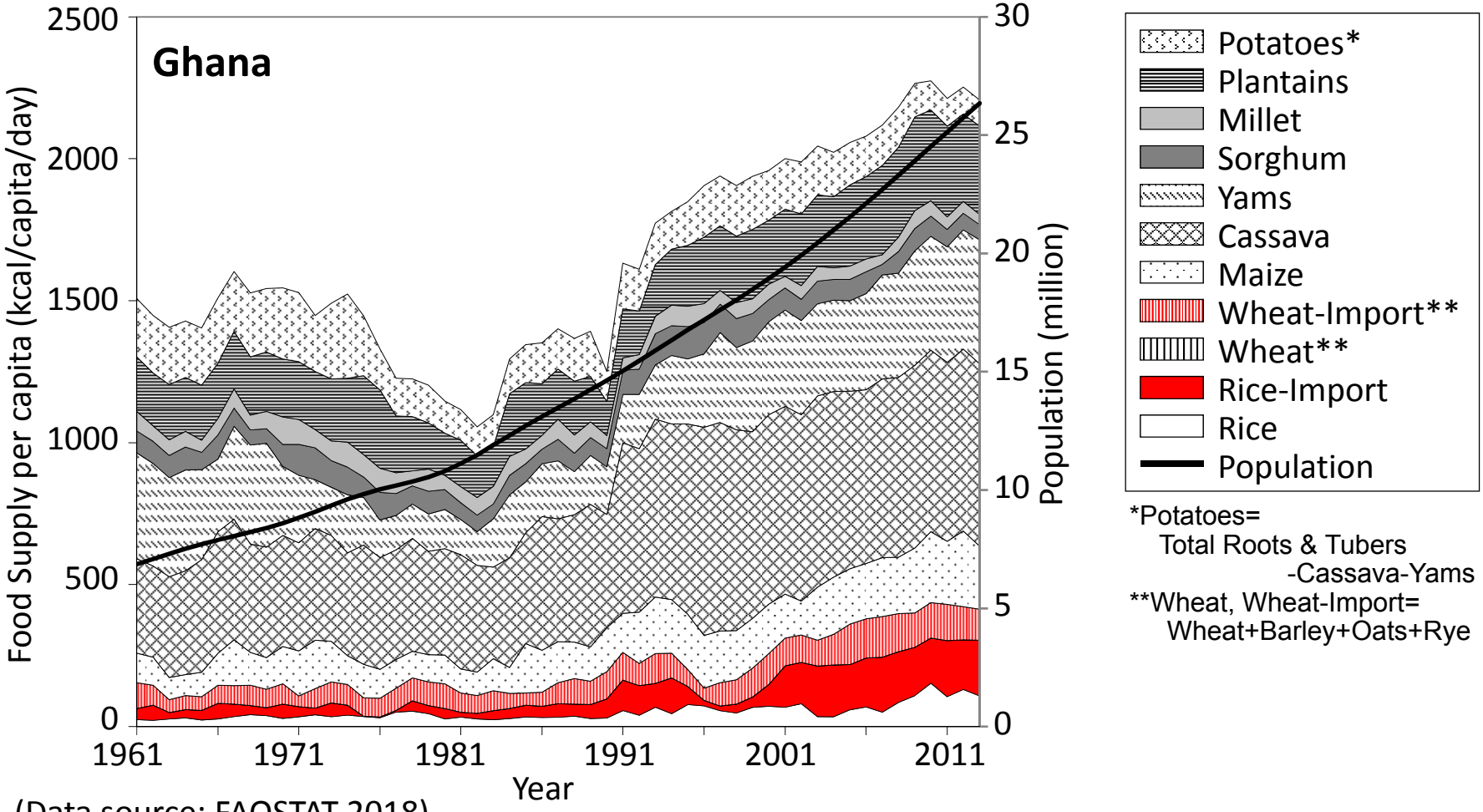
*Potatoes=
Total Roots & Tubers
-Cassava-Yams
**Wheat, Wheat-Import=
Wheat+Barley+Oats+Rye

(Data source: FAOSTAT 2018)

Fig. Various Food Production & Import (kg/person) in Ghana (No.9 rice producing country in SSA) during 1961-2016.

Cereal equivalent amounts of calories per kg are one fifth for Potato & plantain, one fourth for Yam and cassava (FAO Food composition data). In addition to these, postharvest and storage losses are estimated 2 times bigger than cereals for Cassava, 1.6 times for plantain, 1.3 times for Yam, and 1.0 for potatoes. Thus the cereals conversion ratios of potatoes and Yams are 1/5 and 1/8 for Plantains and Cassava.

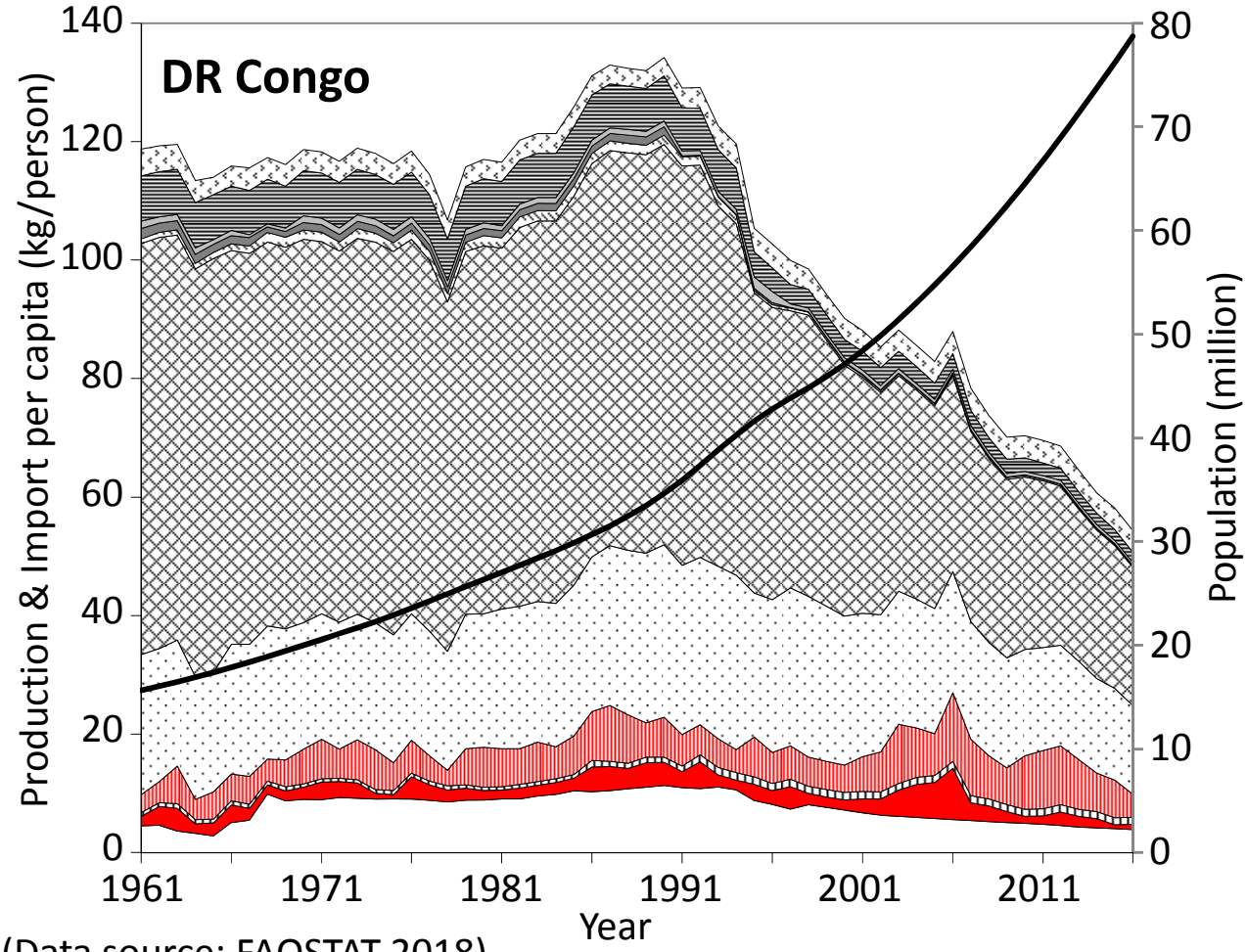
In recent years, rice production is increasing, but rice importation has been expanding more than production increase. The Production of Maize, Cassava and Yams are increasing, too. The food production except for rice are developing very well.



(Data source: FAOSTAT 2018)

Fig. Various Food Supply (kcal/capita/day) in Ghana (No.9 rice producing country in SSA) during 1961-2013.

We used that the cereals' equivalent coefficients of 1/8 for Cassava and Plantains as well as 1/5 for Yam and Potatoes. These conversion factors can be tentatively verified if we compare figure on per capita production and importation amounts in kg and per capita consumption in kcal.



*Potatoes=
Total Roots & Tubers
-Cassava-Yams
**Wheat, Wheat-Import=
Wheat+Barley+Oats+Rye

(Data source: FAOSTAT 2018)

Fig. Various Food Production & Import (kg/person) in DR Congo (No.10 rice producing country in SSA) during 1961-2016.

Cereal equivalent amounts of calories per kg are one fifth for Potato & plantain, one fourth for Yam and cassava (FAO Food composition data). In addition to these, postharvest and storage losses are estimated 2 times bigger than cereals for Cassava, 1.6 times for plantain, 1.3 times for Yam, and 1.0 for potatoes. Thus the cereals conversion ratios of potatoes and Yams are 1/5 and 1/8 for Plantains and Cassava.

After 1990, the agricultural production decreased including rice by several wars. The credibility of data is extremely low because of the situation typical for failed government.

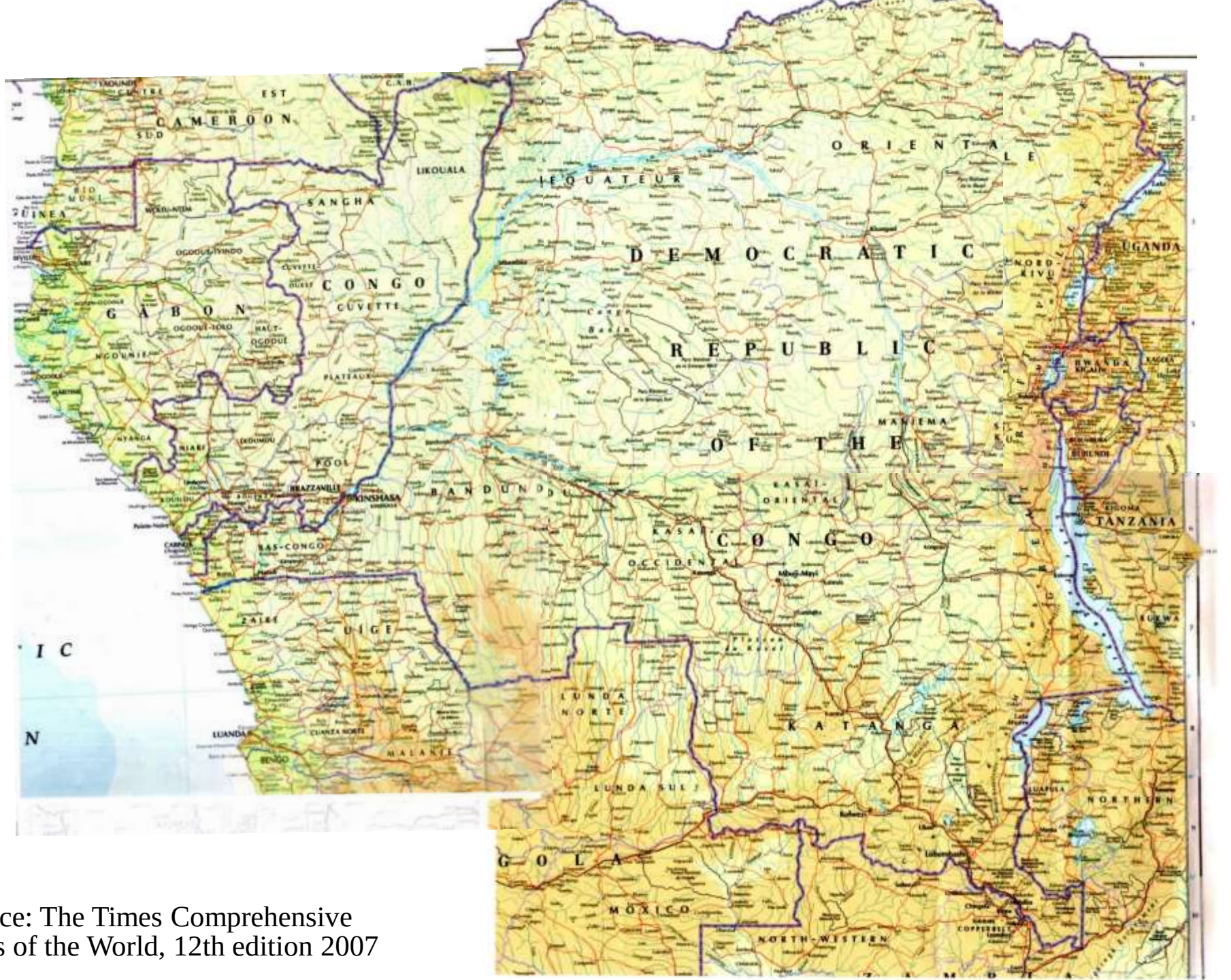
Table. Rice Value Trends in Ghana (No.9 rice producing country in SSA during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

	1961 -1965	1966 -1970	1971 -1975	1976 -1980	1981 -1985	1986 -1990	1991 -1995	1996 -2000	2001 -2005	2008	2006 -2010	2011 -2015	2016
Population (million)	7.30	8.23	9.34	10.4	11.9	13.9	15.9	18.0	20.5	23.3	23.3	26.3	28.2
Area harvested (1,000 ha)	32.6	45.3	68.4	106.6	70.8	64.1	86.5	115	123	133	142	212	244
Index (%) of area harvested (100 for mean of 1971-1980)	37.2	51.8	78.2	121.8	80.9	73.3	98.9	131	141	152	162	242	279
Irrigated rice area harvested (1,000 ha)	4.99	4.99	4.99	4.99	4.99	15.4	11.9	14.9	23.4	21.3	21.1	21.8	
Index (%) of irrigated area (100 for mean of 1971-1980)	100	100	100	100	100	309	239	299	469	426	424	436	
Percent of Irrigated rice area harvested (%)	15.3	11.0	7.29	4.68	7.04	24.0	13.8	13.0	19.0	16.0	14.9	10.3	
Paddy production (1,000 ton)	33.9	53.1	66.3	91.6	63.6	80.0	161	213	264	302	324	552	688
Index (%) of paddy production (100 for mean of 1971-1980)	42.9	67.3	84.0	116	80.6	101	204	270	335	383	411	700	871
Production (1,000 ton, milled rice)	21.2	33.2	41.4	57.2	39.8	50.0	100	133	165	189	203	345	430
Paddy yield (ton/ha)	1.05	1.18	0.97	0.86	0.91	1.31	1.86	1.87	2.15	2.27	2.22	2.59	2.82
Index (%) of paddy yield (100 for mean of 1971-1980)	114	129	106	94.1	99.3	143	203	205	235	248	243	284	308
Yield (ton/ha, milled rice)	0.65	0.74	0.61	0.54	0.57	0.82	1.16	1.17	1.34	1.42	1.39	1.62	1.76
Imported quantity (1,000 ton, milled rice)	30.0	40.1	30.4	32.1	38.3	77.8	180	77.3	543	395	386	404	698
Self-Sufficiency ratio (%)	42.7	45.8	61.8	68.8	51.4	39.8	37.6	66.1	25.4	32.3	33.9	48.6	38.1
Imported rice price ($/ton, milled rice)	215	196	288	382	372	296	234	356	240	547	486	661	411
Consumption per capita (kg/person, milled rice)	7.03	8.90	7.72	8.55	6.52	9.18	17.7	11.6	34.5	25.1	25.2	28.6	40.0

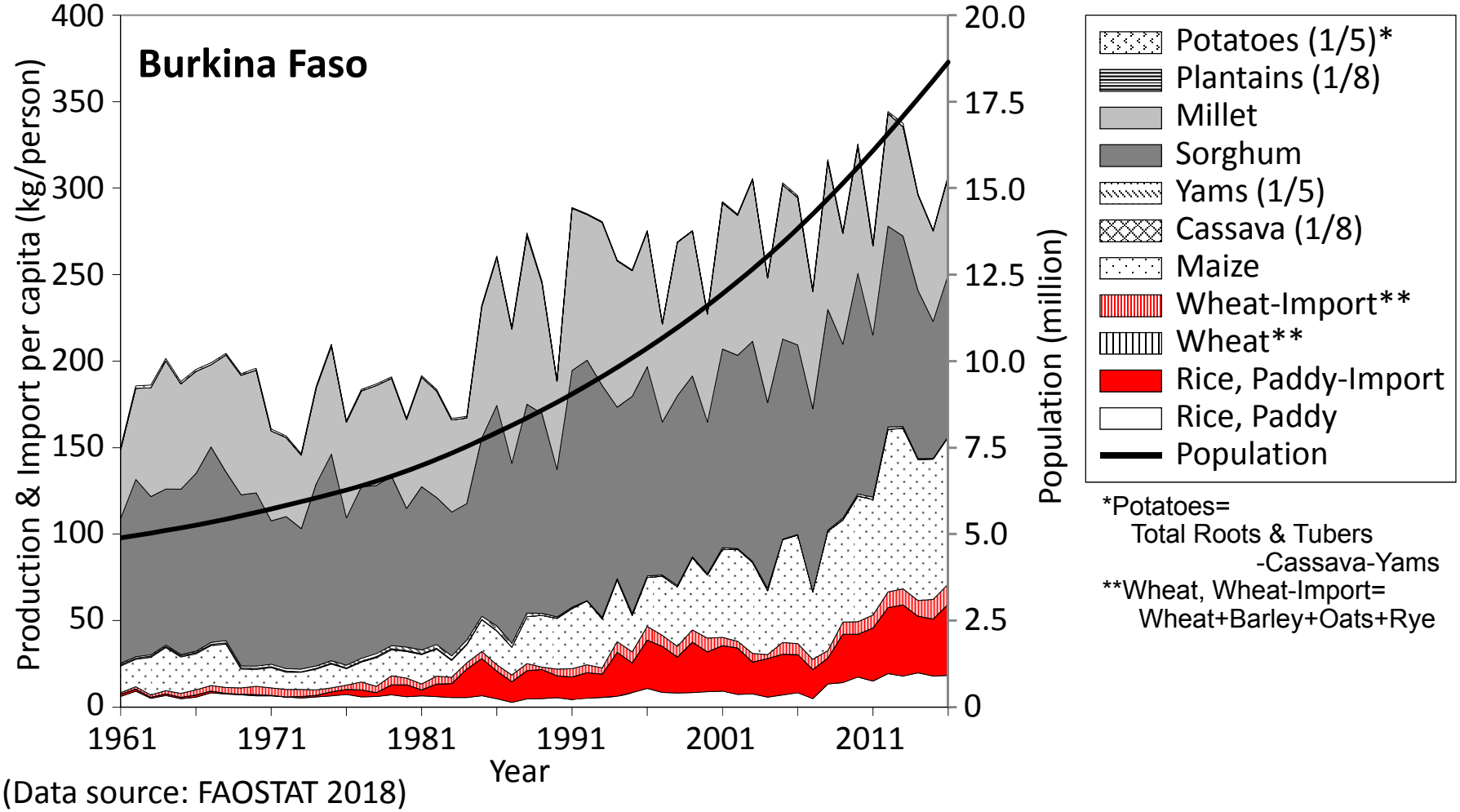
Table. Rice Value Trends in Democratic Republic of the Congo (No.10 rice producing country in SSA during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

	1961 -1965	1966 -1970	1971 -1975	1976 -1980	1981 -1985	1986 -1990	1991 -1995	1996 -2000	2001 -2005	2008	2006 -2010	2011 -2015	2016
Population (million)	16.5	18.9	21.7	25.0	28.4	32.5	38.8	44.9	51.5	60.4	60.5	71.4	78.7
Area harvested (1,000 ha)	85.2	185	258	281	329	437	545	456	420	419	419	410	402
Index (%) of area harvested (100 for mean of 1971-1980)	31.6	68.8	95.7	104	122	162	202	169	156	156	156	152	149
Irrigated rice area harvested (1,000 ha)	-	-	-	1.41	2.69	3.23	3.57	4.56	3.43	2.30	2.30	2.30	
Index (%) of irrigated area (100 for mean of 1976-1985)	-	-	-	68.9	131	157	174	222	167	112	112	112	
Percent of Irrigated rice area harvested (%)	-	-	-	0.50	0.82	0.74	0.65	1.00	0.82	0.55	0.55	0.56	
Paddy production (1,000 ton)	61.8	146	198	220	273	351	404	344	317	317	317	311	306
Index (%) of paddy production (100 for mean of 1971-1980)	29.6	69.6	94.6	105	131	168	193	165	152	151	152	149	147
Production (1,000 ton, milled rice)	38.6	90.9	124	138	171	220	252	215	198	198	198	195	191
Paddy yield (ton/ha)	0.74	0.79	0.77	0.78	0.83	0.80	0.74	0.75	0.75	0.76	0.76	0.76	0.76
Index (%) of paddy yield (100 for mean of 1971-1980)	95.2	102	98.9	101	107	104	95.8	97.4	97.4	97.4	97.5	97.9	98.2
Yield (ton/ha, milled rice)	0.46	0.49	0.48	0.49	0.52	0.50	0.46	0.47	0.47	0.47	0.47	0.47	0.48
Imported quantity (1,000 ton, milled rice)	25.6	24.1	26.7	37.0	33.4	80.3	66.0	64.6	139	98.2	127	68.9	44.0
Self-Sufficiency ratio (%)	61.0	77.6	82.6	79.0	83.7	73.2	79.5	77.2	60.4	66.8	64.8	74.4	81.3
Imported rice price ($/ton, milled rice)	138	174	249	266	233	315	411	375	374	181	319	487	376
Consumption per capita (kg/person, milled rice)	3.91	6.05	6.94	7.02	7.16	9.21	8.24	6.25	6.51	4.90	5.45	3.71	2.99

Source: The Times Comprehensive Atlas of the World, 12th edition 2007



Source: The Times Comprehensive Atlas of the World, 12th edition 2007

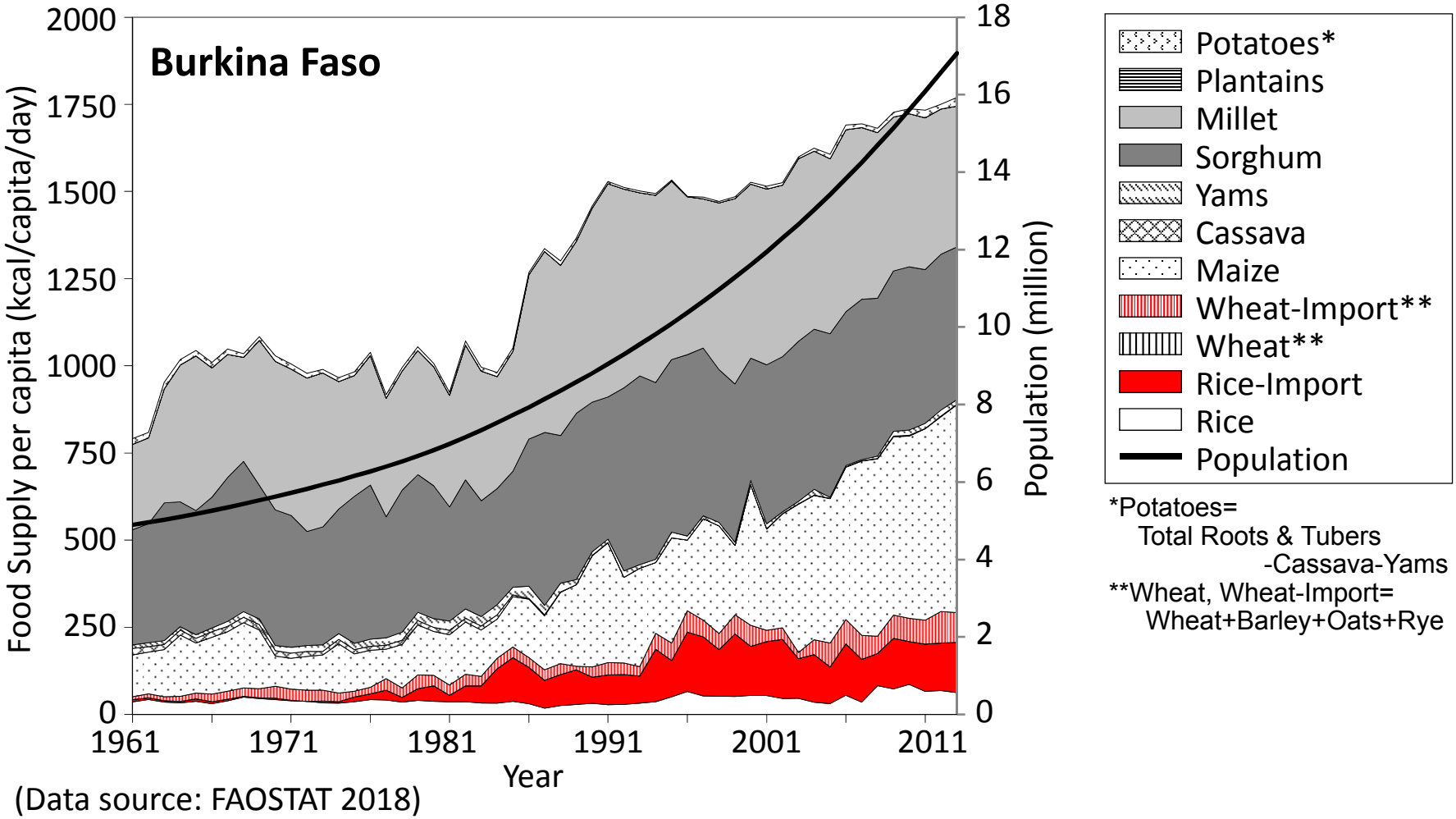


(Data source: FAOSTAT 2018)

Fig. Various Per Capita Food Production & Import (kg/person) in Burkina Faso (No.11 rice producing country in SSA) during 1961-2016.

Cereal equivalent amounts of calories per kg are one fifth for Potato & plantain, one fourth for Yam and cassava (FAO Food composition data). In addition to these, postharvest and storage losses are estimated 2 times bigger than cereals for Cassava, 1.6 times for plantain, 1.3 times for Yam, and 1.0 for potatoes. Thus the cereals conversion ratios of potatoes and Yams are 1/5 and 1/8 for Plantains and Cassava.

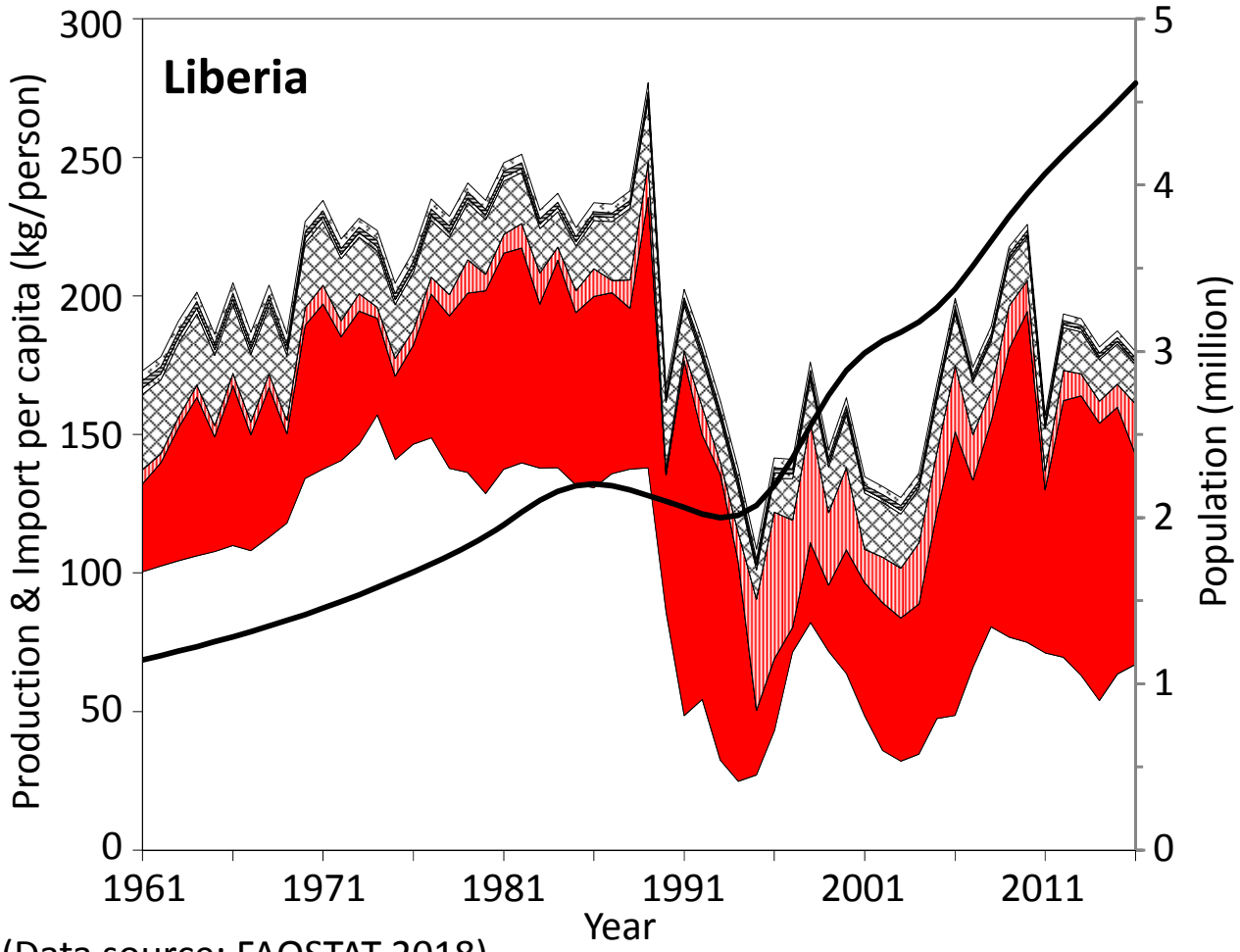
Millet and Sorghum production which are traditional food cover population increase. Rice and Maize production increased markedly. Rice import also increased rapidly.



(Data source: FAOSTAT 2018)

Fig. Various Food Supply (kcal/capita/day) in Burkina Faso (No.11 rice producing country in SSA) during 1961-2013.

We used that the cereals' equivalent coefficients of 1/8 for Cassava and Plantains as well as 1/5 for Yam and Potatoes. These conversion factors can be tentatively verified if we compare figure on per capita production and importation amounts in kg and per capita consumption in kcal.



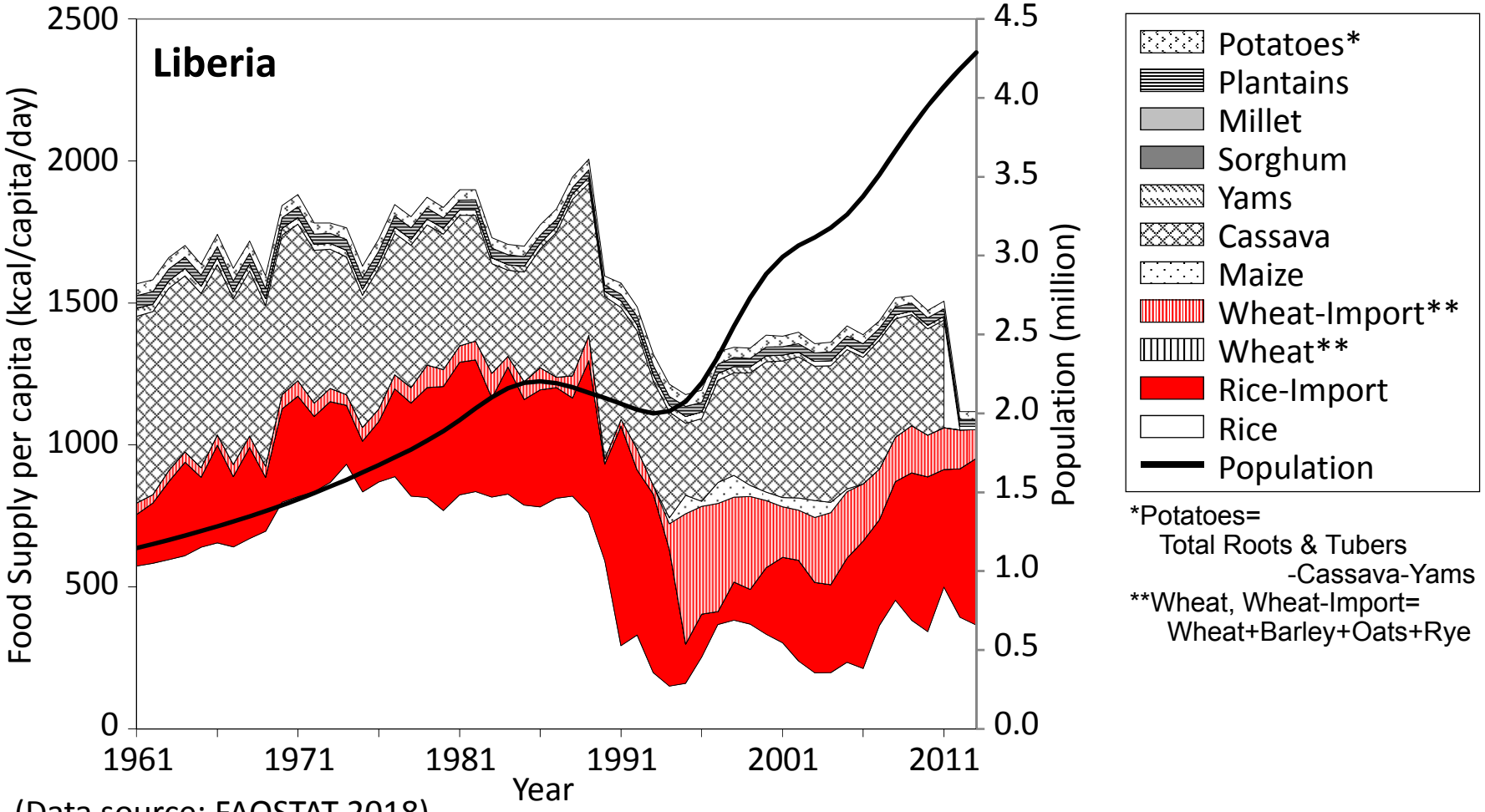
*Potatoes=
Total Roots & Tubers
-Cassava-Yams
**Wheat, Wheat-Import=
Wheat+Barley+Oats+Rye

(Data source: FAOSTAT 2018)

Fig. Various Food Production & Import (kg/person) in Liberia (No.12 rice producing country in SSA) during 1961-2016.

Cereal equivalent amounts of calories per kg are one fifth for Potato & plantain, one fourth for Yam and cassava (FAO Food composition data). In addition to these, postharvest and storage losses are estimated 2 times bigger than cereals for Cassava, 1.6 times for plantain, 1.3 times for Yam, and 1.0 for potatoes. Thus the cereals conversion ratios of potatoes and Yams are 1/5 and 1/8 for Plantains and Cassava.

It is rice-eating country like Sierra Leone. Rice production decreased rapidly for 20 years from the end of 1980s to 2003, in particularly civil war period for the decade 1985-95, thereby It experienced a crisis of the continuation as the nation. The population decreases, too. The rice production cannot be recovered even today.



(Data source: FAOSTAT 2018)

Fig. Various Food Supply (kcal/capita/day) in Liberia (No.12 rice producing country in SSA) during 1961-2013.

We used that the cereals' equivalent coefficients of 1/8 for Cassava and Plantains as well as 1/5 for Yam and Potatoes. These conversion factors can be tentatively verified if we compare figure on per capita production and importation amounts in kg and per capita consumption in kcal.

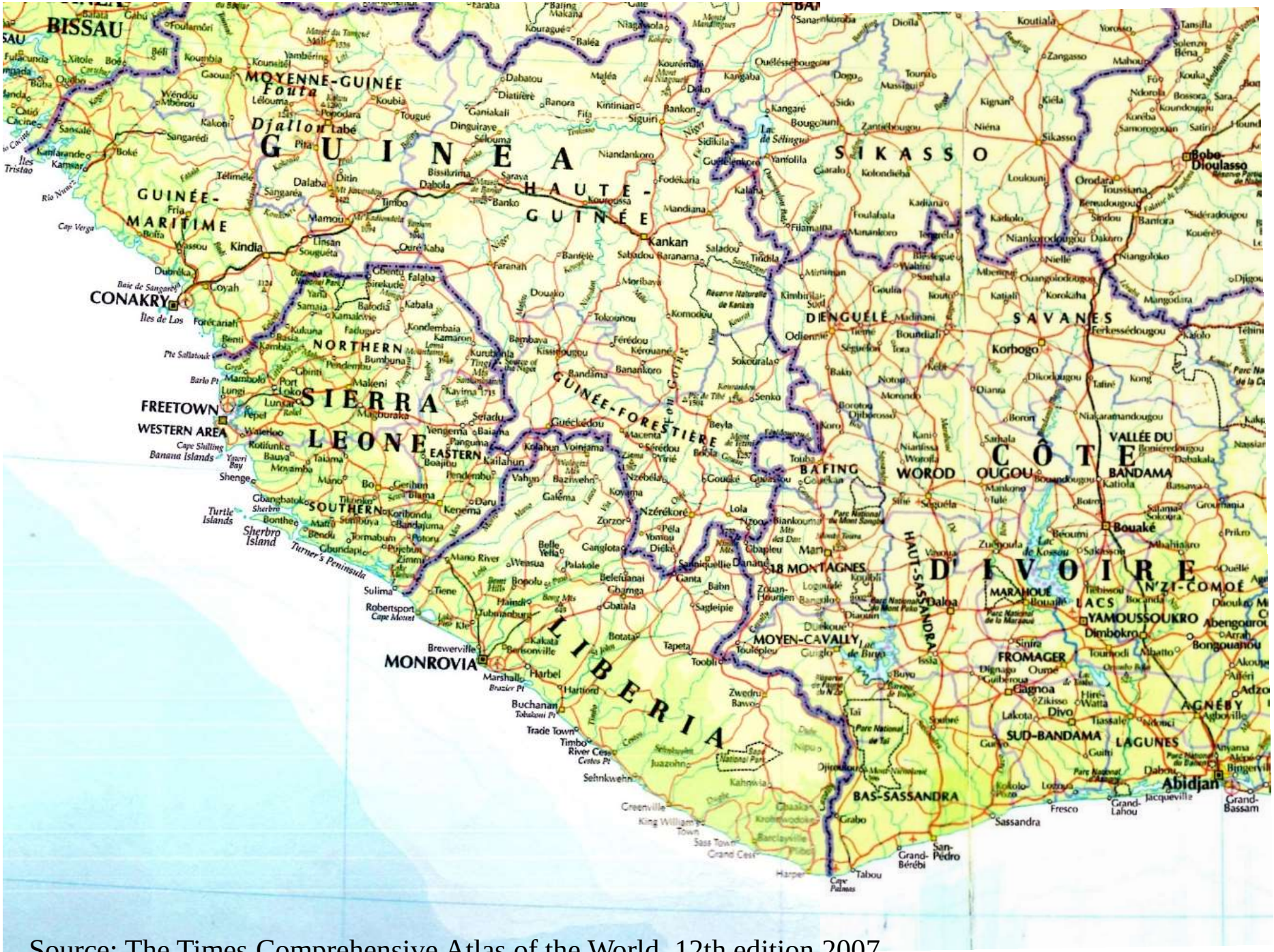
Table. Rice Value Trends in Burkina Faso (No.11 rice producing country in SSA during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

	1961 -1965	1966 -1970	1971 -1975	1976 -1980	1981 -1985	1986 -1990	1991 -1995	1996 -2000	2001 -2005	2008	2006 -2010	2011 -2015	2016
Population (million)	5.03	5.44	5.93	6.54	7.35	8.36	9.6	11.0	12.7	14.7	14.7	17.1	18.6
Area harvested (1,000 ha)	44.3	39.4	38.7	37.7	27.0	21.4	28.5	45.5	51.0	80.1	78.2	141	156
Index (%) of area harvested (100 for mean of 1971-1980)	116	103	101	98.7	70.7	55.9	74.6	119	134	210	205	369	410
Irrigated rice area harvested (1,000 ha)	0.55	0.99	1.88	2.54	3.20	5.32	6.27	9.6	10.3	14.7	14.7	15.3	
Index (%) of irrigated area (100 for mean of 1971-1980)	25.0	45.0	85.0	115	145	241	284	436	467	667	667	695	
Percent of Irrigated rice area harvested (%)	1.25	2.52	4.85	6.73	11.9	24.9	22.0	21.1	20.2	18.4	18.8	10.89	
Paddy production (1,000 ton)	31.8	38.0	35.3	42.0	43.9	37.7	56.8	97.5	92.5	195	172	308	340
Index (%) of paddy production (100 for mean of 1971-1980)	82.3	98.2	91.4	109	113	97.5	147	252	239	505	446	796	879
Production (1,000 ton, milled rice)	19.9	23.7	22.1	26.2	27.4	23.6	35.5	61.0	57.8	122	108	192	212
Paddy yield (ton/ha)	0.74	0.97	0.92	1.12	1.69	1.75	2.01	2.19	1.81	2.44	2.21	2.18	2.17
Index (%) of paddy yield (100 for mean of 1971-1980)	73.1	95.1	90.2	110	166	172	198	215	178	239	217	214	213
Yield (ton/ha, milled rice)	0.47	0.61	0.57	0.70	1.06	1.09	1.26	1.37	1.13	1.52	1.38	1.36	1.36
Imported quantity (1,000 ton, milled rice)	3.00	2.41	3.30	18.1	53.4	77.2	101	175	185	137	196	376	480
Self-Sufficiency ratio (%)	86.7	90.6	88.4	60.8	39.7	23.2	26.4	26.0	23.9	47.1	34.3	33.9	30.7
Imported rice price ($/ton, milled rice)	170	159	280	367	328	333	349	316	207	411	339	277	223
Consumption per capita (kg/person, milled rice)	4.56	4.81	4.27	6.76	10.9	12.0	14.2	21.5	19.2	17.6	20.5	33.2	37.1

Table. Rice Value Trends in Liberia (No.12 rice producing country in SSA during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

	1961 -1965	1966 -1970	1971 -1975	1976 -1980	1981 -1985	1986 -1990	1991 -1995	1996 -2000	2001 -2005	2008	2006 -2010	2011 -2015	2016
Population (million)	1.20	1.35	1.54	1.78	2.09	2.16	2.03	2.54	3.12	3.66	3.66	4.29	4.61
Area harvested (1,000 ha)	232	142	181	200	224	226	77.0	134	122	190	196	216	234
Index (%) of area harvested (100 for mean of 1971-1980)	122	74.4	95.2	105	117	119	40.4	70.4	64.1	99.8	103	113	123
Irrigated rice area harvested (1,000 ha)	-	0.00	0.00	0.00	0.00	0.00	0.00	13.1	9.66	6.24	6.24	6.24	
Index (%) of irrigated area (100 for mean of 1996-2005)	-	0.00	0.00	0.00	0.00	0.00	0.00	115	85.0	54.9	54.9	54.9	
Percent of Irrigated rice area harvested (%)	-	0.00	0.00	0.00	0.00	0.00	0.00	9.76	7.92	3.29	3.19	2.89	
Paddy production (1,000 ton)	125	158	222	247	286	271	76.2	170	124	295	256	275	309
Index (%) of paddy production (100 for mean of 1971-1980)	53.2	67.1	94.7	105	122	116	32.5	72.5	52.8	126	109	117	132
Production (1,000 ton, milled rice)	78.1	98.5	139	155	179	170	47.7	106	77.5	184	160	172	193
Paddy yield (ton/ha)	0.54	1.11	1.23	1.24	1.28	1.19	1.03	1.27	1.01	1.55	1.33	1.28	1.32
Index (%) of paddy yield (100 for mean of 1971-1980)	43.8	89.9	99.5	100	104	96.8	83.4	103	82.2	126	107	103	107
Yield (ton/ha, milled rice)	0.34	0.69	0.77	0.77	0.80	0.75	0.64	0.79	0.63	0.97	0.83	0.80	0.83
Imported quantity (1,000 ton, milled rice)	32.5	40.6	41.4	62.9	91.6	91.6	109	43.2	110	170	216	242	218
Self-Sufficiency ratio (%)	71.0	70.9	77.0	71.5	66.2	65.1	33.0	71.8	41.4	52.0	42.9	42.1	46.9
Imported rice price ($/ton, milled rice)	156	186	308	365	444	351	436	228	221	442	379	456	398
Consumption per capita (kg/person, milled rice)	92.2	103	118	122	130	121	77.1	58.0	60.0	96.9	102	96.3	89.2

Source: The Times Comprehensive Atlas of the World, 12th edition 2007



Source: The Times Comprehensive Atlas of the World, 12th edition 2007

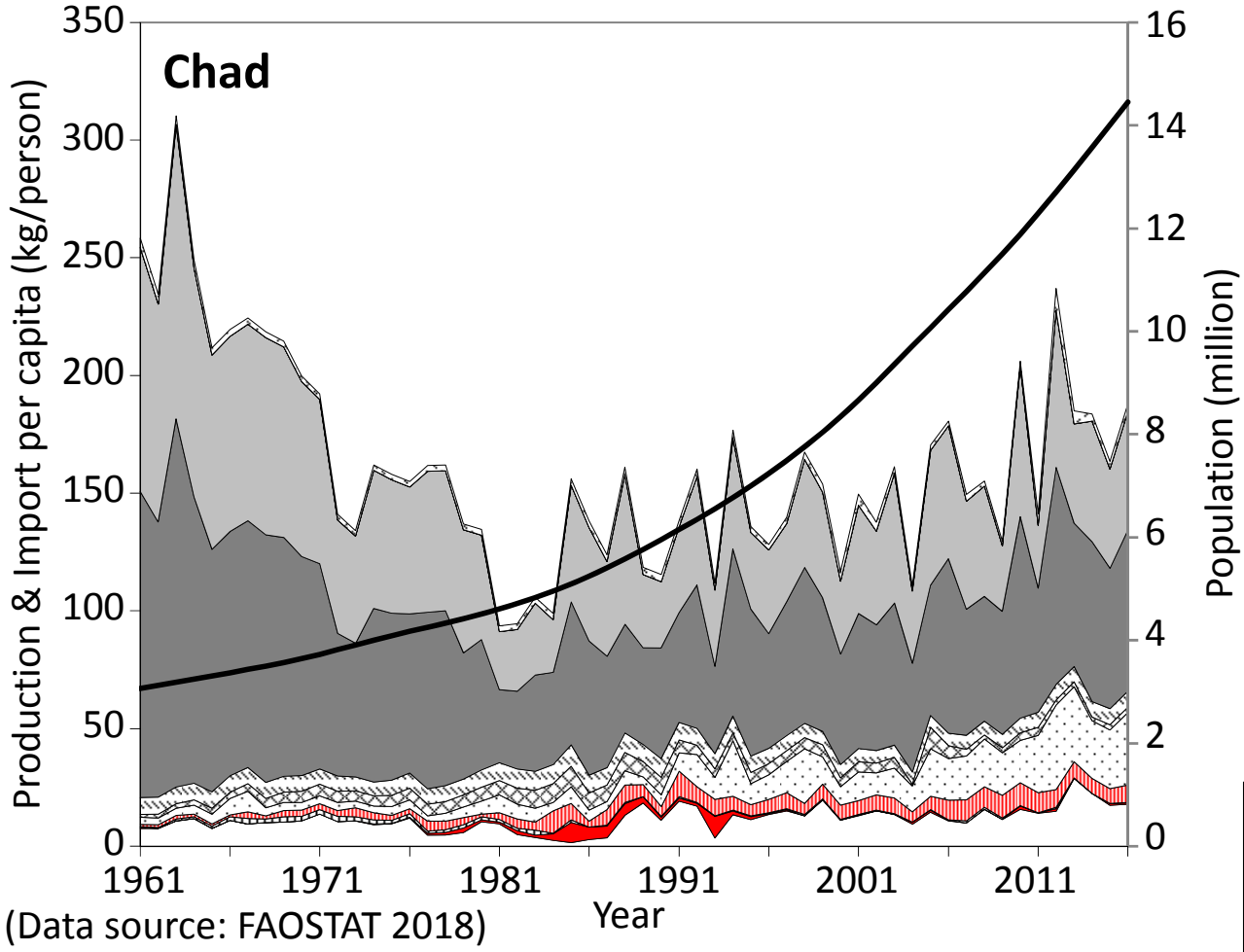
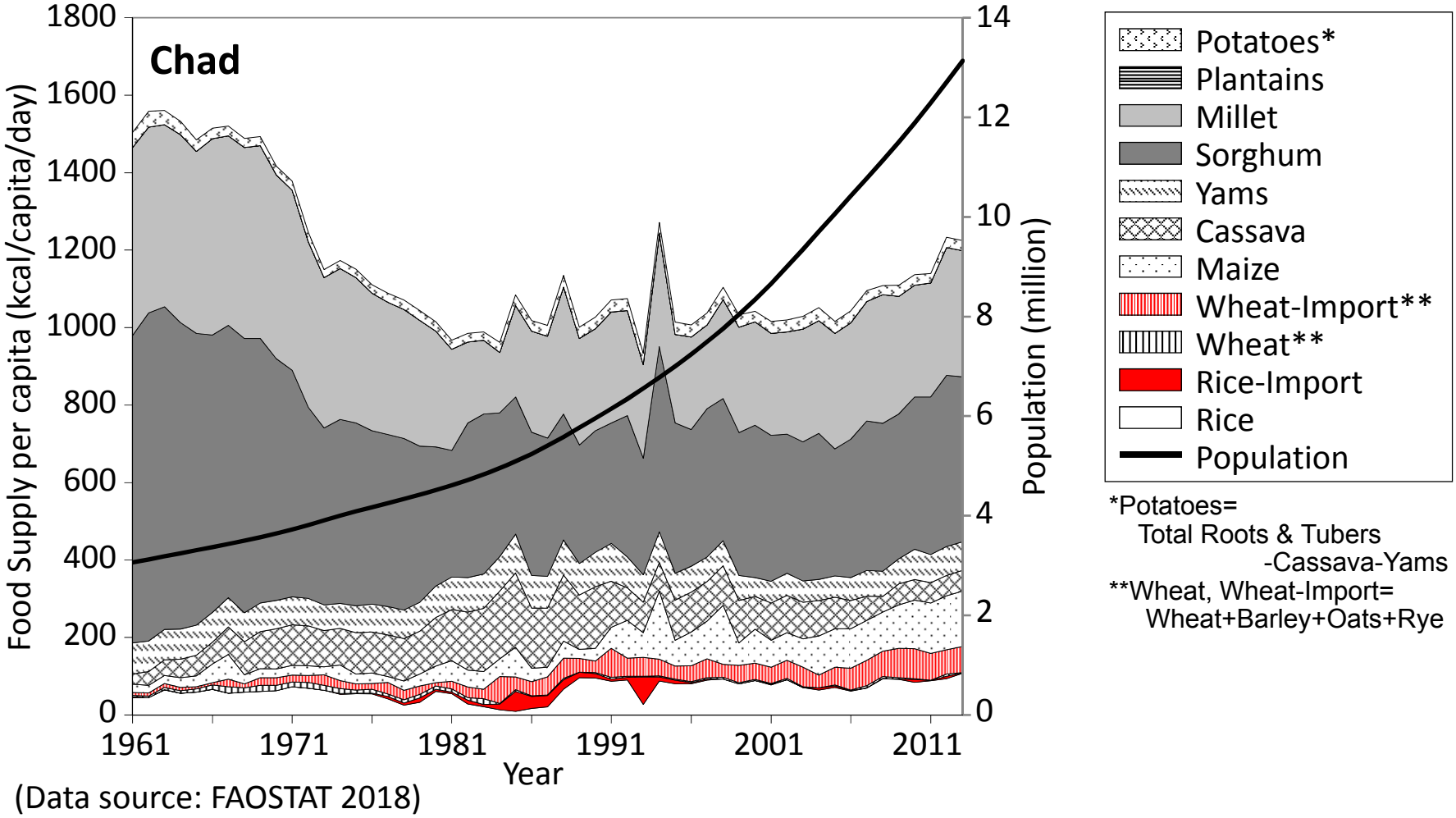


Fig. Various Food Production & Import (kg/person) in Chad (No.13 rice producing country in SSA) during 1961-2016.

Cereal equivalent amounts of calories per kg are one fifth for Potato & plantain, one fourth for Yam and cassava (FAO Food composition data). In addition to these, postharvest and storage losses are estimated 2 times bigger than cereals for Cassava, 1.6 times for plantain, 1.3 times for Yam, and 1.0 for potatoes. Thus the cereals conversion ratios of potatoes and Yams are 1/5 and 1/8 for Plantains and Cassava.

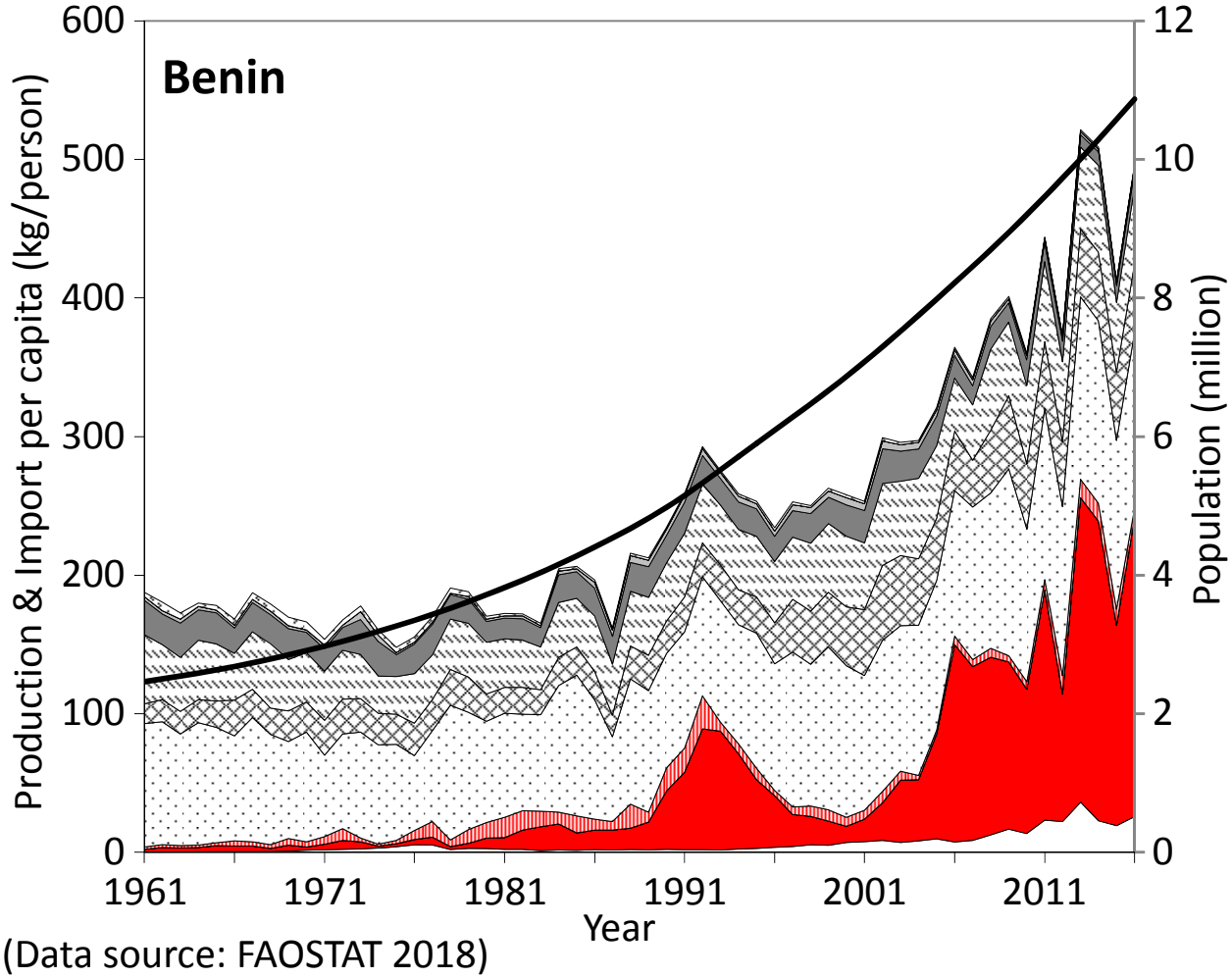
In addition to drought, during past 40 years, the food production, especially Millet and Sorghum decreased by wars within Chad and with Sudan and Libya. Par capita production of Maize and Rice have been increasing rapidly in recent years. The potential of the rice production is extremely high because of Africa No.1 wetlands, i.e., Chad basins.



(Data source: FAOSTAT 2018)

Fig. Various Food Supply (kcal/capita/day) in Chad (No.13 rice producing country in SSA) during 1961-2013.

We used that the cereals' equivalent coefficients of 1/8 for Cassava and Plantains as well as 1/5 for Yam and Potatoes. These conversion factors can be tentatively verified if we compare figure on per capita production and importation amounts in kg and per capita consumption in kcal.

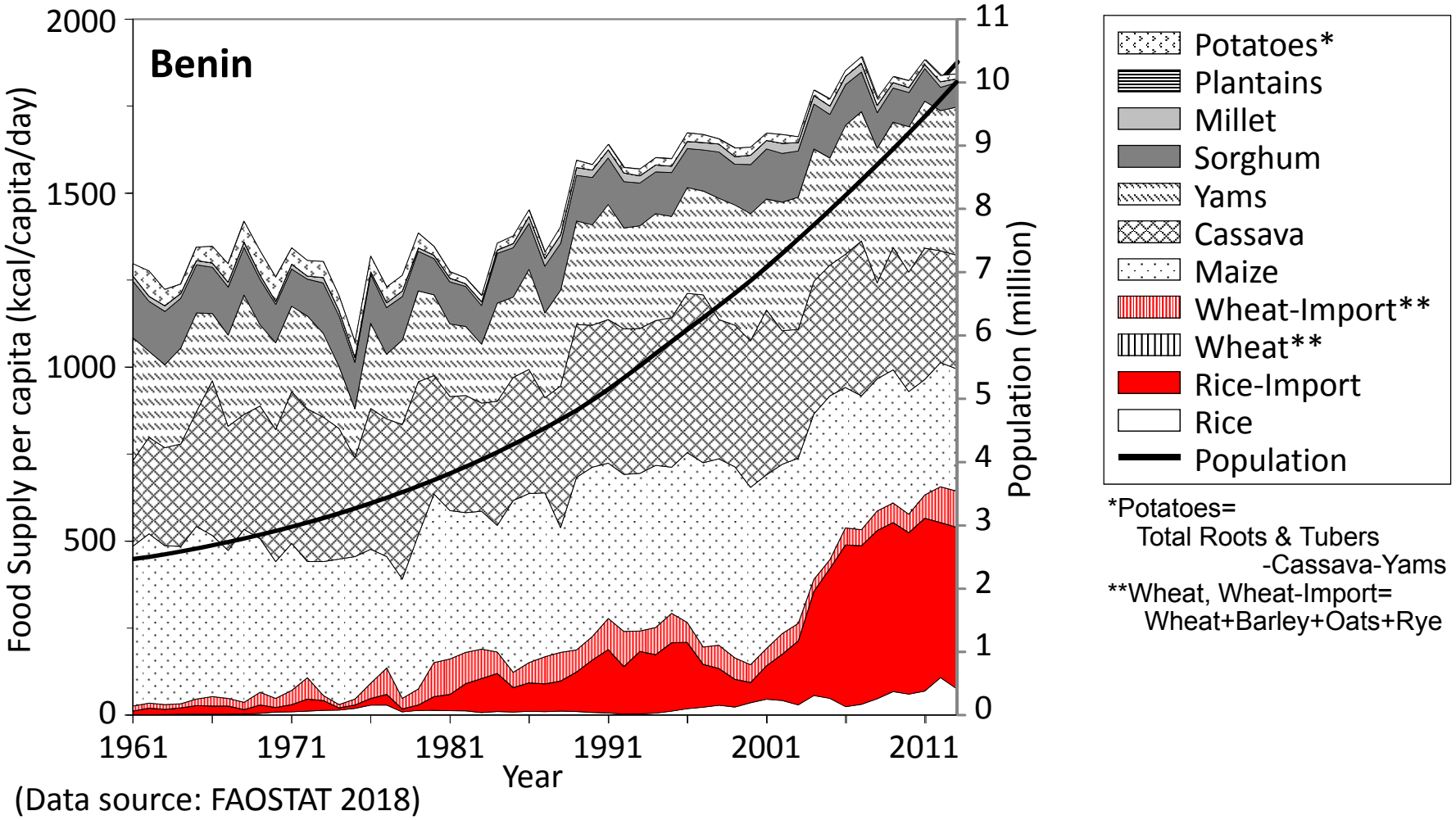


(Data source: FAOSTAT 2018)

Fig. Various Food Production & Import (kg/person) in Benin (No.14 rice producing country in SSA) during 1961-2016.

Cereal equivalent amounts of calories per kg are one fifth for Potato & plantain, one fourth for Yam and cassava (FAO Food composition data). In addition to these, postharvest and storage losses are estimated 2 times bigger than cereals for Cassava, 1.6 times for plantain, 1.3 times for Yam, and 1.0 for potatoes. Thus the cereals conversion ratios of potatoes and Yams are 1/5 and 1/8 for Plantains and Cassava.

The conspicuous increase and decrease is not seen in the production of staple food crops in the past 50 years. But Rice import increased rapidly around 1991 and after 2004. The considerable part of this imported rice which increased rapidly was suspected to be smuggled into Nigeria. Rice production is increasing rapidly in recent years.



(Data source: FAOSTAT 2018)

Fig. Various Food Supply (kcal/capita/day) in Benin (No.14 rice producing country in SSA) during 1961-2013.

We used that the cereals' equivalent coefficients of 1/8 for Cassava and Plantains as well as 1/5 for Yam and Potatoes. These conversion factors can be tentatively verified if we compare figure on per capita production and importation amounts in kg and per capita consumption in kcal.

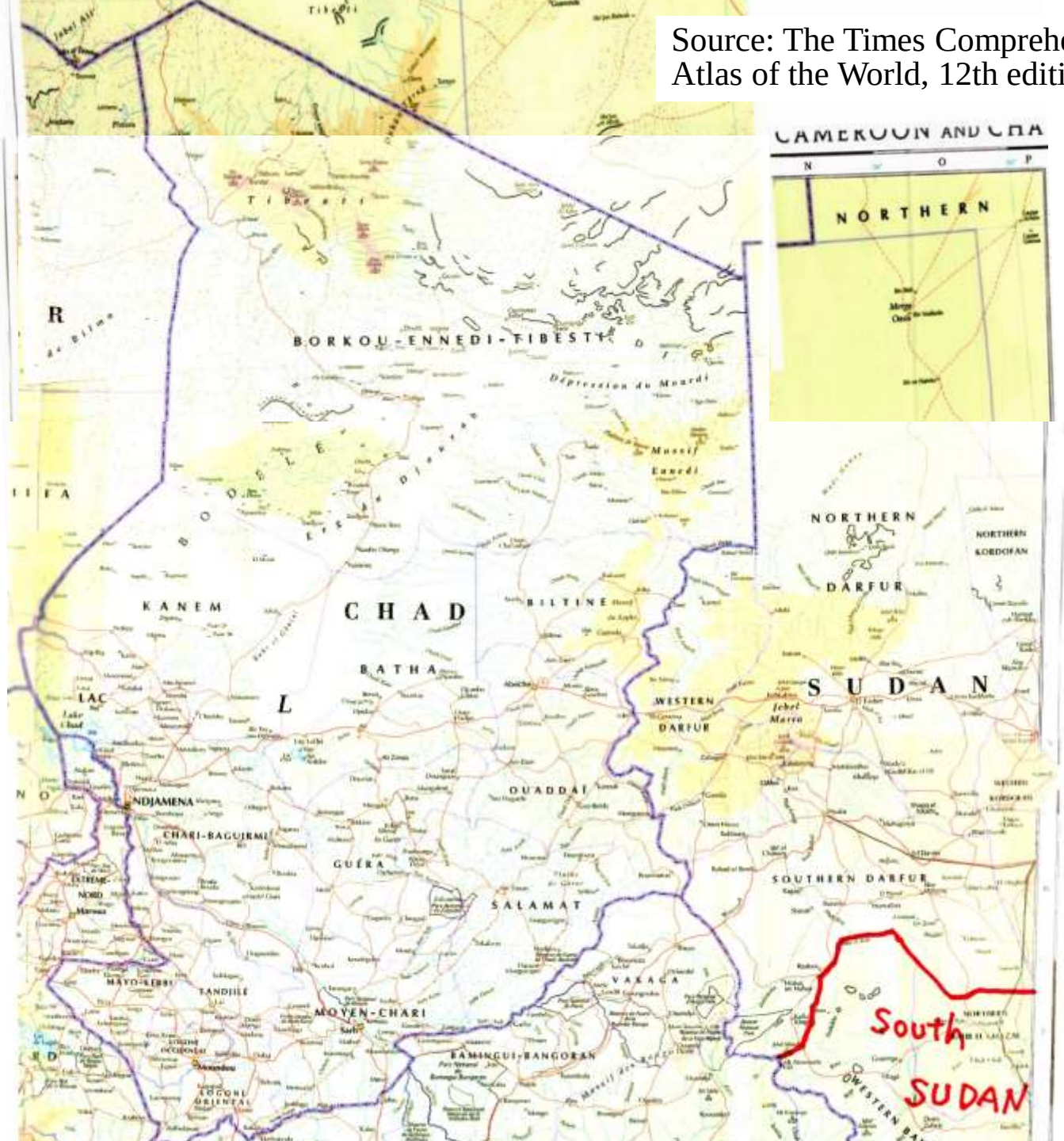
Table. Rice Value Trends in Chad (No.13 rice producing country in SSA during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

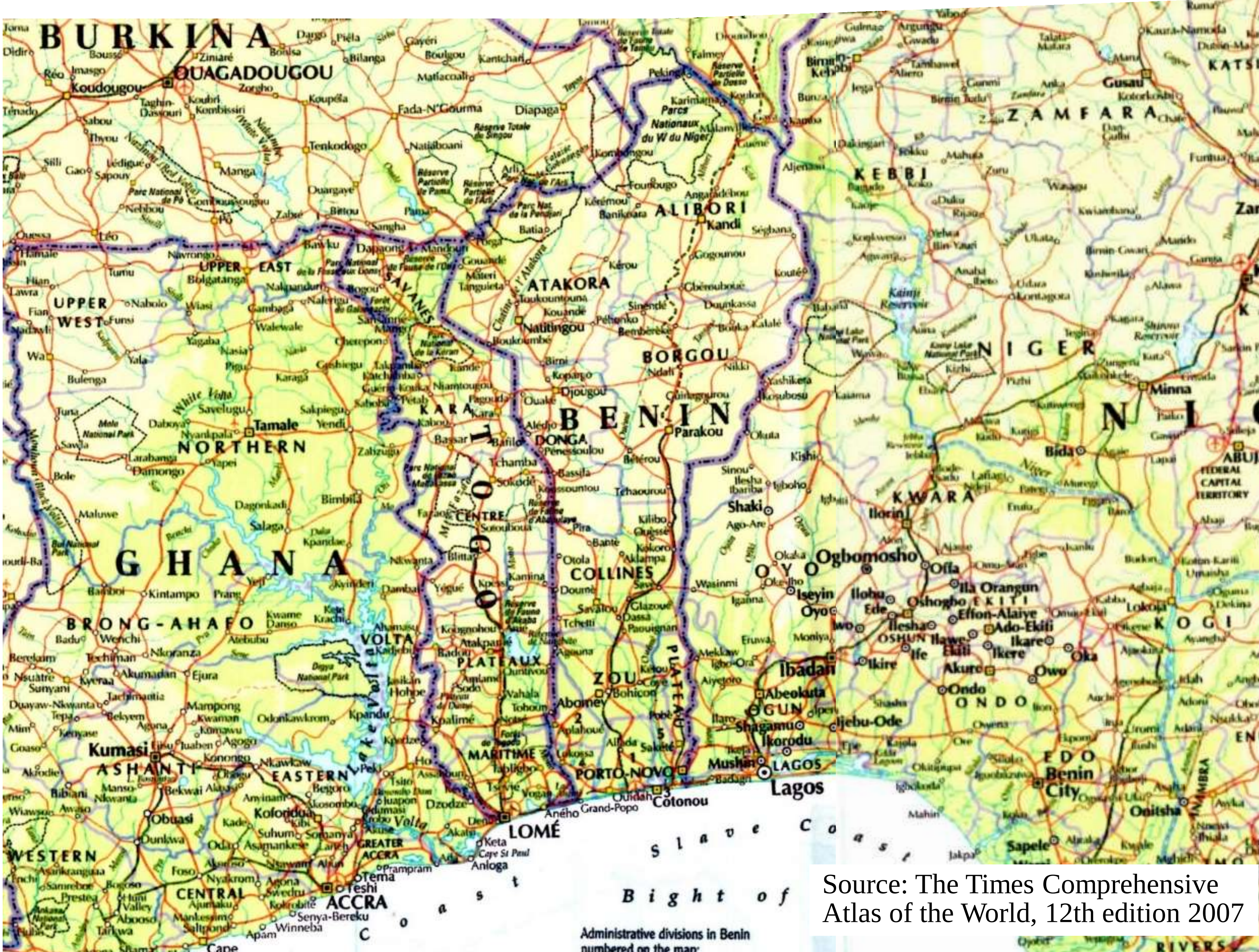
	1961 -1965	1966 -1970	1971 -1975	1976 -1980	1981 -1985	1986 -1990	1991 -1995	1996 -2000	2001 -2005	2008	2006 -2010	2011 -2015	2016
Population (million)	3.18	3.50	3.91	4.34	4.84	5.59	6.57	7.78	9.36	11.1	11.1	13.1	14.5
Area harvested (1,000 ha)	25.2	32.3	48.7	40.8	33.3	29.2	53.0	81.2	100	111	114	170	182
Index (%) of area harvested (100 for mean of 1971-1980)	56.4	72.1	109	91.1	74.4	65.4	118	182	224	248	254	380	408
Irrigated rice area harvested (1,000 ha)	2.38	2.72	3.19	3.80	4.76	7.31	3.06	3.49	9.8	36.7	36.7	36.7	
Index (%) of irrigated area (100 for mean of 1971-1980)	68.0	77.7	91.3	109	136	209	87	100	280	1048	1048	1048	
Percent of Irrigated rice area harvested (%)	9.42	8.42	6.55	9.33	14.3	25.0	5.77	4.30	9.78	33.1	32.2	21.6	
Paddy production (1,000 ton)	28.7	36.1	41.8	32.6	21.1	56.0	83.7	112	122	174	142	258	258
Index (%) of paddy production (100 for mean of 1971-1980)	77.2	97.0	112	87.8	56.6	151	225	302	328	468	382	692	693
Production (1,000 ton, milled rice)	17.9	22.5	26.1	20.4	13.2	35.0	52.3	70.1	76.2	108.7	88.7	161	161
Paddy yield (ton/ha)	1.13	1.14	0.86	0.87	0.61	1.73	1.58	1.39	1.21	1.57	1.25	1.49	1.41
Index (%) of paddy yield (100 for mean of 1971-1980)	131	132	99.4	101	70.3	200	182	161	140	181	144	172	163
Yield (ton/ha, milled rice)	0.71	0.71	0.54	0.54	0.38	1.08	0.99	0.87	0.76	0.98	0.78	0.93	0.88
Imported quantity (1,000 ton, milled rice)	0.23	0.03	0.27	2.79	9.21	13.1	12.0	0.84	2.42	0.75	2.92	3.33	5.07
Self-Sufficiency ratio (%)	98.6	99.9	98.9	86.2	61.8	65.3	78.7	98.8	96.8	99.3	97.3	97.6	96.9
Imported rice price ($/ton, milled rice)	184	455	608	435	395	386	451	357	292	938	530	984	840
Consumption per capita (kg/person, milled rice)	5.70	6.44	6.77	5.34	4.63	8.53	9.88	9.14	8.41	9.83	8.16	12.4	11.5

Table. Rice Value Trends in Benin (No.14 rice producing country in SSA during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

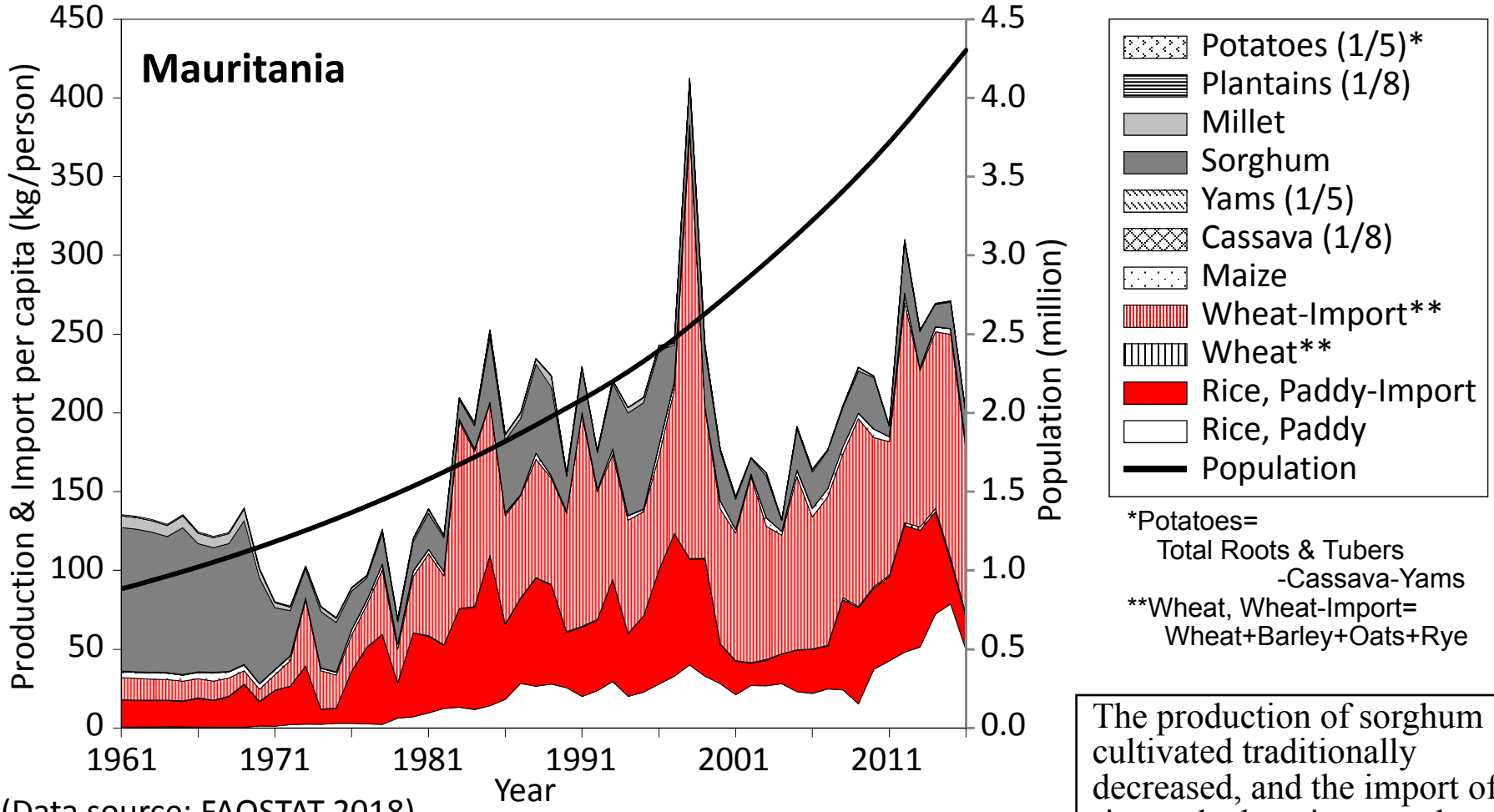
	1961 -1965	1966 -1970	1971 -1975	1976 -1980	1981 -1985	1986 -1990	1991 -1995	1996 -2000	2001 -2005	2008	2006 -2010	2011 -2015	2016
Population (million)	2.55	2.79	3.12	3.53	4.04	4.68	5.52	6.48	7.52	8.70	8.70	10.0	10.9
Area harvested (1,000 ha)	2.16	2.48	5.16	8.95	6.98	7.10	8.42	16.9	26.5	33.3	34.8	74.3	82.4
Index (%) of area harvested (100 for mean of 1971-1980)	30.7	35.2	73.2	127	98.8	101	119	239	375	472	493	1052	1167
Irrigated rice area harvested (1,000 ha)	0.00	0.00	0.00	0.00	0.00	0.71	0.34	5.00	5.32	6.59	6.33	6.59	
Index (%) of irrigated area (100 for mean of 1986-1995)	0.00	0.00	0.00	0.00	0.00	136	64	955	1017	1259	1210	1259	
Percent of Irrigated rice area harvested (%)	0.00	0.00	0.00	0.00	0.00	10.0	4.0	29.7	20.1	19.8	18.2	8.87	
Paddy production (1,000 ton)	0.97	2.40	8.69	13.0	7.37	9.26	12.3	33.6	63.1	109	104	247	281
Index (%) of paddy production (100 for mean of 1971-1980)	8.97	22.2	80.3	120	68.1	85.6	114	310	583	1011	961	2287	2601
Production (1,000 ton, milled rice)	0.61	1.50	5.43	8.10	4.61	5.79	7.69	21.0	39.4	68.4	65.0	155	176
Paddy yield (ton/ha)	0.44	0.91	1.65	1.43	1.07	1.30	1.45	1.97	2.38	3.29	2.94	3.36	3.42
Index (%) of paddy yield (100 for mean of 1971-1980)	28.8	59.2	107	92.9	69.6	84.5	93.7	128	154	213	191	218	222
Yield (ton/ha, milled rice)	0.28	0.57	1.03	0.90	0.67	0.81	0.90	1.23	1.49	2.05	1.84	2.10	2.14
Imported quantity (1,000 ton, milled rice)	4.80	5.93	7.37	10.0	35.8	63.1	239	87.7	200	697	673	1052	1464
Self-Sufficiency ratio (%)	11.5	20.6	44.9	46.4	12.4	9.72	3.32	21.3	19.5	8.93	8.83	13.4	10.7
Imported rice price ($/ton, milled rice)	144	177	295	253	302	285	299	316	224	266	232	547	529
Consumption per capita (kg/person, milled rice)	2.11	2.66	4.12	5.12	10.0	14.5	44.8	17.0	31.3	88.0	85.0	120	151

Source: The Times Comprehensive Atlas of the World, 12th edition 2007





Source: The Times Comprehensive Atlas of the World, 12th edition 2007

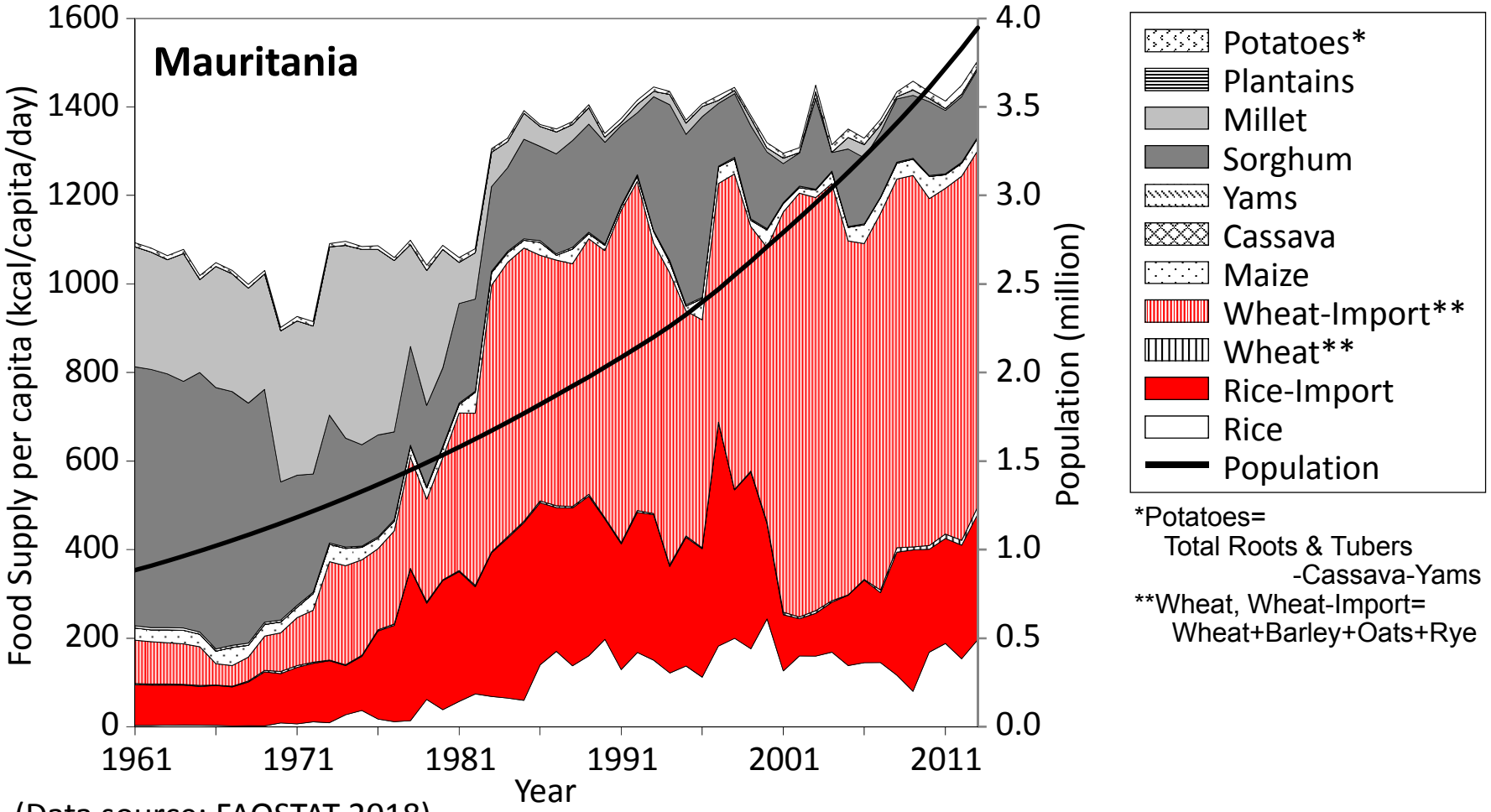


(Data source: FAOSTAT 2018)

Fig. Various Food Production & Import (kg/person) in Mauritania (No.15 rice producing country in SSA) during 1961-2016.

Cereal equivalent amounts of calories per kg are one fifth for Potato & plantain, one fourth for Yam and cassava (FAO Food composition data). In addition to these, postharvest and storage losses are estimated 2 times bigger than cereals for Cassava, 1.6 times for plantain, 1.3 times for Yam, and 1.0 for potatoes. Thus the cereals conversion ratios of potatoes and Yams are 1/5 and 1/8 for Plantains and Cassava.

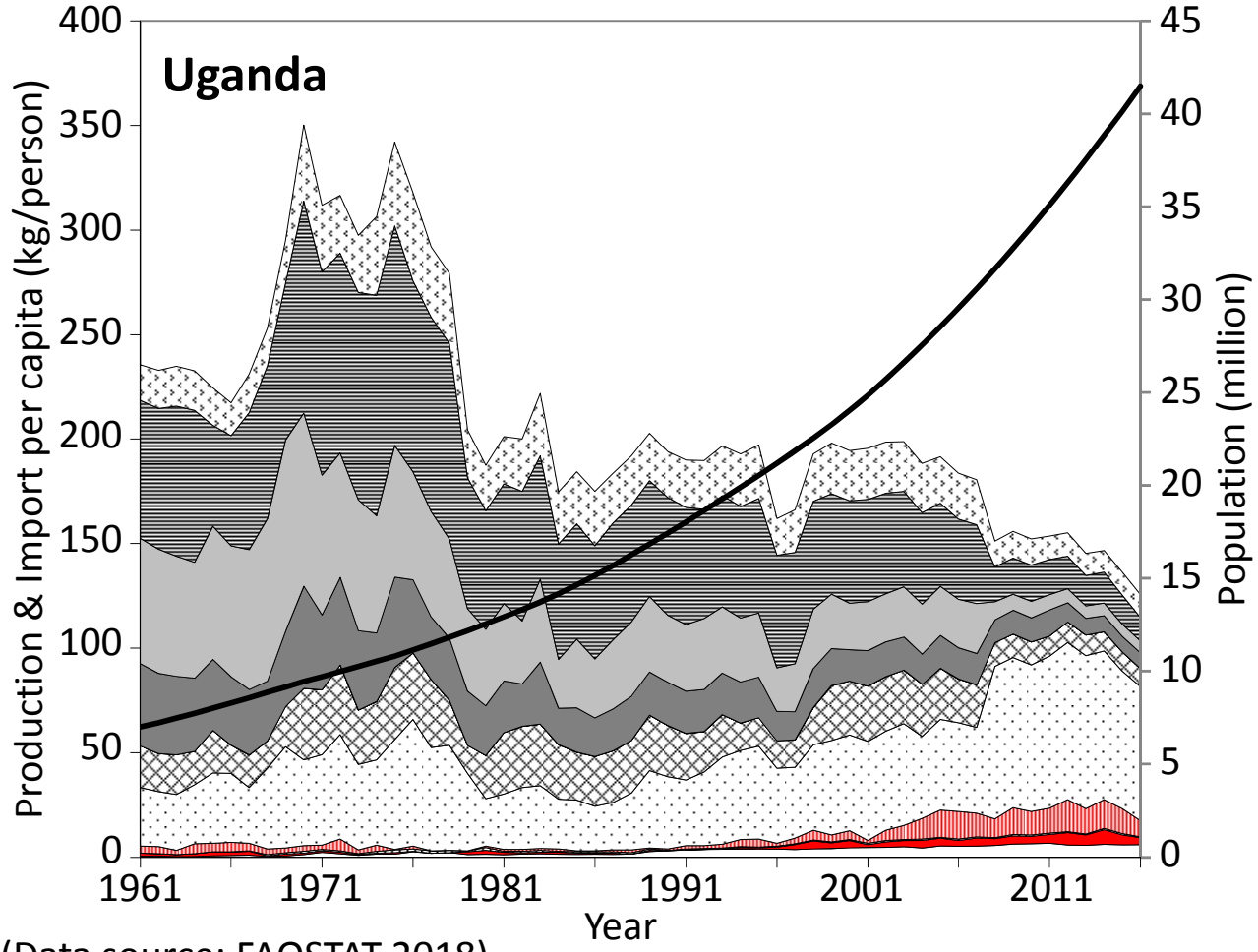
The production of sorghum cultivated traditionally decreased, and the import of rice and wheat increased rapidly. Although the room for production expansion is limited because of the problem of water resources, irrigation rice field is developing at Senegal River flood plain and delta, and the paddy production is increasing with the high yield.



(Data source: FAOSTAT 2018)

Fig. Various Food Supply (kcal/capita/day) in Mauritania (No.15 rice producing country in SSA) during 1961-2013.

We used that the cereals' equivalent coefficients of 1/8 for Cassava and Plantains as well as 1/5 for Yam and Potatoes. These conversion factors can be tentatively verified if we compare figure on per capita production and importation amounts in kg and per capita consumption in kcal.

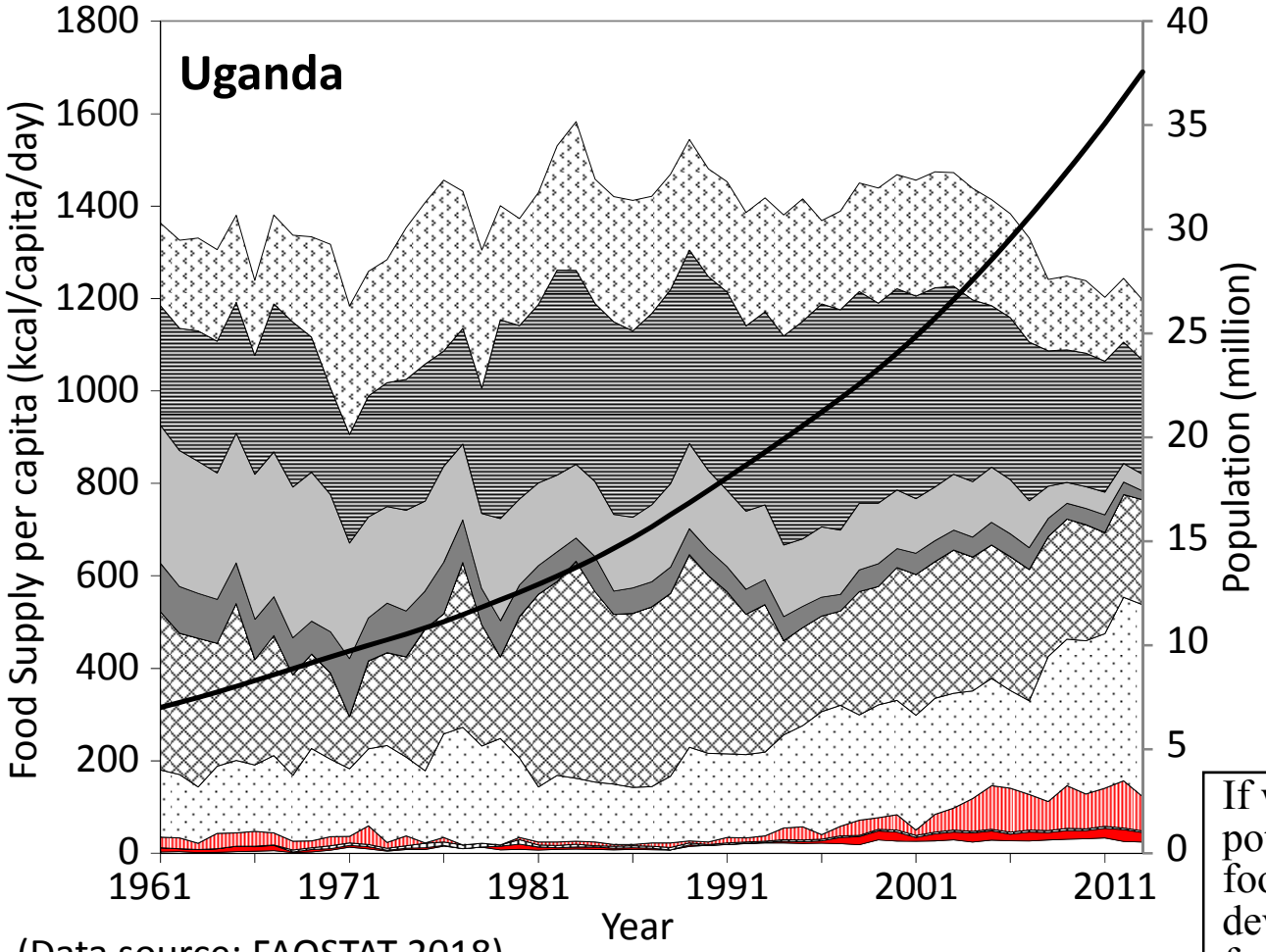


(Data source: FAOSTAT 2018)

Fig. Per Capita Various Food Production & Import (kg/person) in Uganda (No.16 rice producing country in SSA) during 1961-2016.

Cereal equivalent amounts of calories per kg are one fifth for Potato & plantain, one fourth for Yam and cassava (FAO Food composition data). In addition to these, postharvest and storage losses are estimated 2 times bigger than cereals for Cassava, 1.6 times for plantain, 1.3 times for Yam, and 1.0 for potatoes. Thus the cereals conversion ratios of potatoes and Yams are 1/5 and 1/8 for Plantains and Cassava.

Although rice production is recently expanding under upland NERICA program, still it is negligible amount. Traditionally plantain, millet, sorghum and maize are major staples. Food production had decreased after the outbreak of political and social disasters during the late 1970's, especially Millet and Sorghum.



*Potatoes=
Total Roots & Tubers
-Cassava-Yams
**Wheat, Wheat-Import=
Wheat+Barley+Oats+Rye

(Data source: FAOSTAT 2018)

Fig. Per Capita Various Food Supply (kcal/capita/day) in Uganda (No.16 rice producing country in SSA) during 1961-2013.

If we compare production of potatoes and cassava in kg to food supply in kcal, some over devaluation of cereals equivalent factor, 1/5 of potatoes and 1/8 of cassava may estimate in Uganda. However, we have to consider the statistical data reliability, too, especially during 1970s.

We used that the cereals' equivalent coefficients of 1/8 for Cassava and Plantains as well as 1/5 for Yam and Potatoes. These conversion factors can be tentatively verified if we compare figure on per capita production and importation amounts in kg and per capita consumption in kcal.

Table. Rice Value Trends in Mauritania (No.15 rice producing country in SSA during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

	1961 -1965	1966 -1970	1971 -1975	1976 -1980	1981 -1985	1986 -1990	1991 -1995	1996 -2000	2001 -2005	2008	2006 -2010	2011 -2015	2016
Population (million)	0.94	1.08	1.25	1.45	1.67	1.92	2.20	2.55	2.96	3.41	3.41	3.95	4.30
Area harvested (1,000 ha)	0.33	0.62	1.27	2.11	4.23	11.9	15.5	20.8	17.6	17.3	17.9	46.0	40.6
Index (%) of area harvested (100 for mean of 1971-1980)	19.5	36.7	75.2	125	250	703	915	1233	1040	1022	1060	2723	2405
Irrigated rice area harvested (1,000 ha)	0.33	0.62	1.27	2.11	4.23	11.9	15.5	20.8	17.6	17.3	17.9	46.0	
Index (%) of irrigated area (100 for mean of 1971-1980)	19.5	36.7	75.2	125	250	703	915	1233	1040	1022	1060	2723	
Percent of Irrigated rice area harvested (%)	100	100	100	100	100	100	100	100	100	100	100	100	
Paddy production (1,000 ton)	0.59	0.70	2.74	6.19	20.4	48.7	51.1	82.5	74.5	82.2	84.6	233	213
Index (%) of paddy production (100 for mean of 1971-1980)	13.2	15.6	61.4	139	457	1091	1144	1846	1669	1839	1893	5226	4775
Production (1,000 ton, milled rice)	0.37	0.44	1.71	3.87	12.8	30.5	31.9	51.5	46.6	51.4	52.9	146	133
Paddy yield (ton/ha)	1.78	1.22	2.51	2.84	4.81	4.24	3.35	3.96	4.28	4.76	4.64	5.06	5.25
Index (%) of paddy yield (100 for mean of 1971-1980)	66.6	45.5	93.8	106	180	159	125	148	160	178	173	189	196
Yield (ton/ha, milled rice)	1.11	0.76	1.57	1.78	3.01	2.65	2.10	2.48	2.68	2.98	2.90	3.16	3.28
Imported quantity (1,000 ton, milled rice)	9.8	13.1	16.0	38.8	65.8	64.3	66.4	104	35.9	122	96.8	147	54.9
Self-Sufficiency ratio (%)	3.63	3.42	12.3	10.1	17.1	32.5	32.6	35.1	56.8	29.6	36.6	49.9	70.8
Imported rice price ($/ton, milled rice)	125	133	147	229	311	228	229	242	390	629	412	340	546
Consumption per capita (kg/person, milled rice)	10.8	12.5	14.2	29.3	46.5	49.3	44.6	61.3	27.8	50.9	43.5	74.1	43.8

Table. Rice Value Trends in Uganda (No.16 rice producing country in SSA during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

	1961 -1965	1966 -1970	1971 -1975	1976 -1980	1981 -1985	1986 -1990	1991 -1995	1996 -2000	2001 -2005	2008	2006 -2010	2011 -2015	2016
Population (million)	7.50	8.87	10.3	11.8	13.8	16.3	19.3	22.6	26.7	31.7	31.7	37.6	41.5
Area harvested (1,000 ha)	2.64	7.32	17.4	18.3	15.0	24.6	51.6	64.4	87.4	128	107	93.1	97.5
Index (%) of area harvested (100 for mean of 1971-1980)	14.8	41.1	97.5	103	84.1	138	289	361	490	718	598	522	547
Irrigated rice area harvested (1,000 ha)	0.44	0.74	0.74	0.96	1.44	1.66	1.66	1.66	3.04	4.67	4.50	8.69	
Index (%) of irrigated area (100 for mean of 1971-1980)	52.2	87.0	87.0	113	170	196	196	196	358	550	530	1022	
Percent of Irrigated rice area harvested (%)	16.8	10.1	4.25	5.25	9.60	6.76	3.22	2.58	3.48	3.65	4.22	9.33	
Paddy production (1,000 ton)	3.18	6.62	15.5	21.5	19.0	32.6	71.4	91.2	128	178	184	227	247
Index (%) of paddy production (100 for mean of 1971-1980)	17.2	35.8	83.6	116	103	176	386	493	692	961	992	1224	1332
Production (1,000 ton, milled rice)	1.99	4.14	9.68	13.5	11.9	20.4	44.6	57.0	80.0	111	115	142	154
Paddy yield (ton/ha)	1.20	1.07	0.89	1.22	1.27	1.30	1.38	1.41	1.47	1.39	1.80	2.44	2.53
Index (%) of paddy yield (100 for mean of 1971-1980)	114	102	84.2	116	120	123	131	134	139	132	171	231	240
Yield (ton/ha, milled rice)	0.75	0.67	0.56	0.76	0.79	0.81	0.86	0.88	0.92	0.87	1.13	1.52	1.58
Imported quantity (1,000 ton, milled rice)	6.56	6.16	3.97	5.40	6.70	3.62	4.04	37.9	48.5	63.4	69.3	127	85.7
Self-Sufficiency ratio (%)	23.1	41.9	71.2	76.0	63.9	83.7	92.6	61.8	63.3	63.7	62.4	53.2	64.3
Imported rice price ($/ton, milled rice)	186	234	352	402	363	331	436	346	277	377	348	428	425
Consumption per capita (kg/person, milled rice)	1.13	1.17	1.34	1.59	1.35	1.46	2.51	4.18	4.79	5.51	5.78	7.14	5.78

METRES
FEET
LAND BELOW SEA LEVEL
Tropic of Cancer
WESTERN
SAHARA
TIRIS
ZEMMOUR
El Hammâmi
Maqteïr
ADRAR
MAURITANIA
AZZEFFAL
AKCHÂR
INCHIRI
DAKHLET NOUÂDHIBOU
Nouâdhibou
HODH ECH CHARGUI
EL MREYYÉ
Ouarâne
TOMBOUCTOU
MAURITANIA
TAGANT
Dhar Tîchît
Dhar Oualâta
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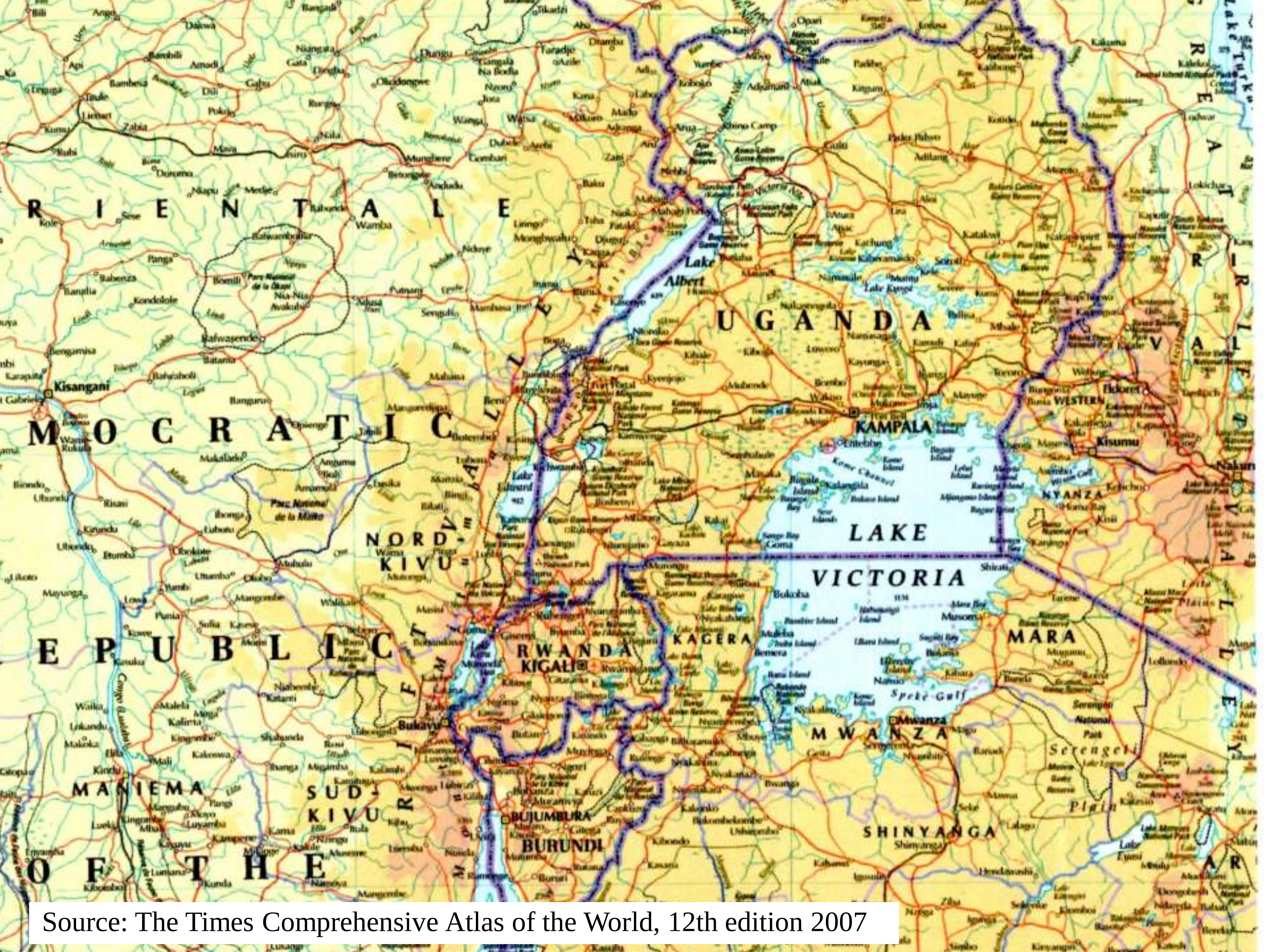

Source: The Times Comprehensive Atlas of the World, 12th edition 2007