Sawah Technology(Statistics 1-3) SSA's paddy production ranking No.17 to No.24 and below countries on rice production and related data during 1961 to 2016

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

1. No.17 to No.24 paddy production during 2011 to 2015 mean data Cameroon>Guinea Bissau>Mozambique>Togo> Kenya>Malawi> Ethiopia> Rwanda

2. No.26 Burundi, No.27 Gambia, No.28 Zambia, No.29 Angola, and No.32 Sudan (former, including South Sudan) based on paddy production during 2011 to 2015 mean data (note, No.31 Central Africa, No.25 Niger)

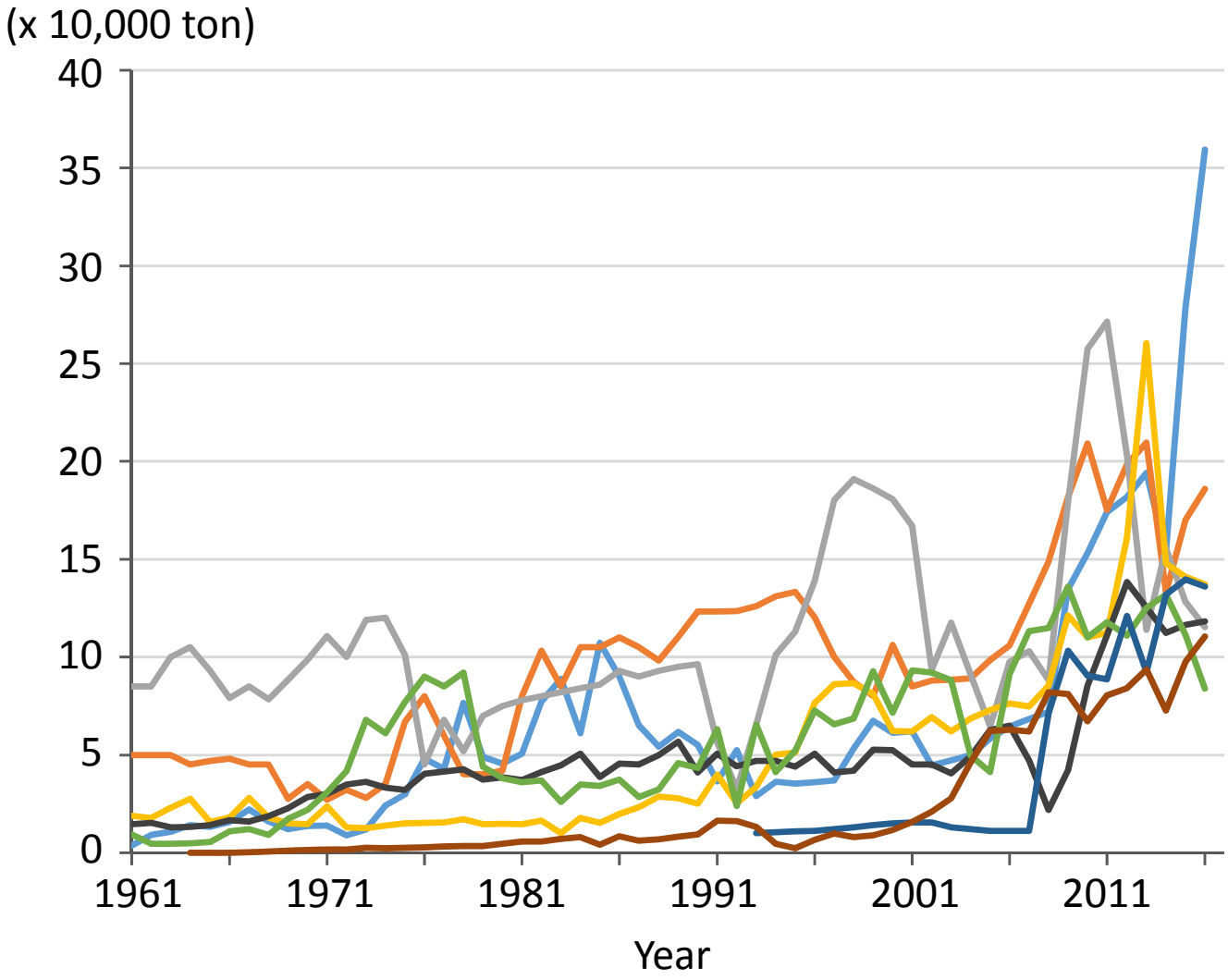


Fig. Paddy Production during 1961-2016 (Sub Saharan Africa Rank 17-24 rice production countries).

Data source: FAOSTAT 2018

Although paddy productions have been fluctuated widely in Mozambique, Guinea-Bissau, Cameroon, Malawi and Kenya, Cameroon's production in 2015-16 is explosive. The paddy productions are increasing rapidly in Togo, Rwanda and Ethiopia in addition to the above countries recently since 2011.

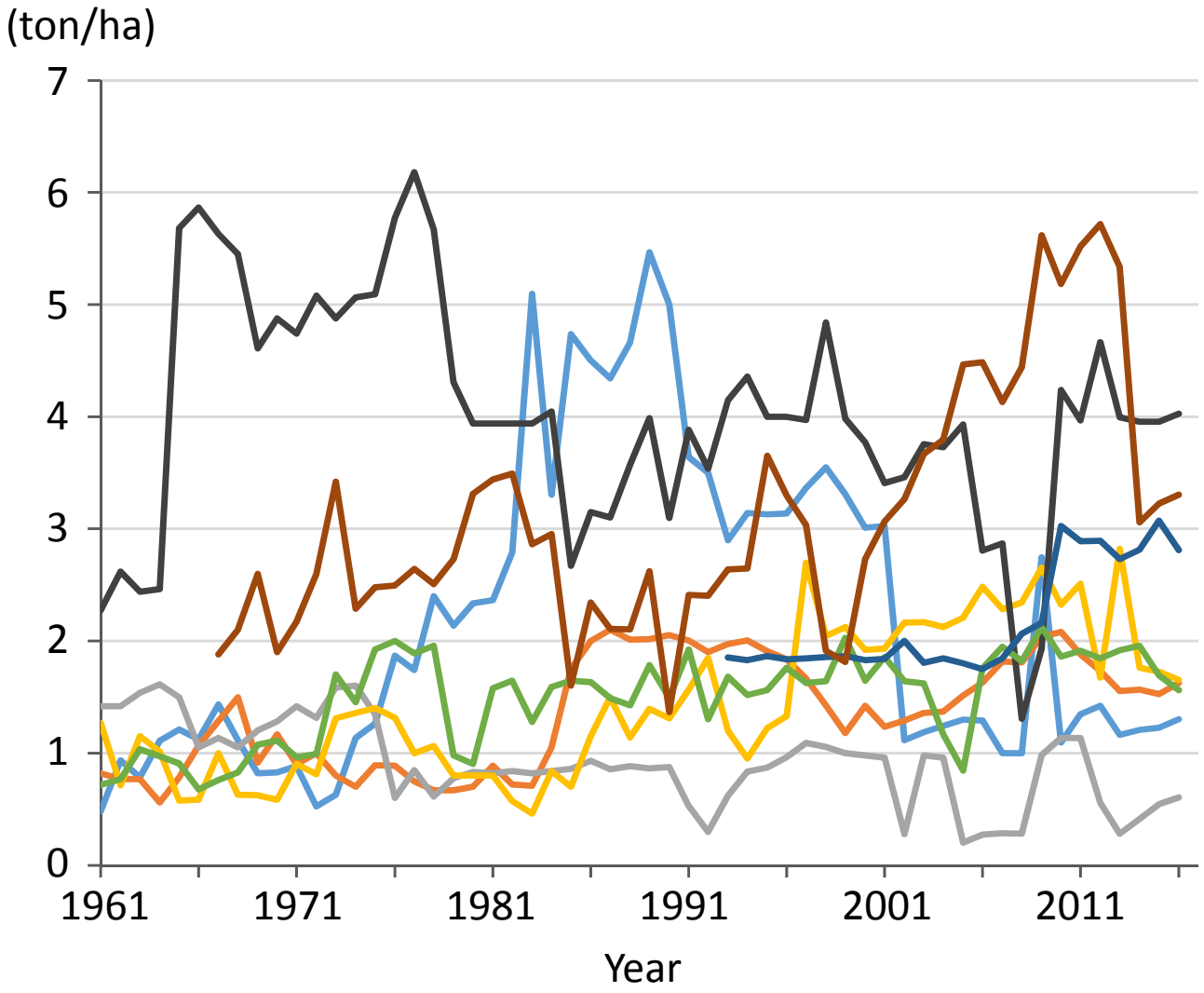


Fig. Paddy Yield during 1961-2016 (Sub Saharan Africa Rank 17-24 rice production countries).

Data source: FAOSTAT 2018

It is necessary to take a careful look at the decline of yield in Kenya where irrigated rice fields are nearly 100%. Although Cameroon had huge SEMRY and other irrigation sites, upland rice cultivation is expanding in recent years, which resulted recent lower paddy yield . The increase of yield in Togo, Ethiopia and Rwanda suggests the Sawah based rice farming is expansing in these countries.

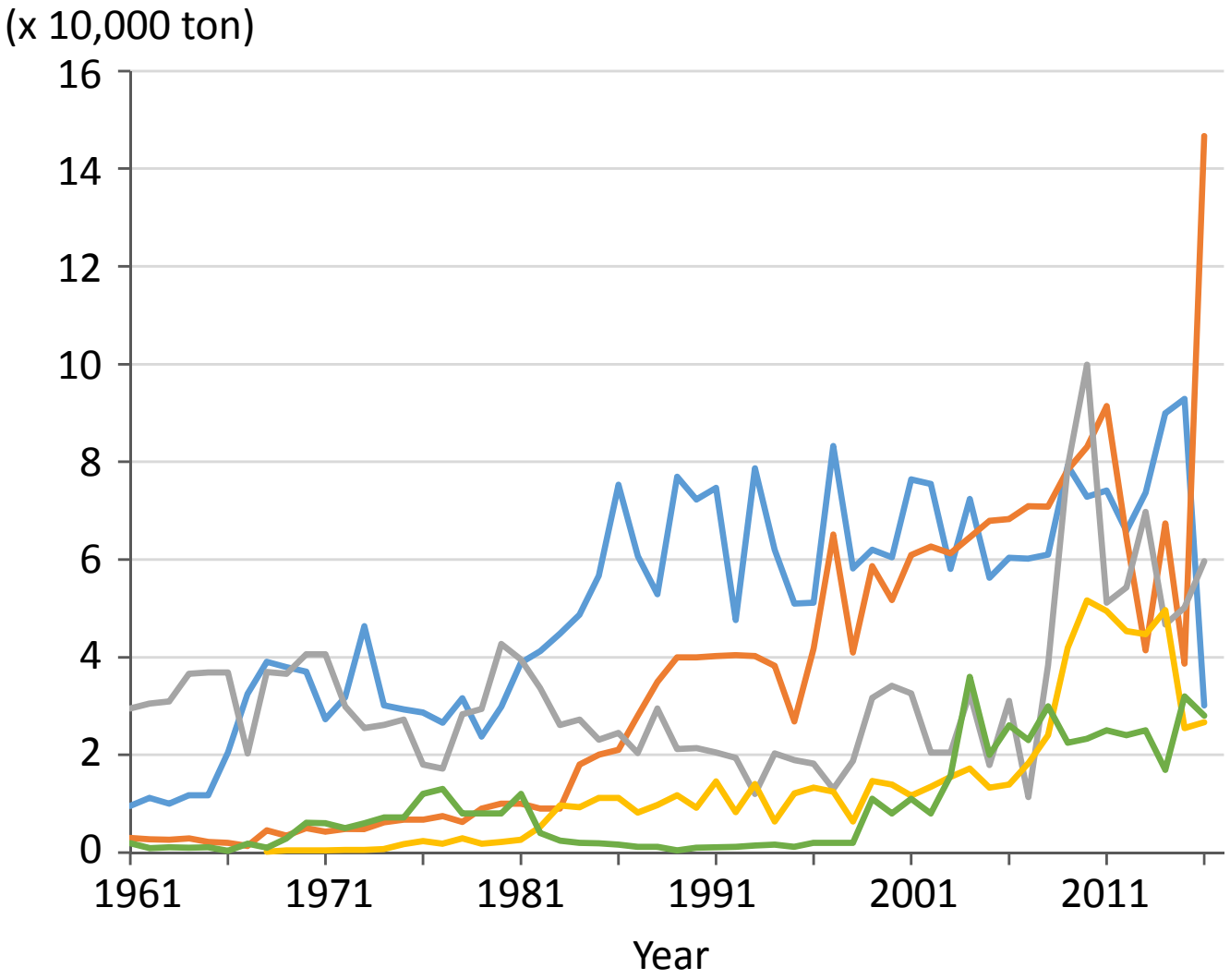


Fig. Paddy Production during 1961-2016 (Sub Saharan Africa Rank below 25 countries rice production countries)

Data source: FAOSTAT 2018

Recent expansion of paddy production in Burundi and Zambia is dramatic. Niger and Gambia are traditional rice producing countries. Paddy productions of Gambia and other countries have turned to increase in recently since 2005. Sudan has huge potential along Nile river flood plain. Sudd wetlands of South Sudan has huge potential for developing irrigated Sawah systems, equal to or higher than Nigeria. However, the paddy production is low at present because of political and social disasters.

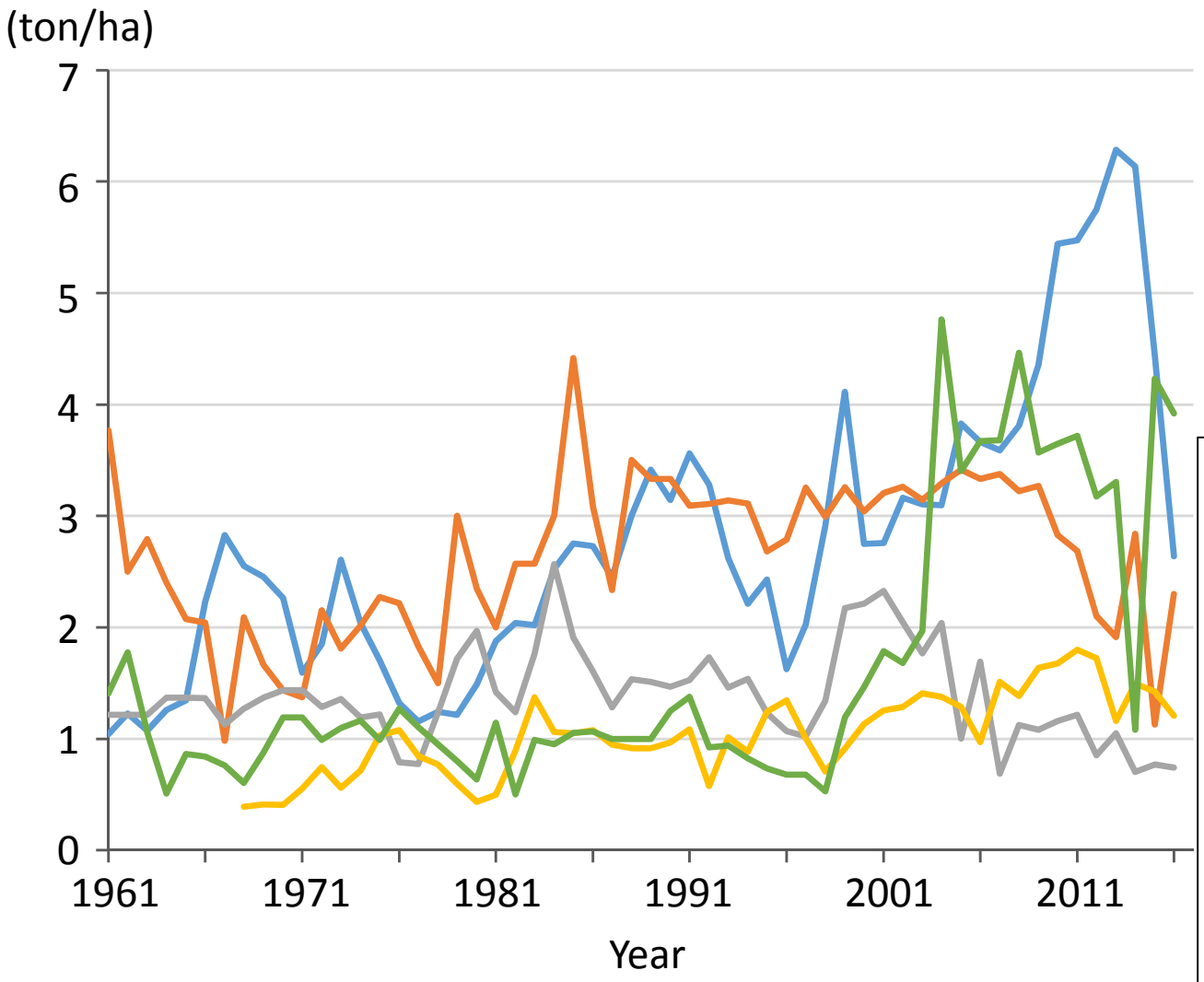
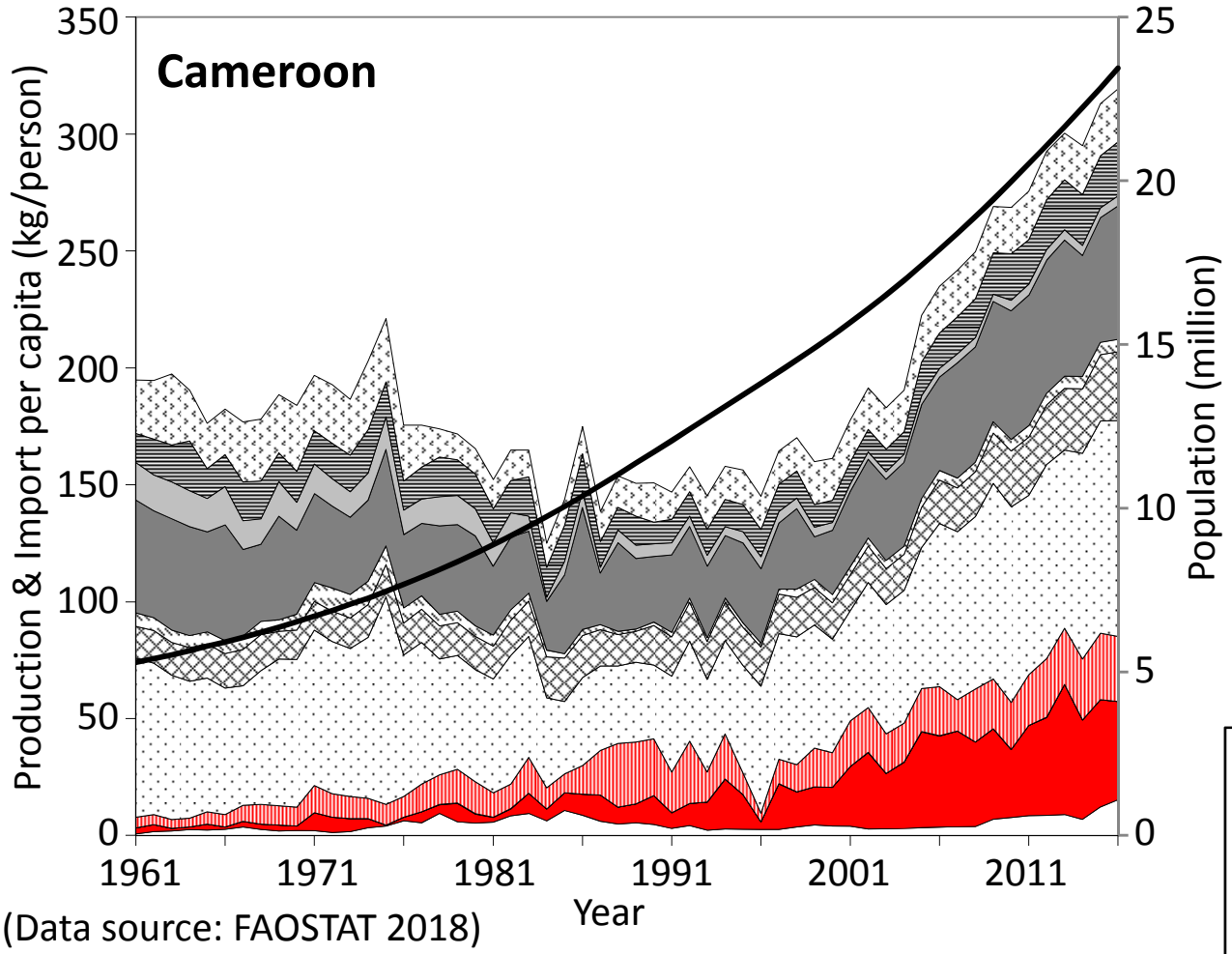


Fig. Paddy Yield during 1961-2016 (Sub Saharan Africa Ranl below 25 countries rice production countries).

Data source: FAOSTAT 2018

The high ratio of sawah equipped for irrigation and the high soil fertility contribute to the high yield in Burundi.
The recent high value in Sudan may be resulting from the spreading of Egyptian irrigated rice farming at Nile flood plains in recent years or the statistical data error caused by the independence of South Sudan.
Maybe the data of Niger needs careful examination.



*Potatoes=Total Roots & Tubers -Cassava-Yams

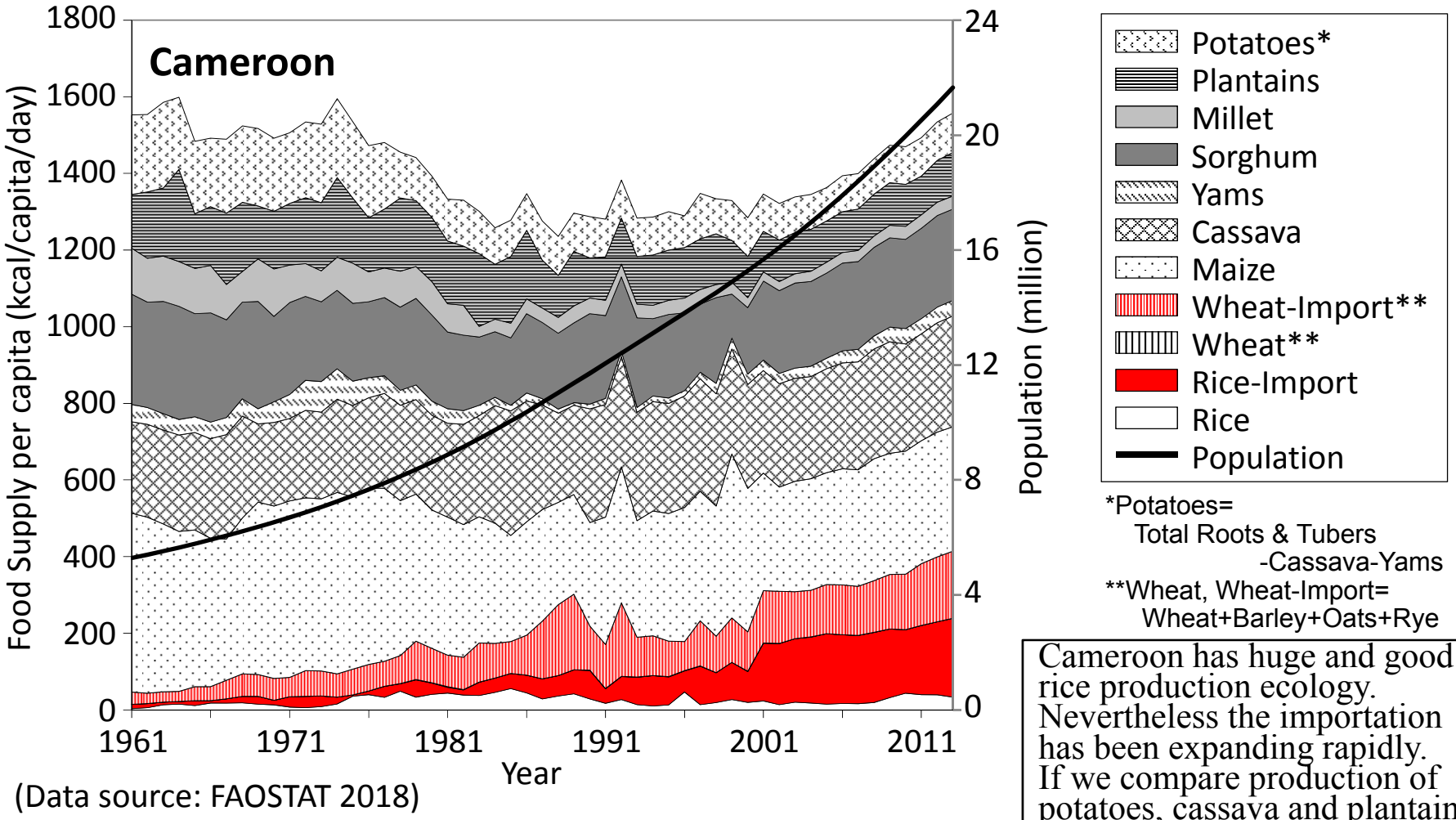
**Wheat, Wheat-Import= Wheat+Barley+Oats+Rye

(Data source: FAOSTAT 2018)

Fig. Various Food Production & Import (kg/person) in Cameroon (No.17 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 maize produced at the southern part and the sorghum at the northern part are staple cereals. The potato production at the cold mountainous area is relatively large. Food production isn't much change in the past 50 years except decrease of Millet. But, the import of wheat and rice is increasing rapidly. Rice production slightly increased in 1980s when management of northern vast irrigated rice field(SEMRY) was carried out, and thereafter decreased. The rice production tend to increase by CARD support of JICA in late years, and in future?



(Data source: FAOSTAT 2018)

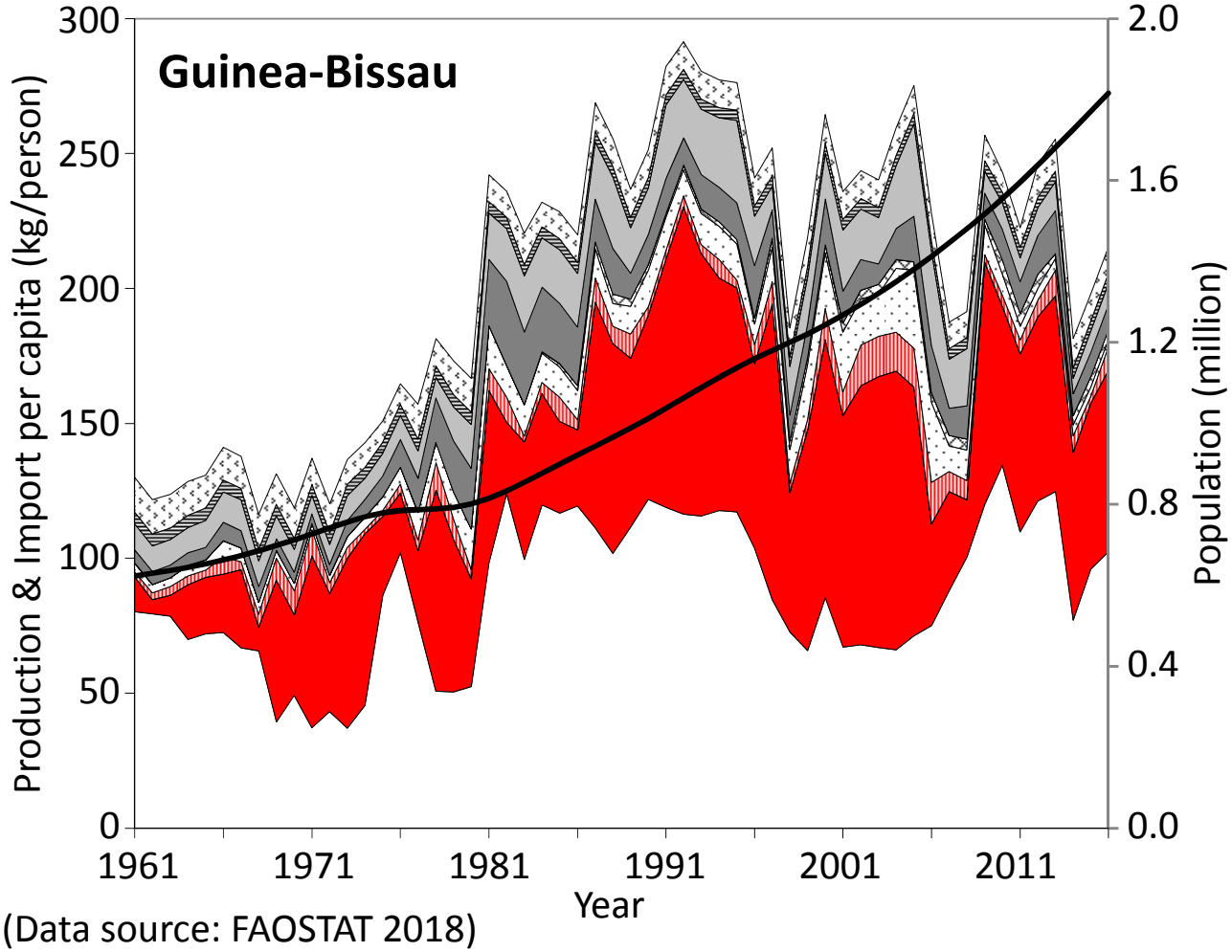
*Potatoes=
Total Roots & Tubers
-Cassava-Yams

**Wheat, Wheat-Import=
Wheat+Barley+Oats+Rye

Fig. Various Food Supply (kcal/capita/day) in Cameroon (No.17 rice producing country in SSA) during 1961-2013.

Cameroon has huge and good rice production ecology. Nevertheless the importation has been expanding rapidly. If we compare production of potatoes, cassava and plantain in kg to food supply in kcal, some over devaluation of cereals equivalent factor, 1/5 of potatoes and 1/8 of cassava and plantain may estimate.

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=
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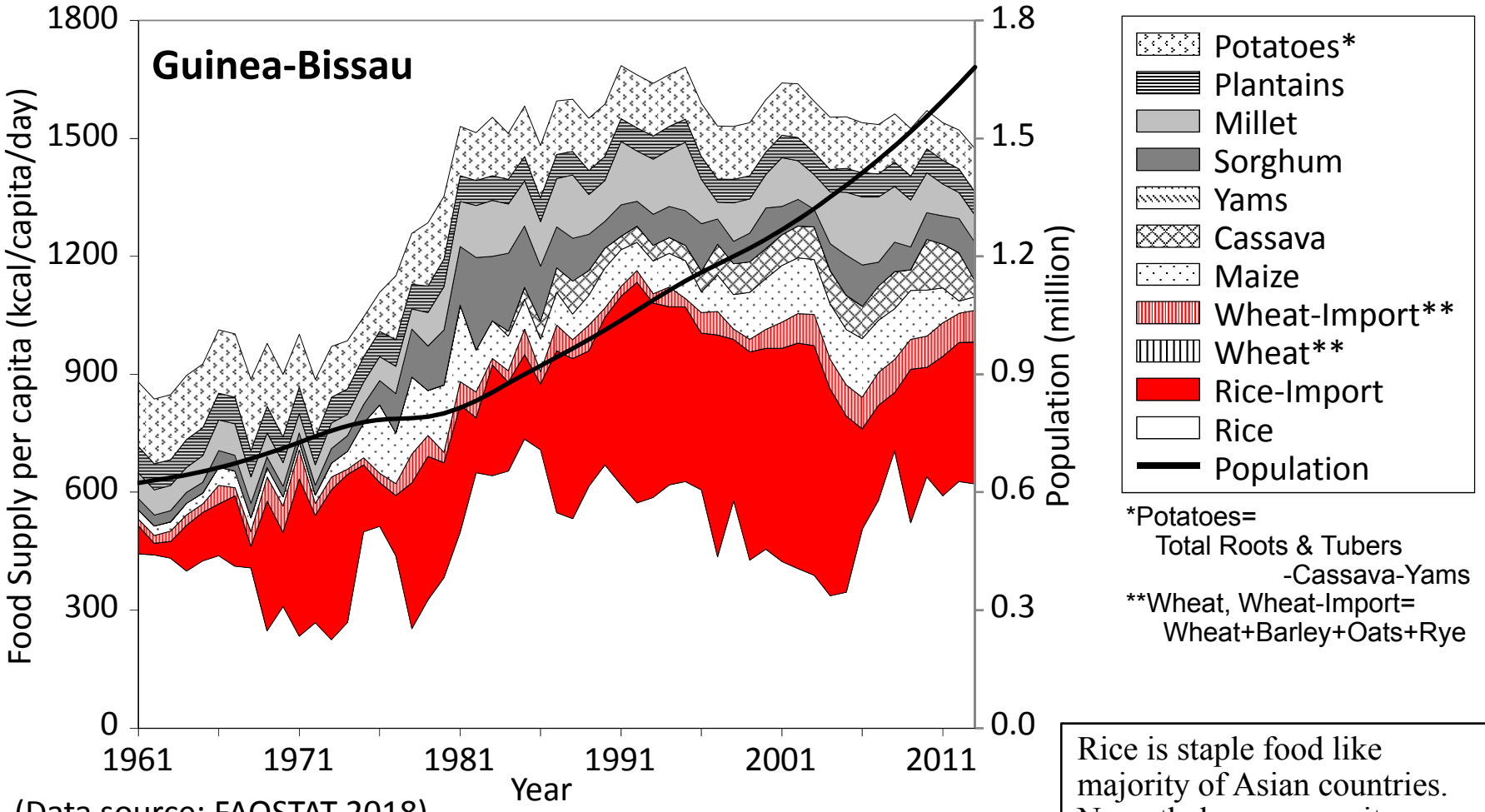
**Wheat, Wheat-Import=
Wheat+Barley+Oats+Rye

(Data source: FAOSTAT 2018)

Fig. Various Food Production & Import (kg/person) in Guinea-Bissau (No.18 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 cultivation using a lowland wetland at Gulf of Guinea banks is traditional agriculture in this country. Although it gained independence from Portugal in 1947, the rice production stagnated because of the continuous internal disturbance after the independence. Rice import is increasing. The rice production tend to increase in late years, and in future?



(Data source: FAOSTAT 2018)

Fig. Various Food Supply (kcal/capita/day) in Guinea-Bissau (No.18 rice producing country in SSA) during 1961-2013.

Rice is staple food like majority of Asian countries. Nevertheless, per capita importation has been huge and expanding immediately after the independence.

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 Cameroon (No.17 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)	5.53	6.21	7.07	8.13	9.46	11.0	12.8	14.5	16.5	18.9	18.9	21.7	23.4
Area harvested (1,000 ha)	10.9	15.0	19.3	24.9	21.5	13.8	11.6	15.6	37.1	72.0	75.9	156	276
Index (%) of area harvested (100 for mean of 1971-1980)	49.3	68.0	87.3	113	97.4	62.4	52.3	70.8	168	326	343	704	1250
Irrigated rice area harvested (1,000 ha)	2.83	5.26	8.09	12.5	18.0	3.45	10.7	14.3	15.6	25.1	25.0	25.1	
Index (%) of irrigated area (100 for mean of 1971-1980)	27.5	51.0	78.4	122	175	33.4	103	139	151	244	242	244	
Percent of Irrigated rice area harvested (%)	26.0	35.0	41.9	50.3	83.6	25.0	92.2	91.6	41.9	34.9	32.9	16.2	
Paddy production (1,000 ton)	10.1	15.9	17.7	52.4	77.0	65.3	37.9	51.0	52.4	72.0	98.5	196	359
Index (%) of paddy production (100 for mean of 1971-1980)	29.0	45.5	50.5	149	220	186	108	146	150	205	281	560	1025
Production (1,000 ton, milled rice)	6.34	9.96	11.1	32.7	48.1	40.8	23.7	31.9	32.8	45.0	61.6	123	225
Paddy yield (ton/ha)	0.90	1.06	0.89	2.10	3.66	4.79	3.26	3.27	1.57	1.00	1.43	1.27	1.30
Index (%) of paddy yield (100 for mean of 1971-1980)	60.6	71.3	59.4	141	245	321	219	219	105	67.0	95.6	85.4	87.2
Yield (ton/ha, milled rice)	0.57	0.67	0.55	1.31	2.29	3.00	2.04	2.05	0.98	0.62	0.89	0.80	0.81
Imported quantity (1,000 ton, milled rice)	7.11	7.88	20.6	22.2	31.5	66.0	103	129	314	427	434	609	615
Self-Sufficiency ratio (%)	47.5	56.5	39.9	61.4	62.8	38.6	21.0	23.7	9.8	9.5	12.5	16.8	26.7
Imported rice price ($/ton, milled rice)	141	168	298	300	249	235	231	182	245	590	474	511	378
Consumption per capita (kg/person, milled rice)	2.43	2.87	4.52	6.73	8.35	9.7	9.9	11.0	20.9	25.0	26.2	33.7	35.8

Table. Rice Value Trends in Guinea-Bissau (No.18 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)	0.64	0.69	0.75	0.79	0.86	0.97	1.09	1.20	1.32	1.48	1.48	1.68	1.82
Area harvested (1,000 ha)	66.2	34.0	44.4	70.0	103	53.7	65.1	65.8	66.4	82.2	81.4	108	114
Index (%) of area harvested (100 for mean of 1971-1980)	116	59.4	77.6	122	179	93.9	114	115	116	144	142	188	200
Irrigated rice area harvested (1,000 ha)	2.39	2.39	2.39	2.39	2.39	1.30	0.22	5.86	6.42	6.57	6.57	6.57	
Index (%) of irrigated area (100 for mean of 1971-1980)	100	100	100	100	100	54.4	9.09	246	269	275	275	275	
Percent of Irrigated rice area harvested (%)	3.60	7.02	5.37	3.41	2.33	2.42	0.33	8.91	9.67	7.99	8.07	6.10	
Paddy production (1,000 ton)	48.4	40.1	37.8	52.4	95.6	109	127	98.7	89.8	149	155	177	186
Index (%) of paddy production (100 for mean of 1971-1980)	107	88.9	83.8	116	212	243	283	219	199	330	343	393	412
Production (1,000 ton, milled rice)	30.3	25.1	23.6	32.8	59.8	68.4	79.6	61.7	56.1	93.0	96.6	111	116
Paddy yield (ton/ha)	0.74	1.19	0.86	0.73	1.02	2.04	1.96	1.51	1.35	1.81	1.87	1.65	1.63
Index (%) of paddy yield (100 for mean of 1971-1980)	93.0	149	108	92	129	256	246	189	170	227	235	207	204
Yield (ton/ha, milled rice)	0.46	0.74	0.54	0.46	0.64	1.27	1.22	0.94	0.85	1.13	1.17	1.03	1.02
Imported quantity (1,000 ton, milled rice)	5.39	12.3	24.8	21.7	22.3	38.9	64.1	61.1	79.1	19.6	45.6	69.4	76.4
Self-Sufficiency ratio (%)	85.2	67.9	47.9	60.1	72.8	64.5	55.5	50.8	41.6	82.6	69.3	61.2	60.3
Imported rice price ($/ton, milled rice)	133	150	245	242	315	318	284	244	292	494	421	414	361
Consumption per capita (kg/person, milled rice)	55.9	54.5	64.1	69.0	96.0	111	132	102	102	76.0	95.2	107	106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BAUCHI
GOMBE
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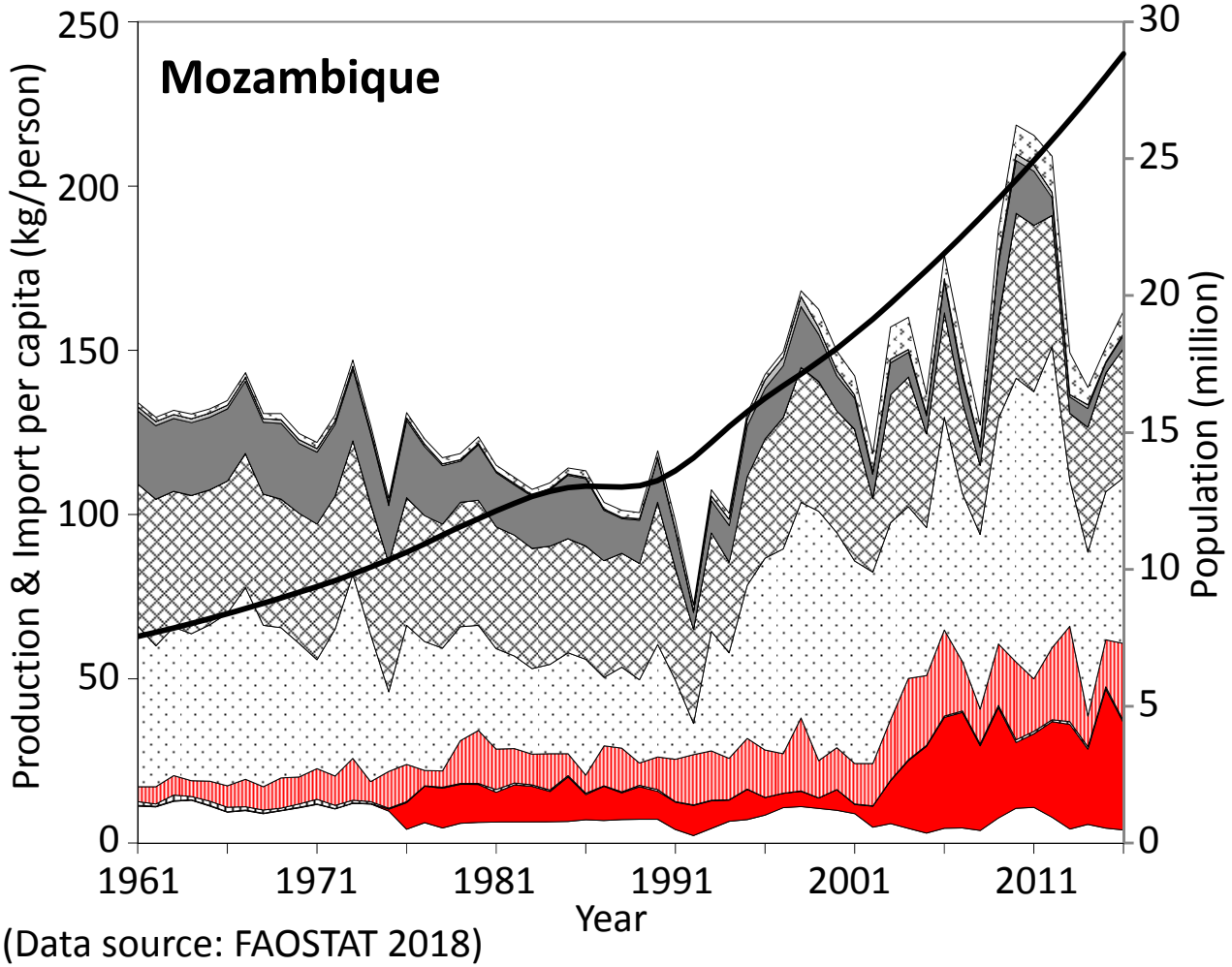
Source: The Times Comprehensive Atlas of the World, 12th edition 2007



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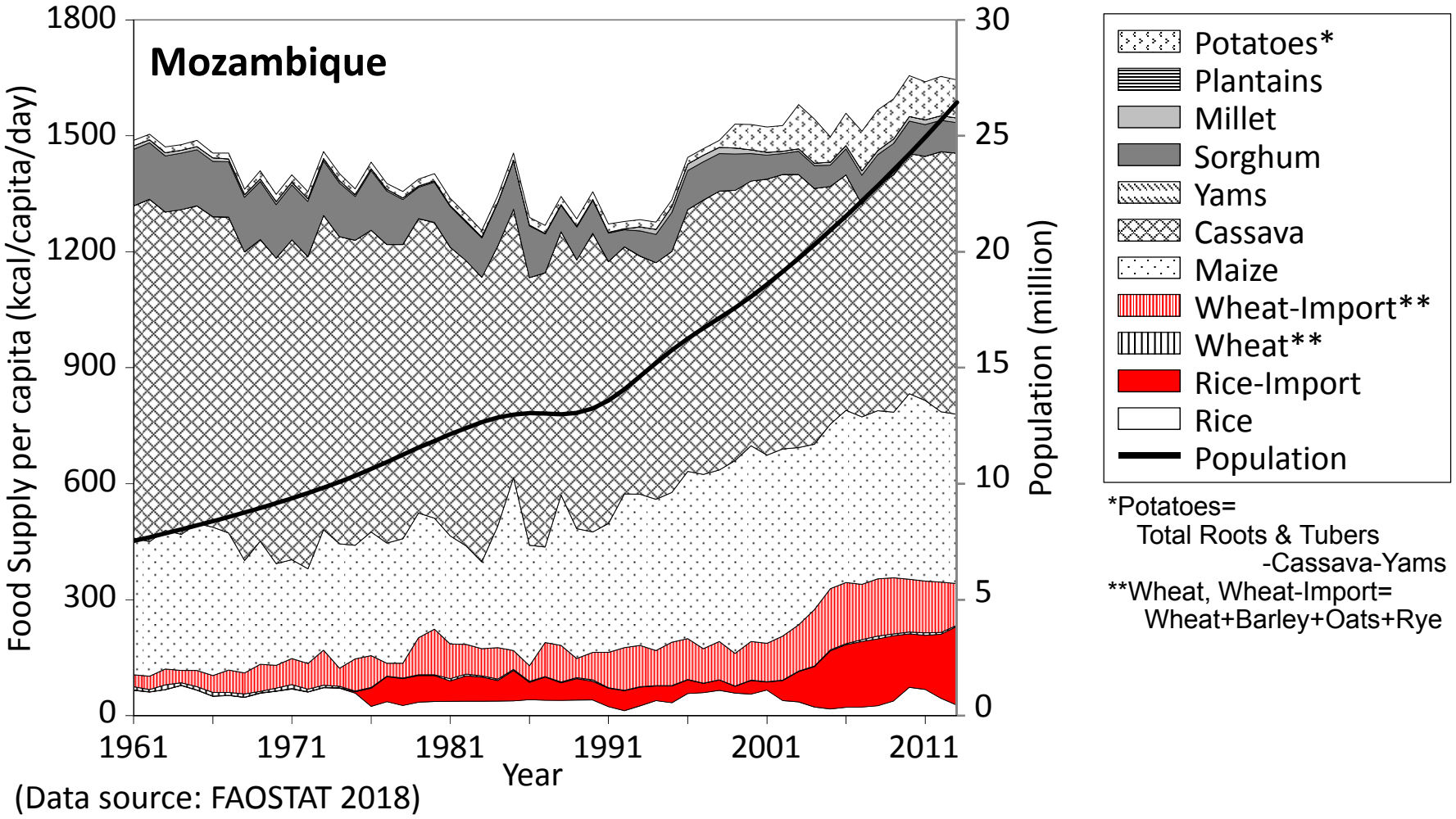
Wheat+Barley+Oats+Rye

(Data source: FAOSTAT 2018)

Fig. Various Food Production & Import (kg/person) in Mozambique (No.19 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.

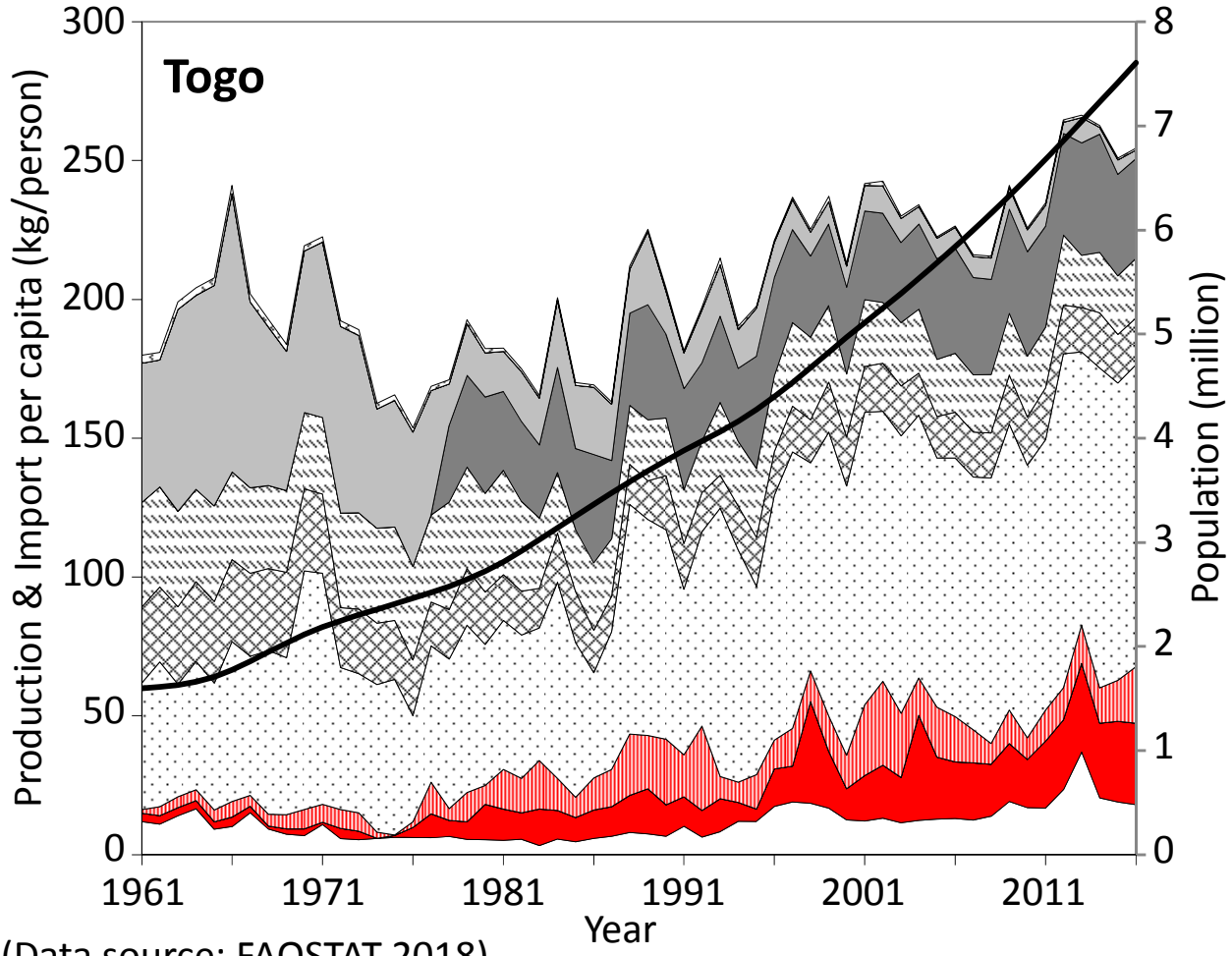
Rice production tend to stagnate or decline in the past 50years. The production of other foods are also stagnating at a low level to feed population increase. The import of rice and wheat are increasing rapidly in recent years.



(Data source: FAOSTAT 2018)

Fig. Various Food Supply (kcal/capita/day) in Mozambique (No.19 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.



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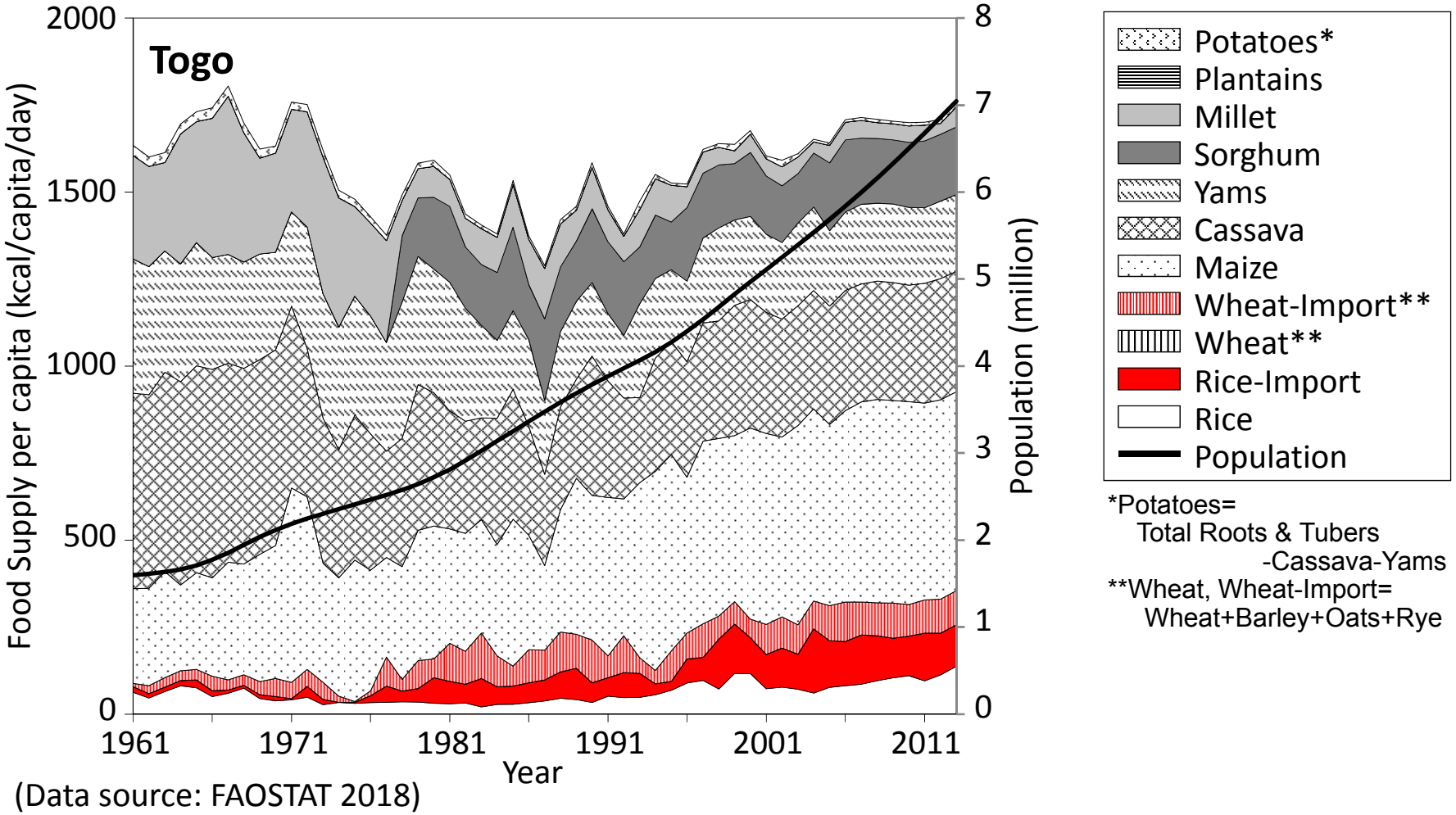
(Data source: FAOSTAT 2018)

Fig. Various Food Production & Import (kg/person) in Togo (No.20 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.

Maize production per population increased markedly. The import of rice and wheat also increased in the past 50 years. Rice production increased in 1960s-1970s when Taiwan supported rice cultivation, but stagnated afterwards. The rice production is getting increase in recent years.



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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.

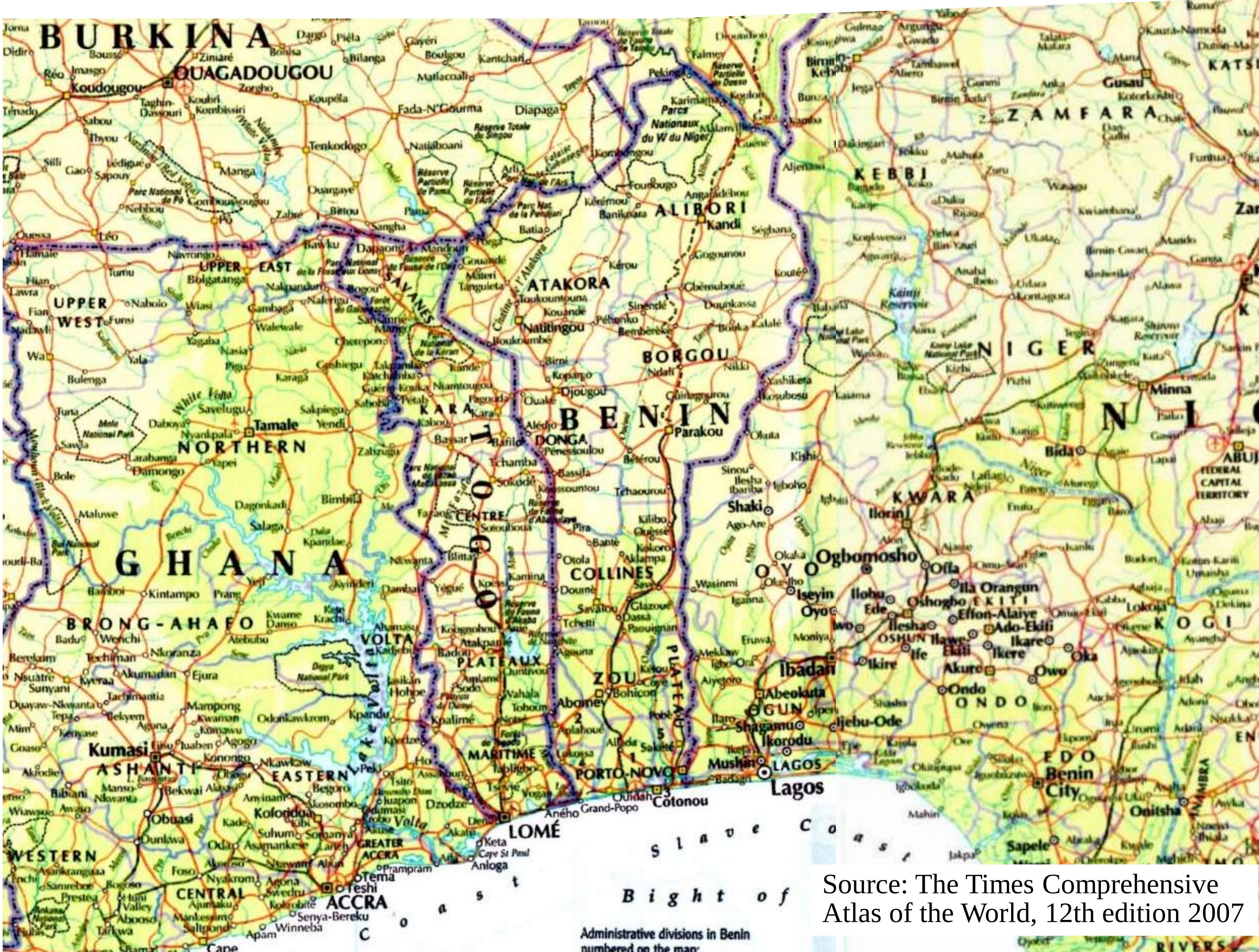
Table. Rice Value Trends in Mozambique (No.19 rice producing country in SSA during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

	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)	7.87	8.76	9.84	11.2	12.6	13.1	14.7	17.1	19.7	22.8	22.9	26.5	28.8
Area harvested (1,000 ha)	62.4	75.0	75.8	84.0	98.0	106	114	172	208	311	288	323	191
Index (%) of area harvested (100 for mean of 1971-1980)	78.1	93.9	94.9	105	123	133	143	215	261	389	360	405	239
Irrigated rice area harvested (1,000 ha)	2.38	4.37	6.51	10.9	16.0	26.5	15.6	5.34	4.13	5.02	5.02	5.02	
Index (%) of irrigated area (100 for mean of 1971-1980)	27.3	50.1	74.7	125	184	304	179	61.2	47.4	57.6	57.6	57.6	
Percent of Irrigated rice area harvested (%)	3.82	5.82	8.59	13.0	16.3	25.0	13.7	3.10	1.98	1.61	1.74	1.55	
Paddy production (1,000 ton)	93.6	85.9	110	62.0	82.0	93.5	73.8	175	107	88.2	145	174	115
Index (%) of paddy production (100 for mean of 1971-1980)	109	99.8	128	72.0	95.3	109	85.7	204	124	102	169	203	134
Production (1,000 ton, milled rice)	58.5	53.7	68.8	38.8	51.3	58.4	46.1	110	66.7	55.1	90.7	109	72.0
Paddy yield (ton/ha)	1.50	1.14	1.45	0.73	0.84	0.88	0.63	1.02	0.68	0.28	0.59	0.59	0.60
Index (%) of paddy yield (100 for mean of 1971-1980)	137	105	133	67.1	76.5	80.6	57.7	93.1	61.8	25.9	54.1	53.7	55.2
Yield (ton/ha, milled rice)	0.94	0.72	0.91	0.46	0.52	0.55	0.39	0.64	0.42	0.18	0.37	0.37	0.38
Imported quantity (1,000 ton, milled rice)	0.93	0.80	1.43	77.1	85.0	72.9	76.1	51.0	175	368	422	494	588
Self-Sufficiency ratio (%)	98.4	98.5	97.9	33.4	38.0	44.7	36.5	68.4	35.9	13.0	17.9	19.2	10.9
Imported rice price ($/ton, milled rice)	201	221	236	293	276	337	332	325	234	417	381	433	407
Consumption per capita (kg/person, milled rice)	7.55	6.21	7.14	10.3	10.8	10.0	8.29	9.35	12.1	18.5	22.5	22.7	22.9

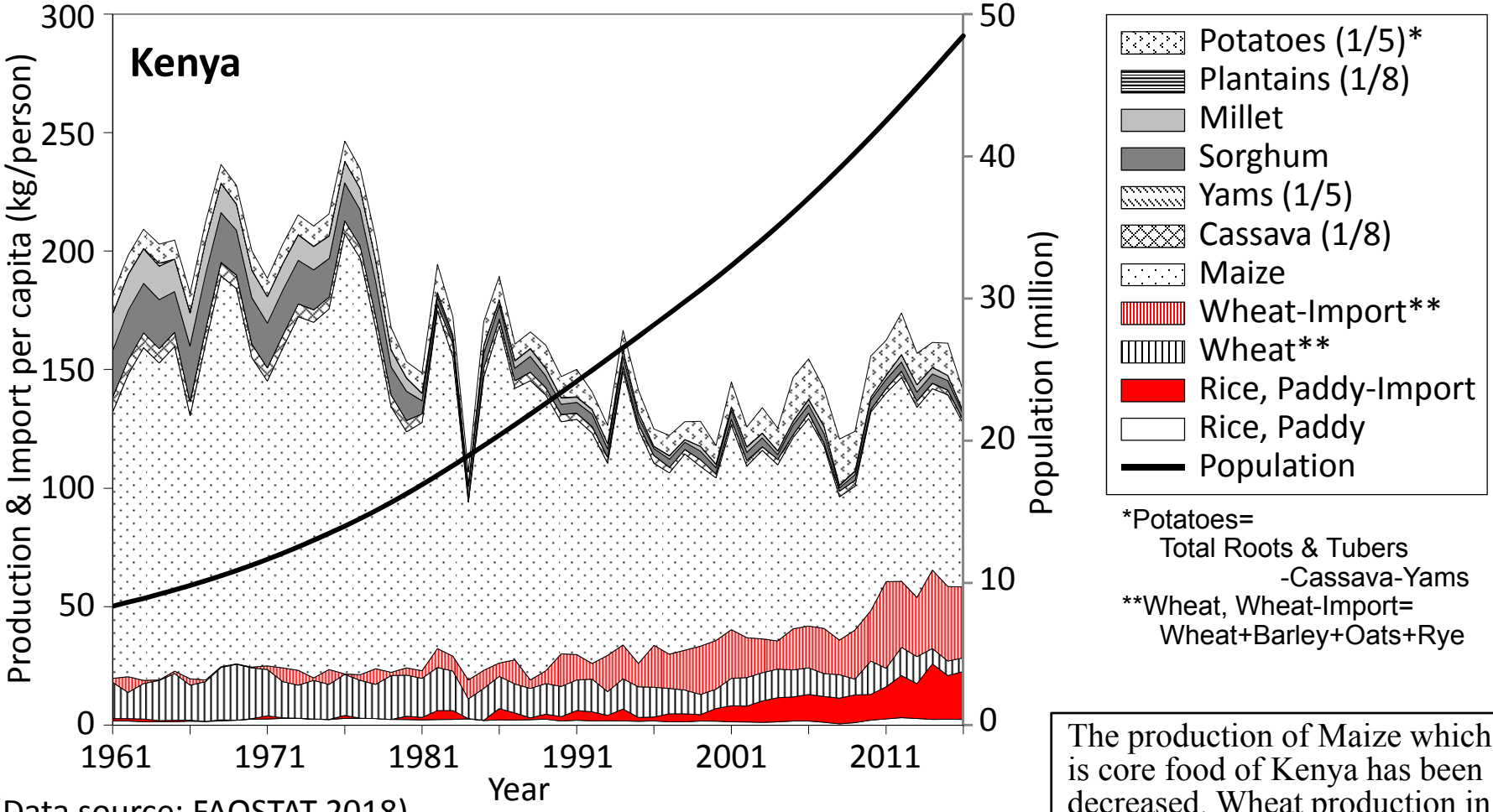
Table. Rice Value Trends in Togo (No.20 rice producing country in SSA during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

	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)	1.64	1.95	2.30	2.58	3.03	3.58	4.07	4.68	5.39	6.16	6.17	7.05	7.61
Area harvested (1,000 ha)	22.8	27.3	14.6	16.0	22.2	19.4	32.4	40.5	31.6	36.5	38.6	79.7	82.9
Index (%) of area harvested (100 for mean of 1971-1980)	150	179	95.4	105	145	127	212	265	207	239	253	522	543
Irrigated rice area harvested (1,000 ha)	0.38	0.38	0.38	0.38	1.59	0.78	0.60	2.72	5.25	7.78	7.78	7.78	
Index (%) of irrigated area (100 for mean of 1971-1980)	100	100	100	100	420	206	159	721	1390	2060	2060	2060	
Percent of Irrigated rice area harvested (%)	1.65	1.39	2.59	2.36	7.14	4.00	1.85	6.72	16.6	21.3	20.1	9.75	
Paddy production (1,000 ton)	20.6	18.7	15.6	15.4	14.8	24.9	40.0	78.6	66.9	85.5	93.6	164	137
Index (%) of paddy production (100 for mean of 1971-1980)	132	121	101	99.3	95.0	160	258	506	431	551	603	1059	883
Production (1,000 ton, milled rice)	12.9	11.7	9.78	9.64	9.22	15.6	25.0	49.1	41.8	53.5	58.5	103	85.7
Paddy yield (ton/ha)	0.94	0.69	1.16	0.99	0.68	1.30	1.36	2.02	2.12	2.34	2.42	2.10	1.65
Index (%) of paddy yield (100 for mean of 1971-1980)	87.8	63.6	108	92.4	62.8	121	126	188	197	218	225	195	154
Yield (ton/ha, milled rice)	0.59	0.43	0.72	0.62	0.42	0.81	0.85	1.27	1.32	1.47	1.51	1.31	1.03
Imported quantity (1,000 ton, milled rice)	3.02	2.63	2.36	12.0	20.0	27.8	21.9	55.6	76.0	71.9	75.3	121	139
Self-Sufficiency ratio (%)	80.5	81.2	81.4	47.0	31.8	36.2	53.3	49.4	37.2	42.7	43.3	45.2	38.1
Imported rice price ($/ton, milled rice)	139	162	224	261	326	283	223	137	83.6	130	157	153	132
Consumption per capita (kg/person, milled rice)	9.68	7.46	5.32	8.35	9.66	12.1	11.5	22.4	21.7	20.3	21.7	31.7	29.6

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



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

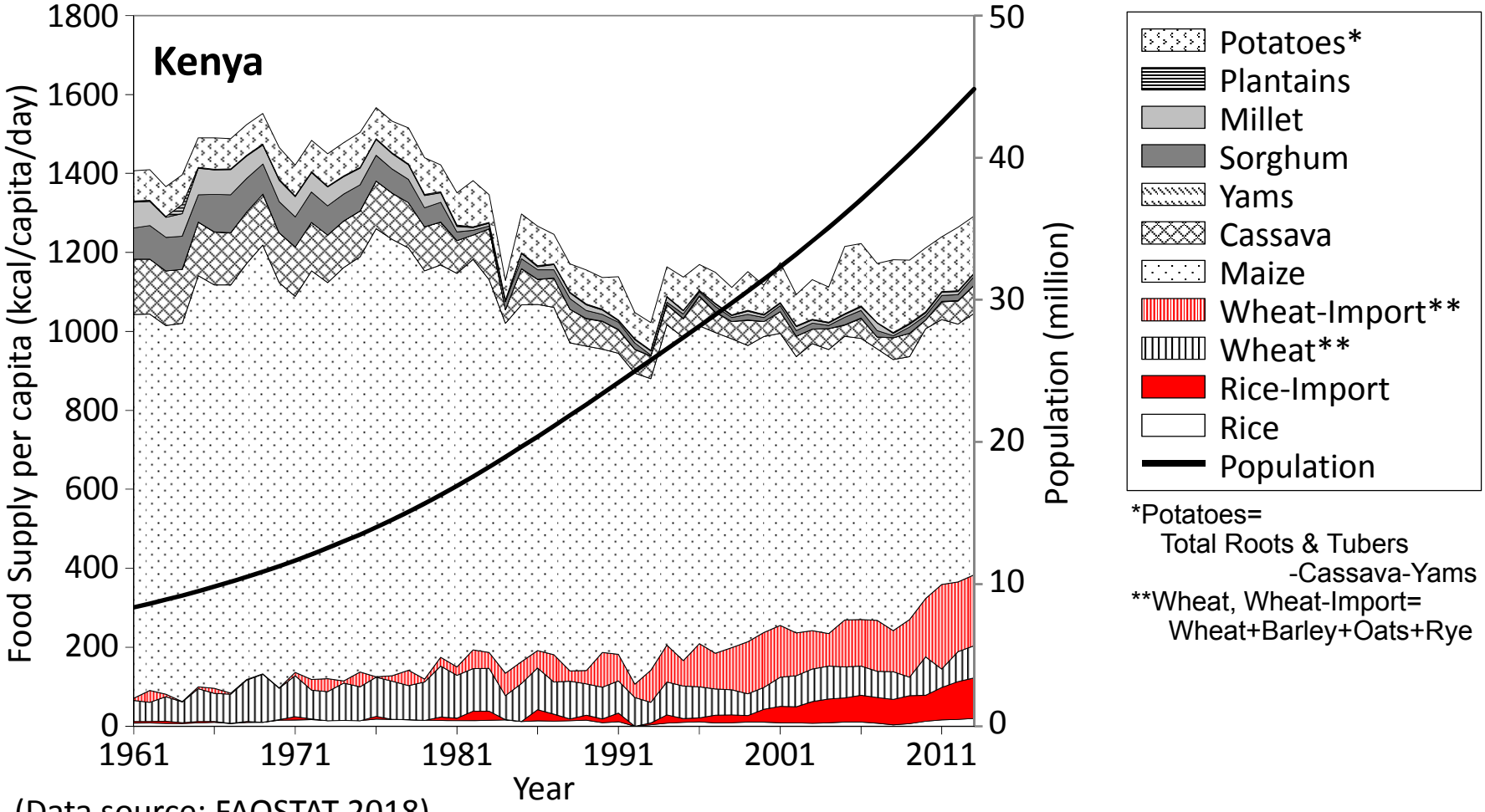


(Data source: FAOSTAT 2018)

Fig. Various Food Production & Import (kg/person) in Kenya (No.21 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.

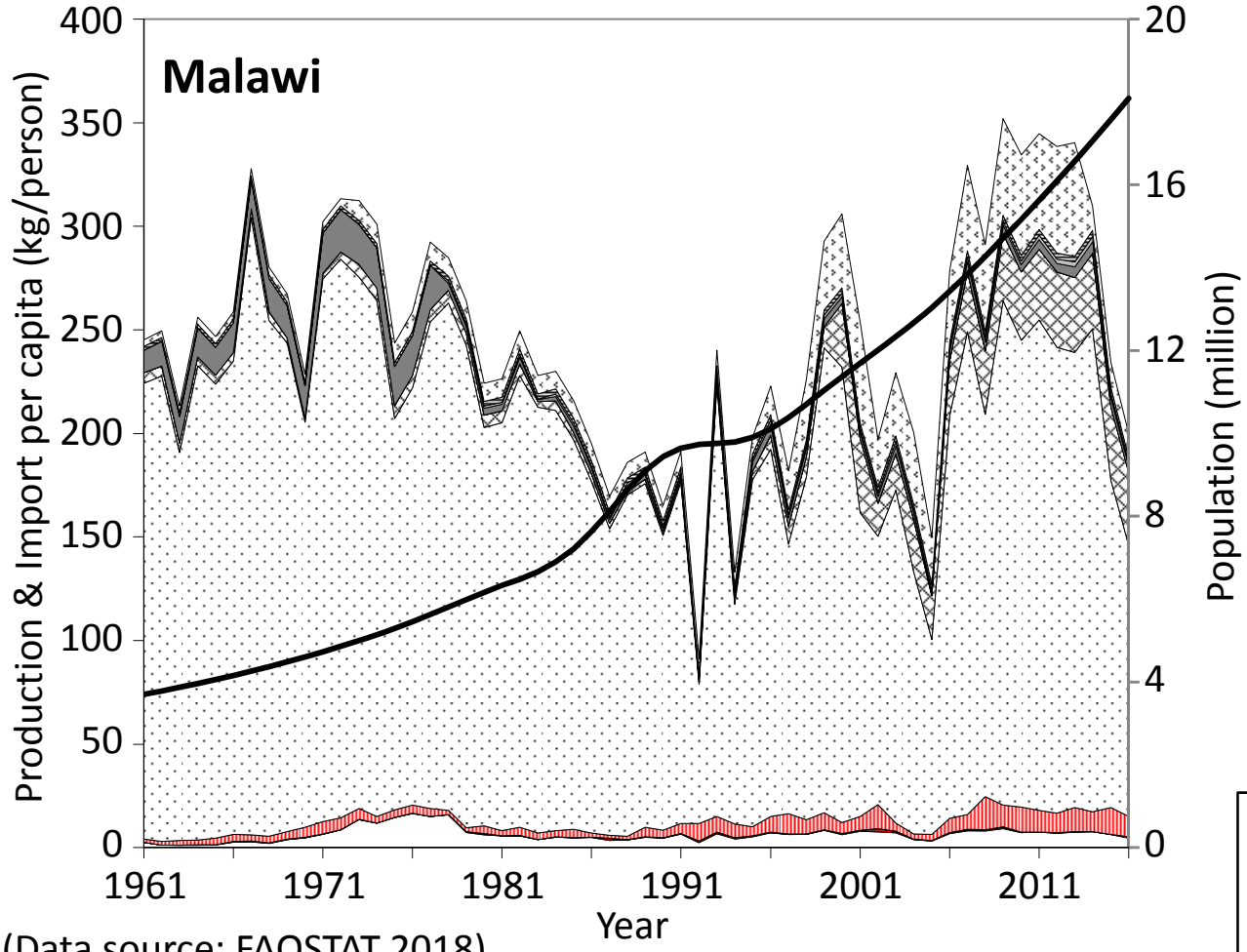
The production of Maize which is core food of Kenya has been decreased. Wheat production in highlands has been also decreased. These decreases were covered by Potatoes production and the increase of rice and wheat importation. All together, the agricultural productions are stagnating. Although Kenya attracts a lots of ODA, the effects are not so clear?



(Data source: FAOSTAT 2018)

Fig. Various Food Supply (kcal/capita/day) in in Kenya (No.21 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.



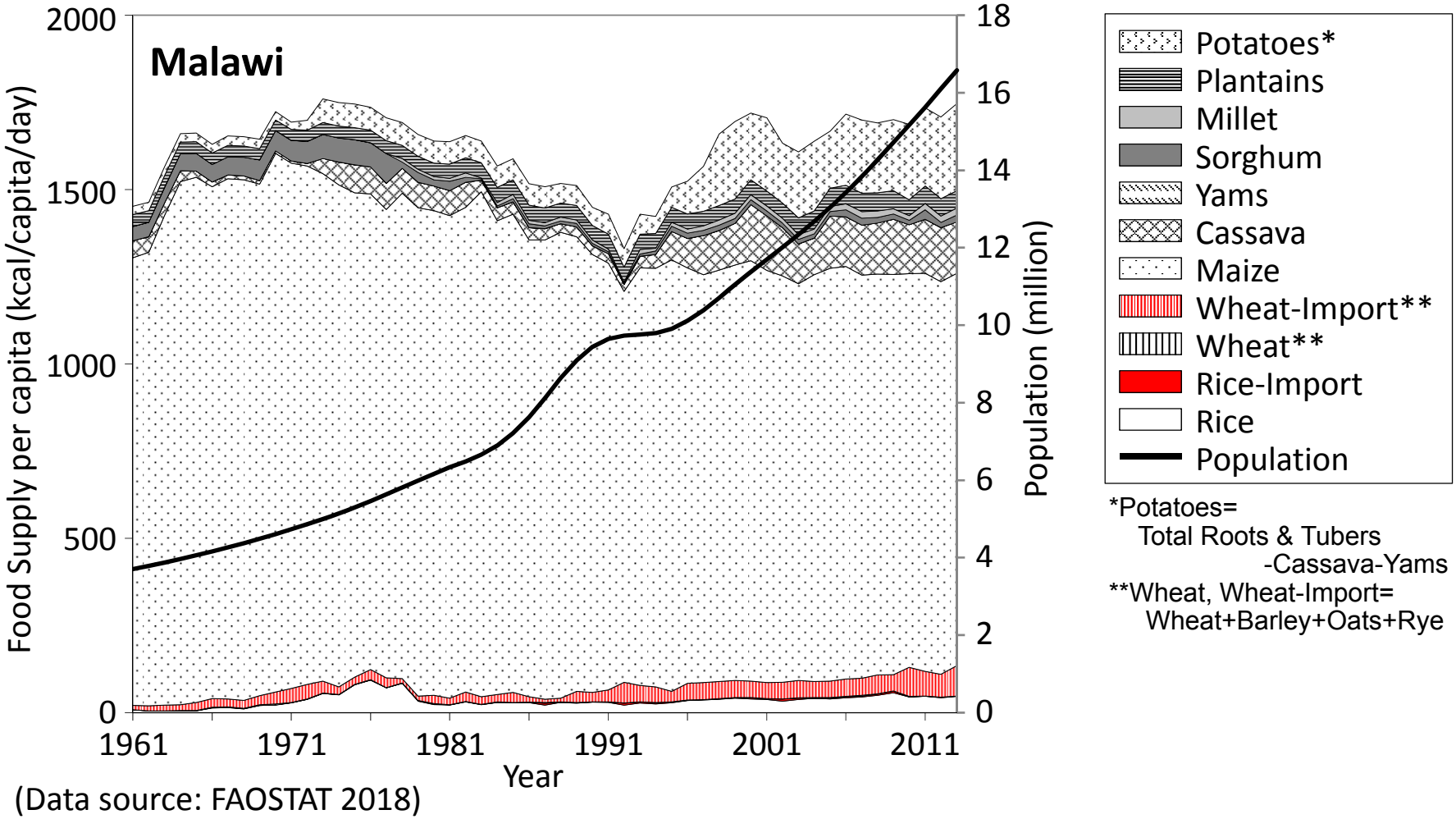
*Potatoes=
Total Roots & Tubers
-Cassava-Yams
**Wheat, Wheat-Import=
Wheat+Barley+Oats+Rye

(Data source: FAOSTAT 2018)

Fig. Various Food Production & Import (kg/person) in Malawi (No.22 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 staple food of maize production decreased sharply in around 1992 and around 2004 that were the time of the internal disturbance. The population increase also stopped at the time. The production of potatoes and cassava is increasing in recent years, but agricultural production is on the whole stagnating. Rice production increased in 1970s when Taiwan supported rice cultivation, but stagnated afterwards.



(Data source: FAOSTAT 2018)

Fig. Various Food Supply (kcal/capita/day) in Malawi (No.22 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.

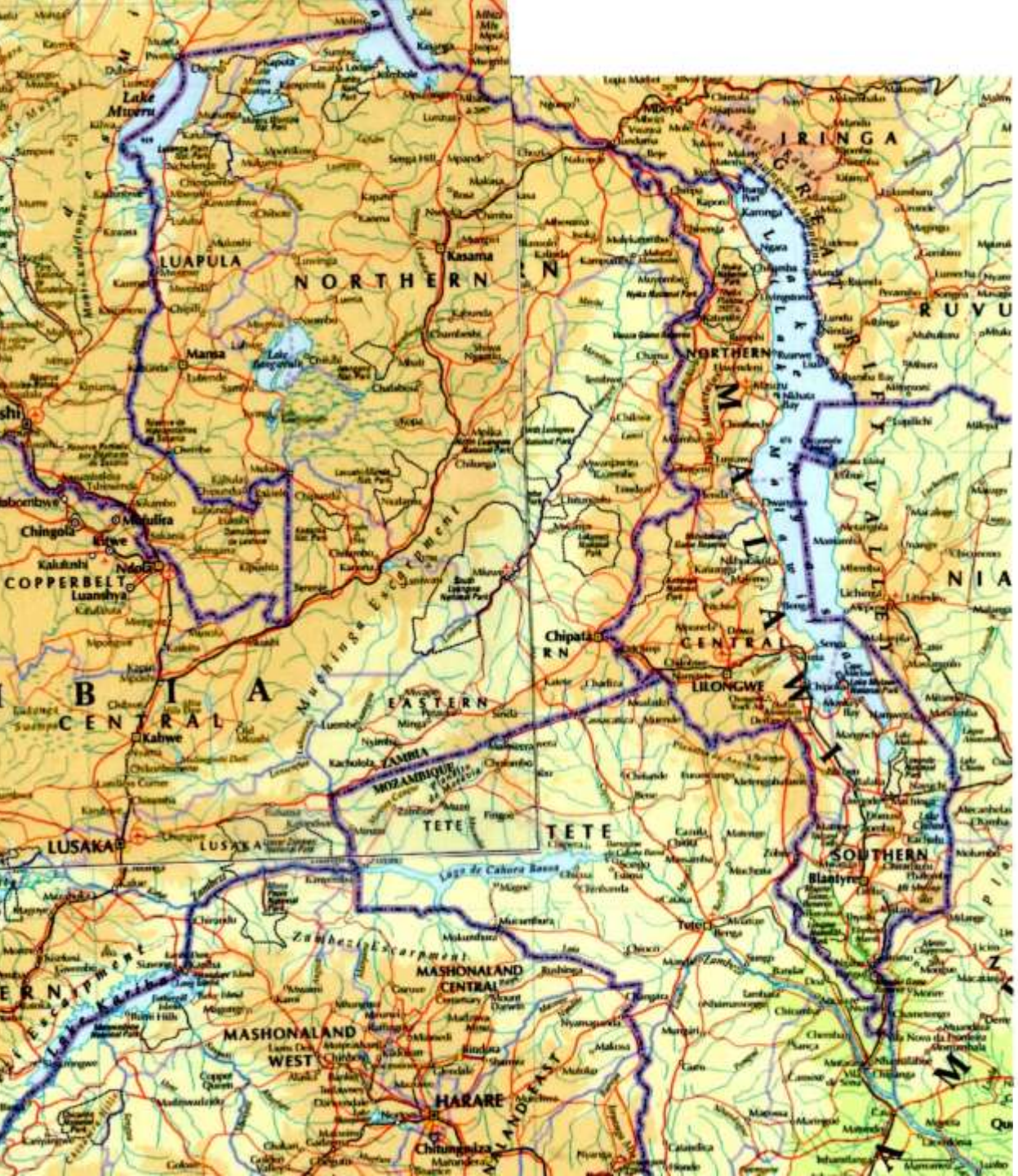
Table. Rice Value Trends in Kenya (No.21 rice producing country in SSA during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

	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)	8.92	10.5	12.6	15.1	18.3	21.9	25.8	29.8	34.2	39.1	39.2	44.8	48.5
Area harvested (1,000 ha)	5.07	3.97	6.70	7.93	11.6	14.1	11.7	11.7	13.2	16.7	19.7	29.4	29.3
Index (%) of area harvested (100 for mean of 1971-1980)	69.4	54.3	91.6	108	159	193	160	161	181	229	269	402	401
Irrigated rice area harvested (1,000 ha)	3.92	3.07	5.18	6.13	9.00	14.1	11.6	11.5	13.2	16.3	19.2	28.7	
Index (%) of irrigated area (100 for mean of 1971-1980)	69.4	54.3	91.6	108	159	249	205	203	234	289	339	507	
Percent of Irrigated rice area harvested (%)	77.4	77.4	77.4	77.4	77.4	100	98.8	97.7	100	97.7	97.7	97.7	
Paddy production (1,000 ton)	14.0	20.5	33.3	40.0	42.4	47.7	46.5	47.7	48.5	21.9	52.3	121	118
Index (%) of paddy production (100 for mean of 1971-1980)	38.2	55.9	90.8	109	116	130	127	130	132	59.7	143	329	322
Production (1,000 ton, milled rice)	8.75	12.8	20.8	25.0	26.5	29.8	29.1	29.8	30.3	13.7	32.7	75.4	73.8
Paddy yield (ton/ha)	3.10	5.29	4.97	5.17	3.71	3.38	3.99	4.11	3.66	1.31	2.63	4.11	4.03
Index (%) of paddy yield (100 for mean of 1971-1980)	61.0	104	98.0	102	73.1	66.7	78.6	81.1	72.1	25.8	51.9	81.0	79.4
Yield (ton/ha, milled rice)	1.93	3.30	3.11	3.23	2.32	2.11	2.49	2.57	2.29	0.82	1.64	2.57	2.52
Imported quantity (1,000 ton, milled rice)	4.72	1.50	2.42	4.77	19.5	33.3	53.8	62.3	184	265	272	495	610
Self-Sufficiency ratio (%)	65.4	89.5	91.4	86.9	68.2	50.4	37.2	34.7	14.5	4.91	10.6	13.7	10.8
Imported rice price ($/ton, milled rice)	194	202	352	381	300	278	293	313	214	329	305	472	425
Consumption per capita (kg/person, milled rice)	1.52	1.35	1.87	1.98	2.55	2.91	3.23	3.07	6.23	7.11	7.78	12.7	14.1

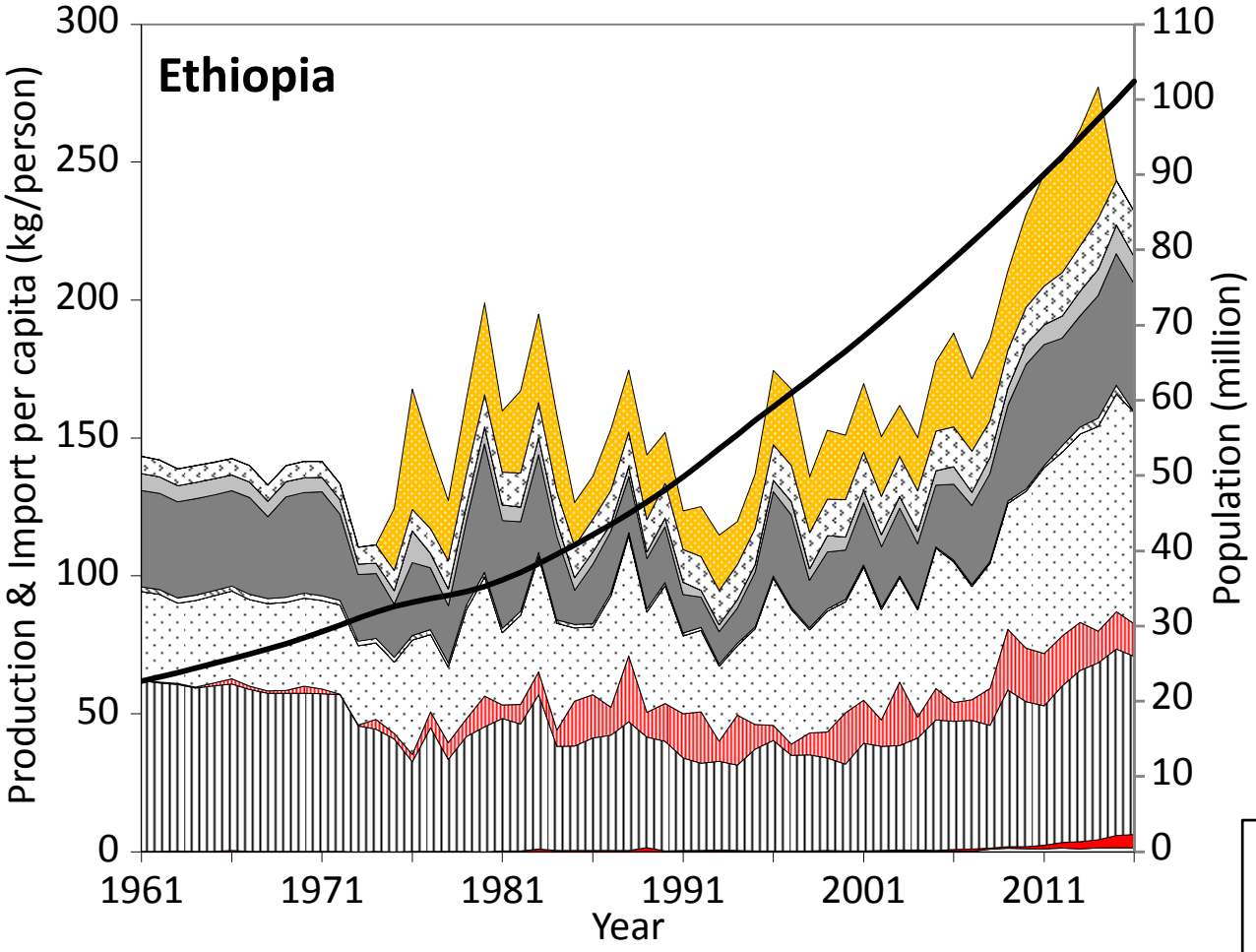
Table. Rice Value Trends in Malawi (No.22 rice producing country in SSA during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

	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)	3.88	4.38	5.00	5.81	6.72	8.58	9.77	10.7	12.4	14.3	14.3	16.6	18.1
Area harvested (1,000 ha)	6.88	15.7	39.2	44.8	21.7	23.8	30.1	42.5	50.4	63.1	59.3	64.0	53.7
Index (%) of area harvested (100 for mean of 1971-1980)	16.4	37.5	93.3	107	51.6	56.8	71.6	101	120	150	141	152	128
Irrigated rice area harvested (1,000 ha)	0.15	0.48	1.35	2.49	2.70	5.96	12.4	11.9	5.76	14.0	13.9	14.0	
Index (%) of irrigated area (100 for mean of 1971-1980)	7.81	25.0	70.3	130	141	310	644	621	300	727	726	727	
Percent of Irrigated rice area harvested (%)	2.18	3.05	3.44	5.56	12.5	25.0	41.1	28.0	11.4	22.1	23.5	21.8	
Paddy production (1,000 ton)	5.75	14.2	55.7	69.8	33.6	37.4	49.1	74.3	72.9	115	113	119	83.8
Index (%) of paddy production (100 for mean of 1971-1980)	9.17	22.7	88.8	111	53.6	59.6	78.3	118	116	183	180	190	133
Production (1,000 ton, milled rice)	3.60	8.88	34.8	43.6	21.0	23.4	30.7	46.4	45.5	71.8	70.7	74.7	52.3
Paddy yield (ton/ha)	0.88	0.89	1.41	1.55	1.55	1.57	1.60	1.74	1.43	1.82	1.90	1.87	1.56
Index (%) of paddy yield (100 for mean of 1971-1980)	59.6	60.3	95.3	105	105	106	108	118	96.6	123	129	126	106
Yield (ton/ha, milled rice)	0.55	0.56	0.88	0.97	0.97	0.98	1.00	1.09	0.89	1.14	1.19	1.17	0.98
Imported quantity (1,000 ton, milled rice)	0.11	0.39	0.05	0.73	0.12	1.26	3.24	1.37	4.10	5.31	4.06	1.03	7.89
Self-Sufficiency ratio (%)	96.8	95.2	99.8	97.4	99.4	94.6	89.0	97.1	93.1	93.1	94.7	98.6	86.9
Imported rice price ($/ton, milled rice)	125	217	627	680	777	1266	662	343	229	561	555	1019	796
Consumption per capita (kg/person, milled rice)	0.96	2.10	6.90	7.74	3.16	2.87	3.48	4.45	4.07	5.40	5.23	4.57	3.33

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



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



*Potatoes= Total Roots & Tubers -Cassava-Yams

**Wheat, Wheat-Import= Wheat+Barley+Oats+Rye

Fig. Various Food Production & Import (kg/person) in Ethiopia (No.23 rice producing country in SSA) during 1961-2016.

(Data source: FAOSTAT 2018 , The World Bank Group 2018 and Fujimoto 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 imperial rule was abolished by the revolution of 1974, and the revolutionary government collapsed in 1991. After that the internal disturbance such as Eritrean disputes continued until about 2005. Consequently, the agriculture stagnated. In late years it is recovering gradually. The cultivation of wheat, potato and maize at the mountainous area, and sorghum at the arid lowland are main food productions. In late years rice cultivation is started, and the production is increasing rapidly.

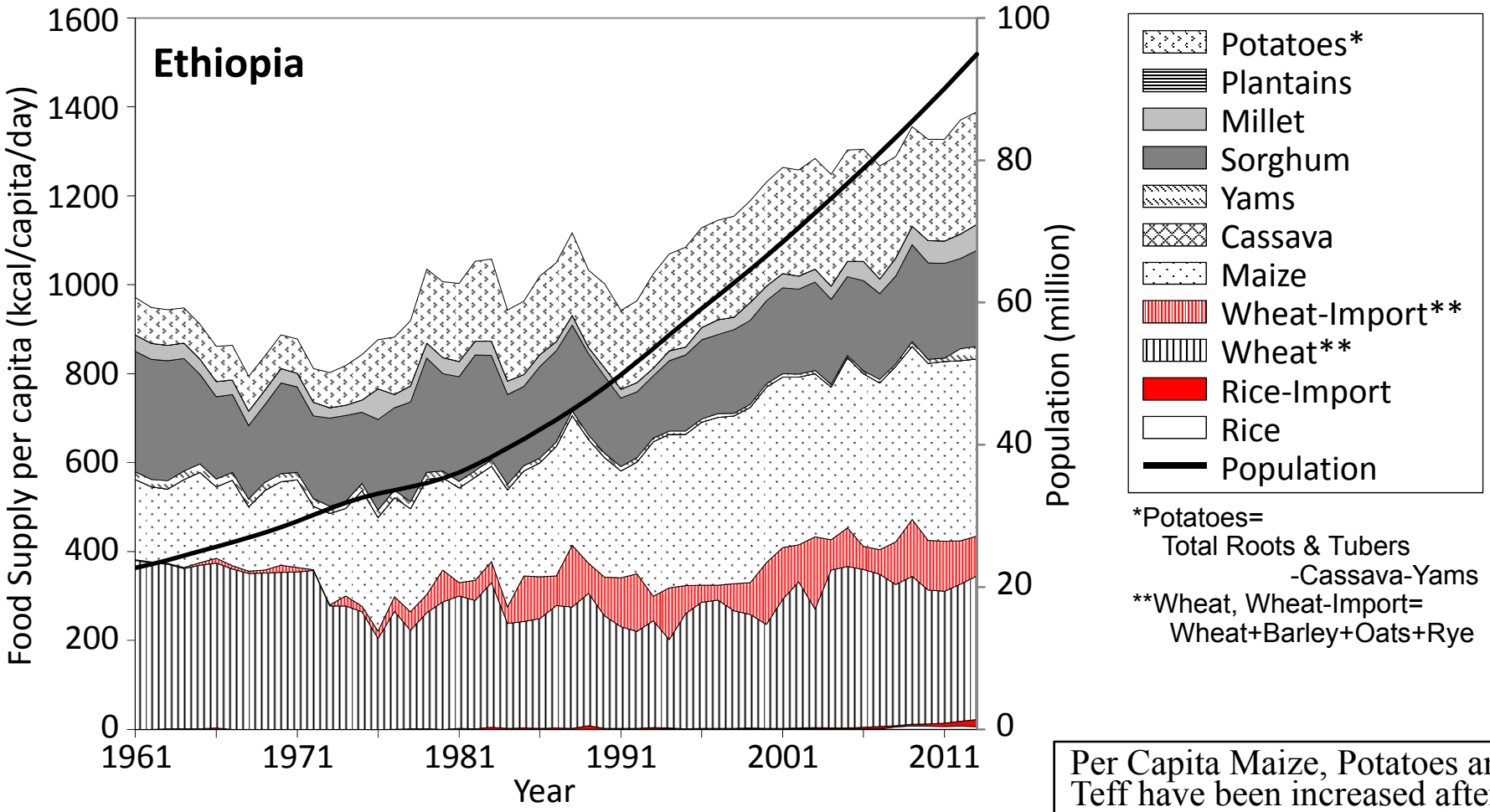
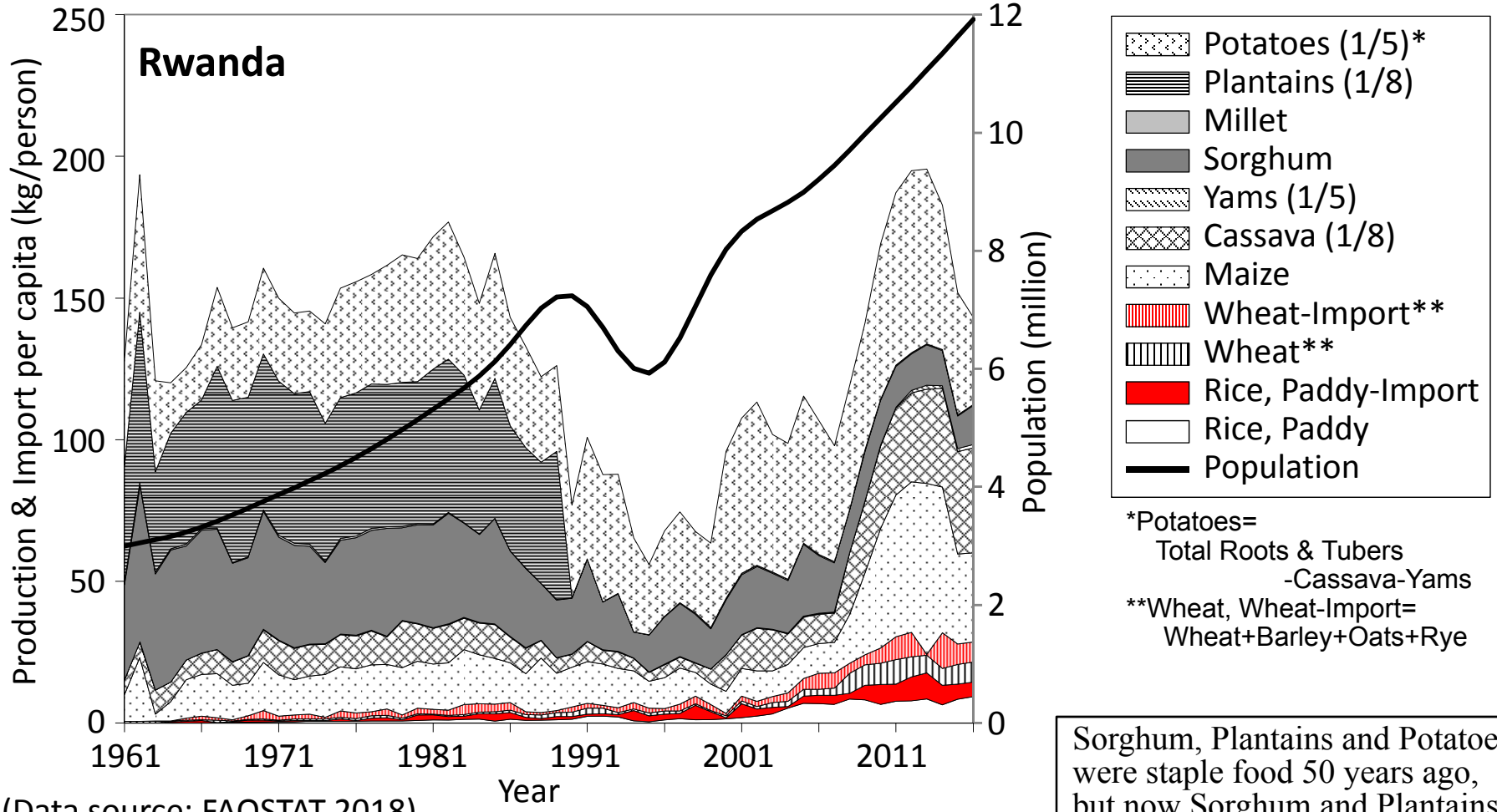


Fig. Various Food Supply (kcal/capita/day) in Ethiopia (No.23 rice producing country in SSA) during 1961-2013.

(Data source: FAOSTAT 2018 and The World Bank Group 2018)

Per Capita Maize, Potatoes and Teff have been increased after 1990s. As we see in Sawah Technology (statistics 1-1), National maize yield is now more than 3t/ha, No.1 in SSA.

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.



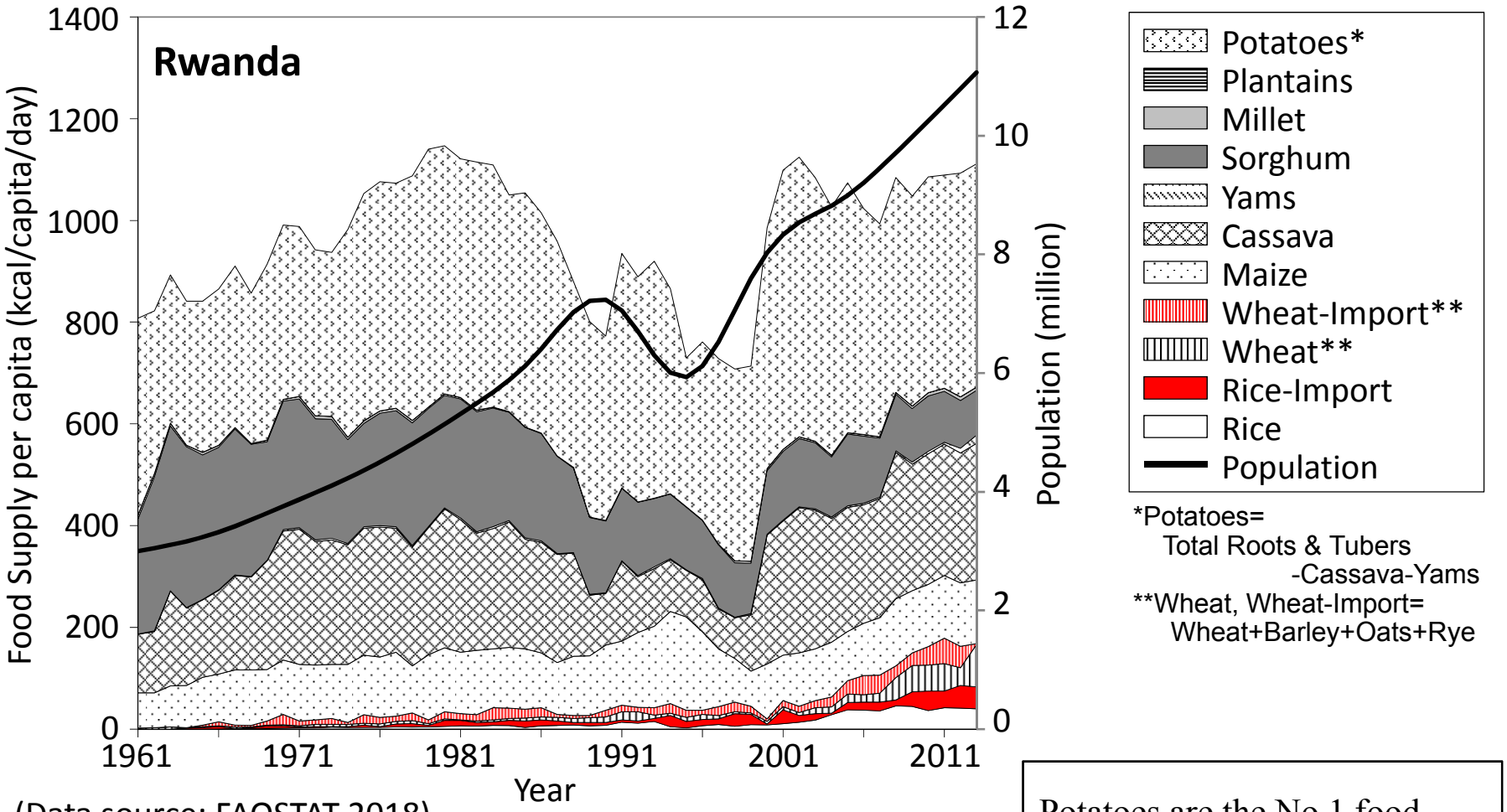
*Potatoes=
Total Roots & Tubers
-Cassava-Yams
**Wheat, Wheat-Import=
Wheat+Barley+Oats+Rye

(Data source: FAOSTAT 2018)

Fig. Various Food Production & Import (kg/person) in Rwanda (No.24 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.

Sorghum, Plantains and Potatoes were staple food 50 years ago, but now Sorghum and Plantains are decreasing and Potatoes and Maize are increasing. The agriculture stagnated from the late 1980s to about 2005. That period was before and after the crisis that 10-20% of the total population were slaughtered in 1994. The production and import of rice and wheat are increasing in late years.



(Data source: FAOSTAT 2018)

Potatoes are the No.1 food.

Fig. Various Food Supply (kcal/capita/day) in Rwanda (No.24 rice producing country in SSA) during 1961-2013.

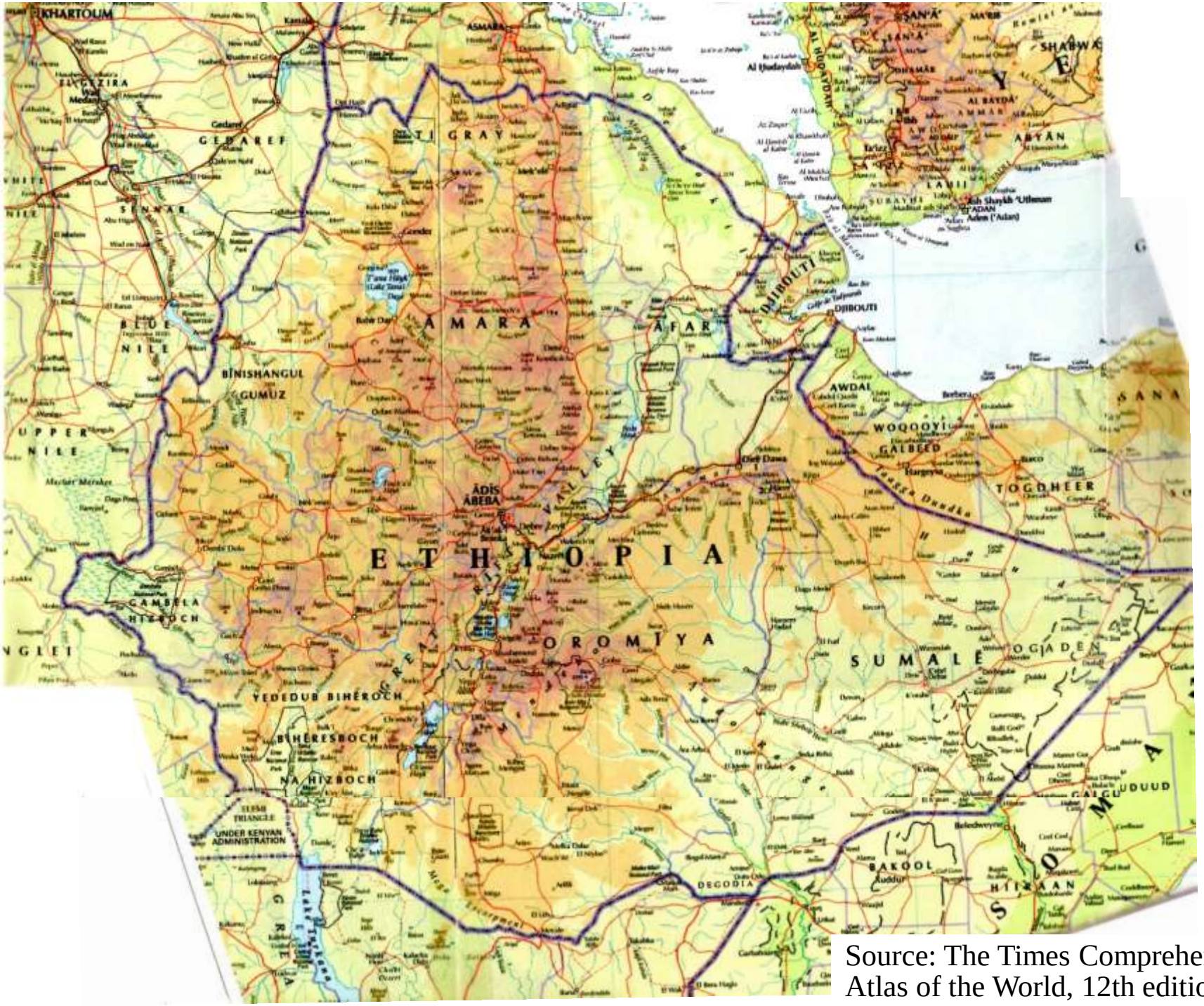
We used that the cereals' equivalent coefficients of 1/8 for Cassava and Plantains as well as 1/5 for Yam and Potatoes. These conversion factors can be tentatively verified if we compare figure on per capita production and importation amounts in kg and per capita consumption in kcal.

Table. Rice Value Trends in Ethiopia (No.23 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)	23.8	27.0	31.0	34.1	38.4	45.0	53.5	62.8	72.6	83.2	83.2	94.9	102
Area harvested (1,000 ha)	-	-	-	-	-	-	5.66	7.05	7.20	34.6	24.9	39.7	48.4
Index (%) of area harvested (100 for mean of 1991-2000)	-	-	-	-	-	-	89.1	111	113	545	393	625	762
Irrigated rice area harvested (1,000 ha)	-	-	-	-	-	-	1.63	3.39	3.46	16.6	12.0	19.1	
Index (%) of irrigated area (100 for mean of 1991-2000)	-	-	-	-	-	-	65.0	135	138	663	478	760	
Percent of Irrigated rice area harvested (%)	-	-	-	-	-	-	48.1	48.1	48.1	48.1	48.1	48.1	
Paddy production (1,000 ton)	-	-	-	-	-	-	10.5	13.0	13.4	71.4	57.5	115	136
Index (%) of paddy production (100 for mean of 1991-2000)	-	-	-	-	-	-	89	111	114	608	490	977	1158
Production (1,000 ton, milled rice)	-	-	-	-	-	-	6.54	8.14	8.38	44.6	35.9	71.7	85.0
Paddy yield (ton/ha)	-	-	-	-	-	-	1.85	1.85	1.86	2.06	2.17	2.88	2.81
Index (%) of paddy yield (100 for mean of 1991-2000)	-	-	-	-	-	-	100	100	101	112	117	156	152
Yield (ton/ha, milled rice)	-	-	-	-	-	-	1.15	1.15	1.16	1.29	1.36	1.80	1.76
Imported quantity (1,000 ton, milled rice)	1.60	2.36	0.57	1.68	11.3	17.0	9.82	4.51	14.0	22.3	34.3	162	310
Self-Sufficiency ratio (%)	0.00	0.00	0.00	0.00	0.00	0.00	31.0	66.4	40.8	66.7	44.6	33.0	21.5
Imported rice price ($/ton, milled rice)	177	234	477	571	614	362	397	374	319	544	482	650	650
Consumption per capita (kg/person, milled rice)	0.07	0.09	0.02	0.05	0.29	0.37	0.26	0.20	0.31	0.80	0.83	2.43	3.86

Table. Rice Value Trends in Rwanda (No.24 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)	3.11	3.53	4.11	4.81	5.70	6.92	6.40	7.06	8.67	9.71	9.72	11.1	11.9
Area harvested (1,000 ha)	-	0.40	0.81	1.25	2.19	3.94	4.17	3.71	9.04	18.5	15.0	20.2	33.4
Index (%) of area harvested (100 for mean of 1971-1980)	-	38.4	78.9	121	213	382	405	361	879	1793	1456	1960	3248
Irrigated rice area harvested (1,000 ha)	-	0.08	0.20	0.31	0.55	0.98	1.79	2.26	5.04	9.31	7.56	10.2	
Index (%) of irrigated area (100 for mean of 1971-1980)	-	30.7	78.9	121	213	382	696	880	1958	3618	2937	3954	
Percent of Irrigated rice area harvested (%)	-	25.0	25.0	25.0	25.0	25.0	43.0	61.0	55.7	50.4	50.4	50.4	
Paddy production (1,000 ton)	0.006	0.68	2.09	3.43	6.08	7.77	10.5	8.98	34.6	82.0	71.1	85.7	111
Index (%) of paddy production (100 for mean of 1971-1980)	0.22	24.5	75.7	124	221	282	381	326	1254	2973	2576	3107	4008
Production (1,000 ton, milled rice)	0.004	0.42	1.30	2.14	3.80	4.86	6.56	5.61	21.6	51.3	44.4	53.6	69.1
Paddy yield (ton/ha)	-	2.12	2.59	2.74	2.87	2.11	2.75	2.56	3.65	4.44	4.77	4.57	3.31
Index (%) of paddy yield (100 for mean of 1971-1980)	-	79.6	97.3	103	108	79.1	103	96.0	137	167	179	172	124
Yield (ton/ha, milled rice)	-	1.33	1.62	1.71	1.79	1.32	1.72	1.60	2.28	2.78	2.98	2.86	2.07
Imported quantity (1,000 ton, milled rice)	0.37	1.16	1.11	2.99	6.30	5.36	6.37	10.5	13.6	12.7	25.0	49.5	38.5
Self-Sufficiency ratio (%)	0.39	27.5	56.3	47.2	38.9	49.4	50.3	41.7	60.1	80.1	65.5	52.3	64.2
Imported rice price ($/ton, milled rice)	201	216	321	556	620	507	428	408	325	395	380	443	500
Consumption per capita (kg/person, milled rice)	0.12	0.44	0.58	1.05	1.77	1.49	2.02	2.30	4.04	6.59	7.10	9.32	9.03



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

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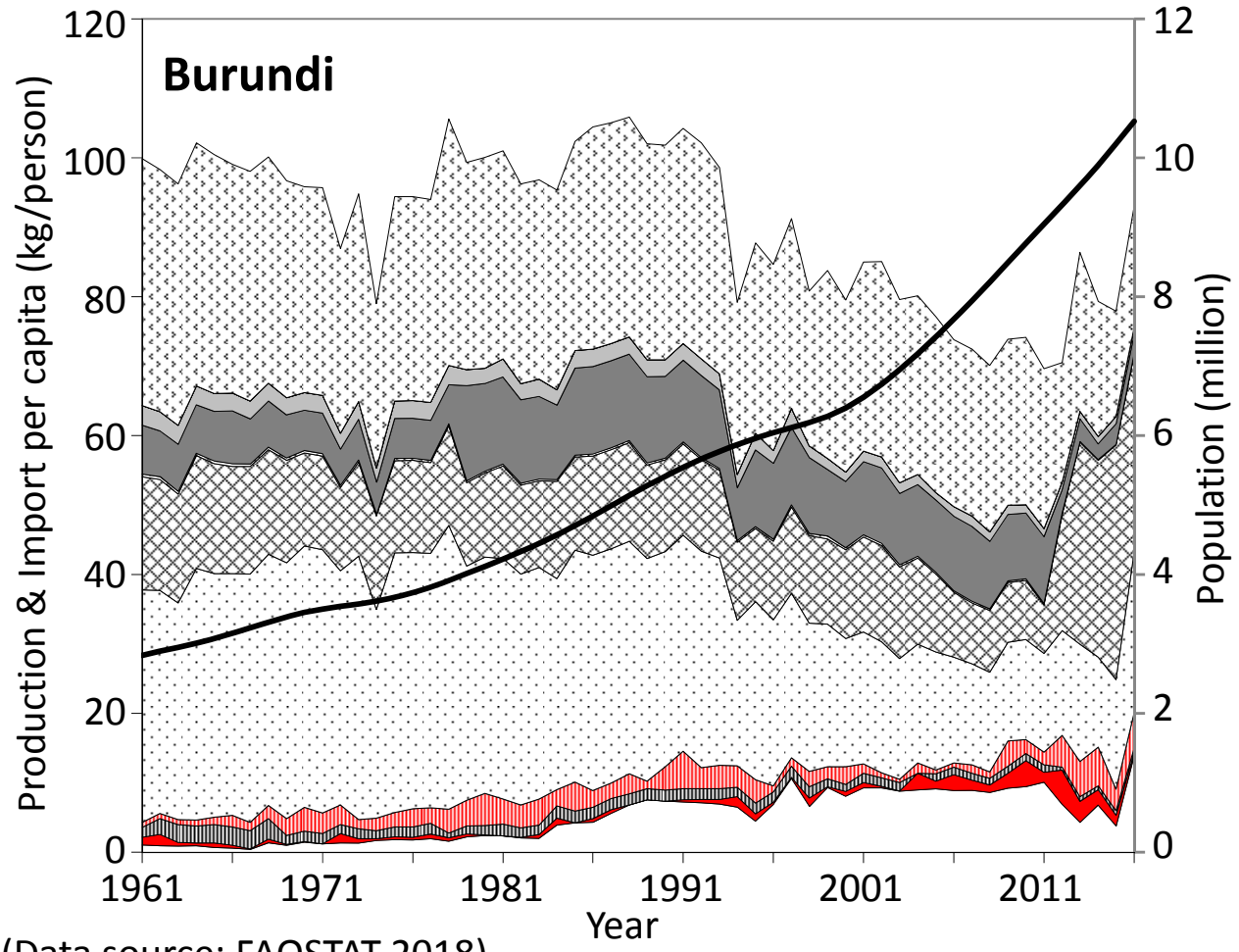


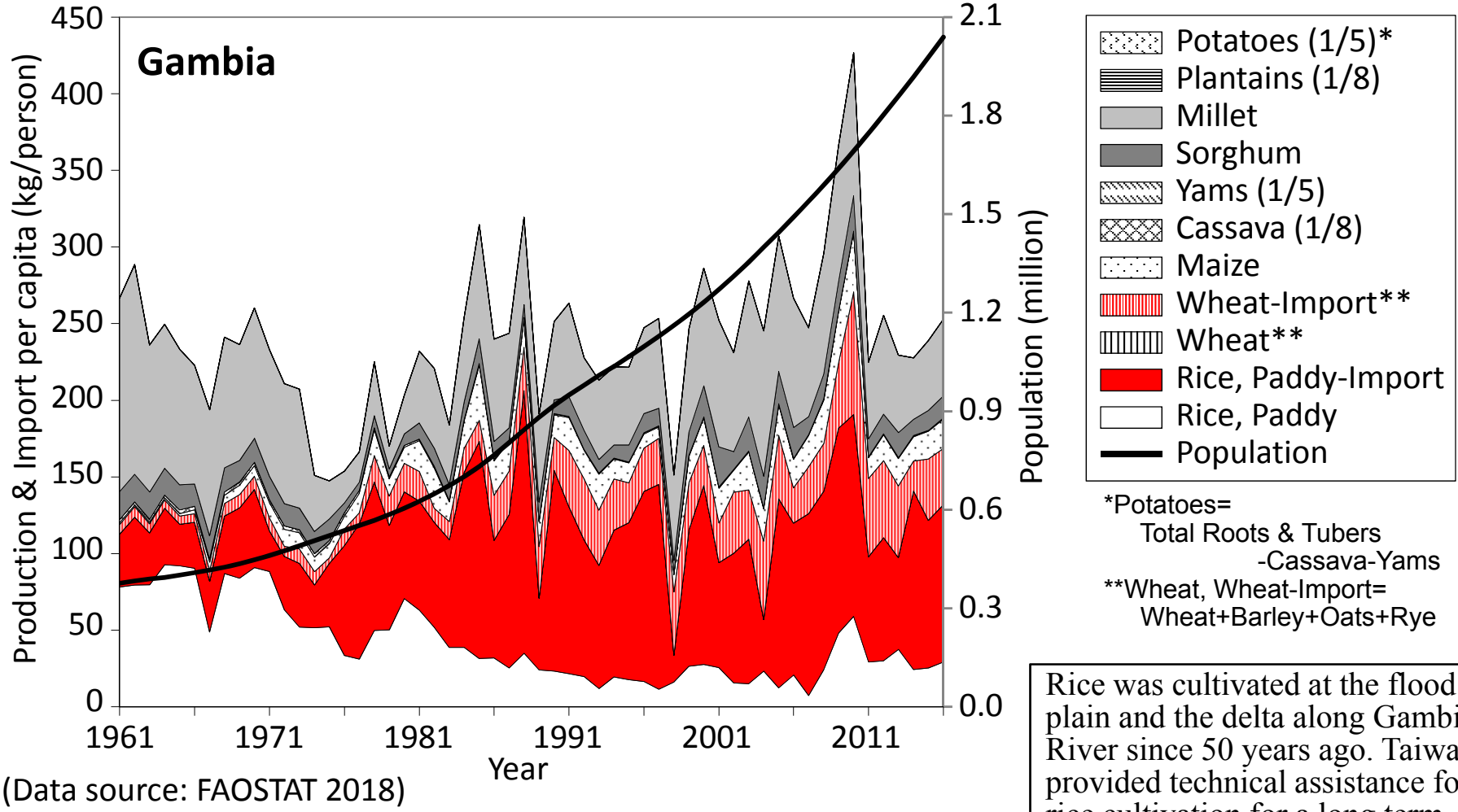
*Potatoes=
Total Roots & Tubers
-Cassava-Yams
**Wheat, Wheat-Import=
Wheat+Barley+Oats+Rye

(Data source: FAOSTAT 2018)

Fig. Various Food Production & Import (kg/person) in Burundi (No.26 rice producing country in SSA) during 1961-2016.

Potatoes and Maize were staple food 50 years ago, but today, Maize is decreasing and Rice is increasing. The agriculture stagnated until around 2010 due to the Rwanda crisis in 1994.

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.



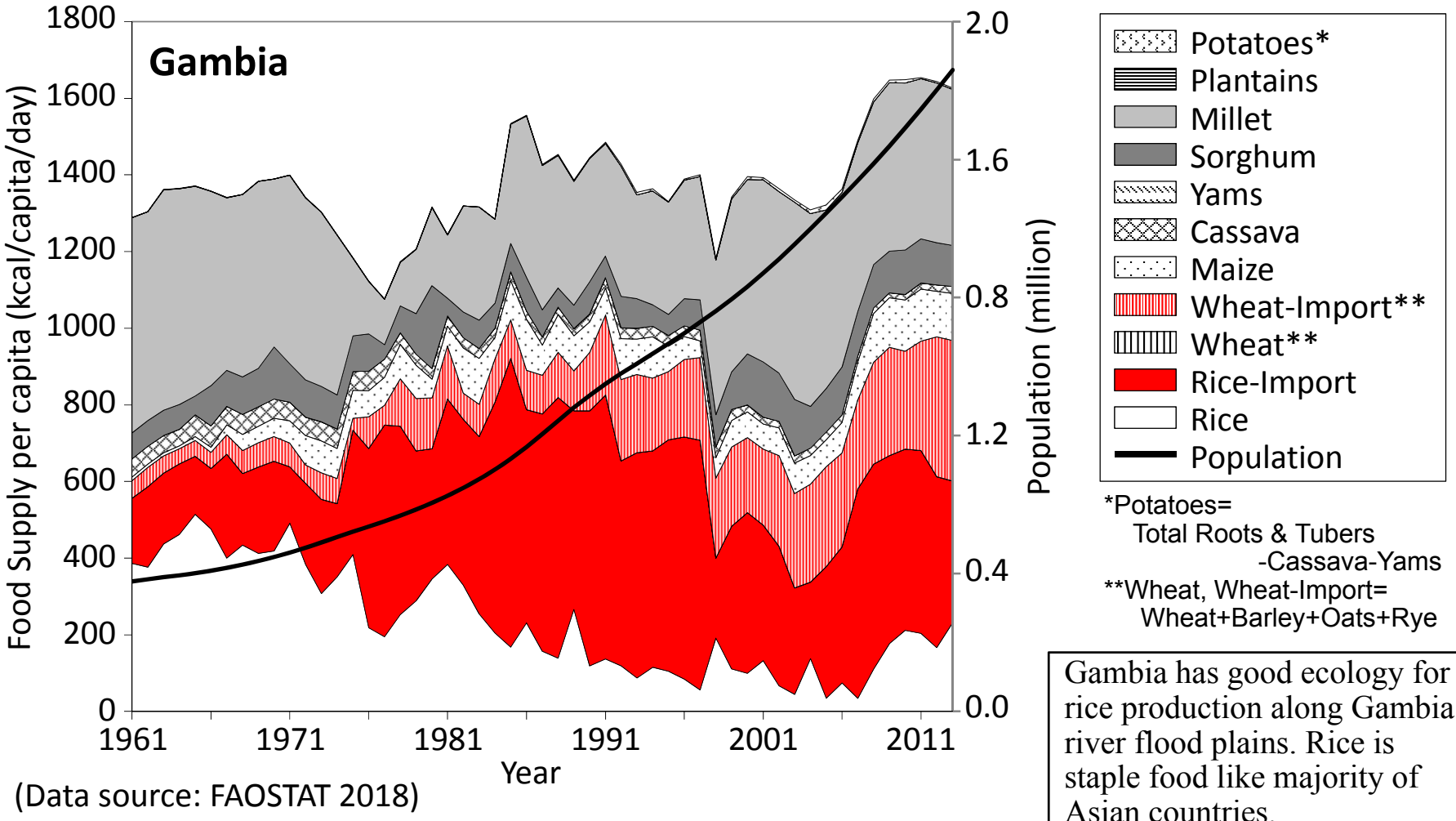
*Potatoes=
Total Roots & Tubers
-Cassava-Yams
**Wheat, Wheat-Import=
Wheat+Barley+Oats+Rye

(Data source: FAOSTAT 2018)

Fig. Various Food Production & Import (kg/person) in Gambia (No.27 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 was cultivated at the flood plain and the delta along Gambia River since 50 years ago. Taiwan provided technical assistance for rice cultivation for a long term from the 1960s. However, the rice production stagnated by the collapse of Senegambia confederation formed of former French Senegal and former British Gambia (1989) and the political unrest. Because Gambia is in a agricultural crisis, rice import is increasing rapidly.



(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 Gambia (No.27 rice producing country in SSA) during 1961-2013.

Gambia has good ecology for rice production along Gambia river flood plains. Rice is staple food like majority of Asian countries. Nevertheless, per capita importation has been huge and expanding immediately after the independence.

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.

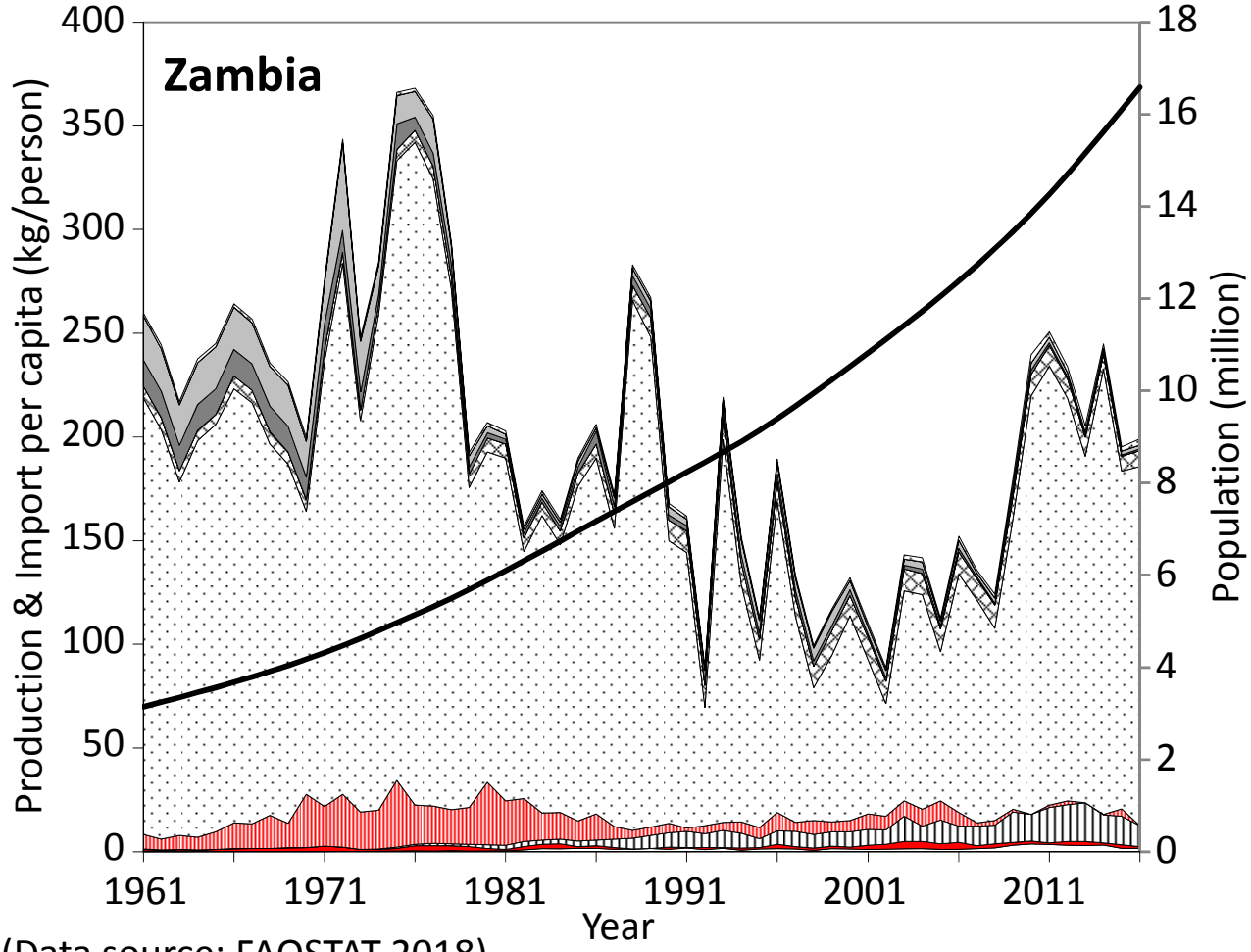
Table. Rice Value Trends in Burundi (No.26 rice producing country in SSA during 2011-2015) during 1961-2016. Data source: FAOSTAT 2018; Conversion ratio: Paddy x 0.625 = Milled rice amount; All data are mean of five years except for 2008 and 2016 as well as missing annual data.

	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)	2.95	3.31	3.58	3.92	4.46	5.13	5.76	6.20	6.97	8.21	8.22	9.61	10.5
Area harvested (1,000 ha)	1.02	2.03	2.80	3.72	4.51	10.6	12.2	16.7	19.4	22.0	23.4	28.9	63.8
Index (%) of area harvested (100 for mean of 1971-1980)	31.3	62.4	86.0	114	138	324	375	513	596	675	717	886	1955
Irrigated rice area harvested (1,000 ha)	0.26	0.51	0.70	0.93	1.13	2.64	4.01	6.81	10.5	14.8	15.7	19.4	
Index (%) of irrigated area (100 for mean of 1971-1980)	31.3	62.4	86.0	114	138	324	492	835	1287	1816	1930	2384	
Percent of Irrigated rice area harvested (%)	25.0	25.0	25.0	25.0	25.0	25.0	32.8	40.7	54.0	67.3	67.3	67.3	
Paddy production (1,000 ton)	2.70	3.29	5.36	7.90	13.2	32.8	37.2	51.6	63.5	70.8	74.3	60.7	147
Index (%) of paddy production (100 for mean of 1971-1980)	40.7	49.7	80.8	119	199	495	561	779	957	1069	1121	916	2212
Production (1,000 ton, milled rice)	1.69	2.06	3.35	4.94	8.25	20.5	23.2	32.3	39.7	44.3	46.4	37.9	91.6
Paddy yield (ton/ha)	2.71	1.64	1.92	2.18	2.91	3.12	3.03	3.07	3.26	3.22	3.20	2.13	2.30
Index (%) of paddy yield (100 for mean of 1971-1980)	132	80.1	93.8	106	142	152	147	149	159	157	156	104	112
Yield (ton/ha, milled rice)	1.69	1.03	1.20	1.36	1.82	1.95	1.89	1.92	2.04	2.01	2.00	1.33	1.44
Imported quantity (1,000 ton, milled rice)	1.59	0.53	1.20	0.99	0.92	0.65	2.97	1.95	4.04	5.50	11.2	15.7	2.78
Self-Sufficiency ratio (%)	54.3	79.7	76.9	82.9	90.9	96.1	88.5	93.9	91.5	89.0	81.4	70.3	97.1
Imported rice price ($/ton, milled rice)	136	177	314	687	650	856	325	499	659	393	525	709	462
Consumption per capita (kg/person, milled rice)	1.12	0.78	1.27	1.51	2.04	4.10	4.56	5.51	6.26	6.06	6.99	5.64	8.97

Table. Rice Value Trends in Gambia (No.27 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)	0.39	0.43	0.49	0.57	0.68	0.84	1.01	1.16	1.36	1.59	1.59	1.86	2.04
Area harvested (1,000 ha)	25.7	25.8	22.9	21.3	18.5	15.8	12.3	14.7	13.9	34.0	45.6	60.7	80.3
Index (%) of area harvested (100 for mean of 1971-1980)	116	117	104	96.4	83.6	71.4	55.6	66.6	62.8	154	206	274	363
Irrigated rice area harvested (1,000 ha)	0.88	0.88	0.88	0.88	0.88	1.11	0.87	1.32	1.32	12.1	16.0	24.3	
Index (%) of irrigated area (100 for mean of 1971-1980)	100	100	100	100	100	126	99.1	150	150	1377	1818	2755	
Percent of Irrigated rice area harvested (%)	3.43	3.41	3.84	4.13	4.76	7.00	7.10	8.98	9.53	35.7	35.1	40.0	
Paddy production (1,000 ton)	32.9	34.3	29.9	27.1	29.9	23.4	18.2	23.2	24.8	38.3	51.9	54.4	59.6
Index (%) of paddy production (100 for mean of 1971-1980)	115	120	105	95.1	105	82.1	64.0	81.2	87.1	134	182	191	209
Production (1,000 ton, milled rice)	20.5	21.4	18.7	17.0	18.7	14.6	11.4	14.5	15.5	23.9	32.5	34.0	37.3
Paddy yield (ton/ha)	1.28	1.31	1.30	1.30	1.78	1.48	1.50	1.56	1.84	1.13	1.15	0.92	0.74
Index (%) of paddy yield (100 for mean of 1971-1980)	98.4	101	100	100	137	114	115	121	141	86.8	88.5	70.8	57.2
Yield (ton/ha, milled rice)	0.80	0.82	0.81	0.81	1.11	0.93	0.94	0.98	1.15	0.70	0.72	0.57	0.46
Imported quantity (1,000 ton, milled rice)	8.56	10.6	10.6	28.0	40.0	55.6	60.0	69.7	68.8	116	120	98.8	131
Self-Sufficiency ratio (%)	70.5	66.7	63.5	36.9	33.9	23.1	15.9	21.9	21.4	17.1	19.6	26.7	22.2
Imported rice price ($/ton, milled rice)	124	123	199	204	217	207	308	246	198	243	254	422	273
Consumption per capita (kg/person, milled rice)	74.8	74.8	60.0	78.8	86.2	83.2	70.9	72.4	62.0	87.9	94.9	71.0	82.4

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



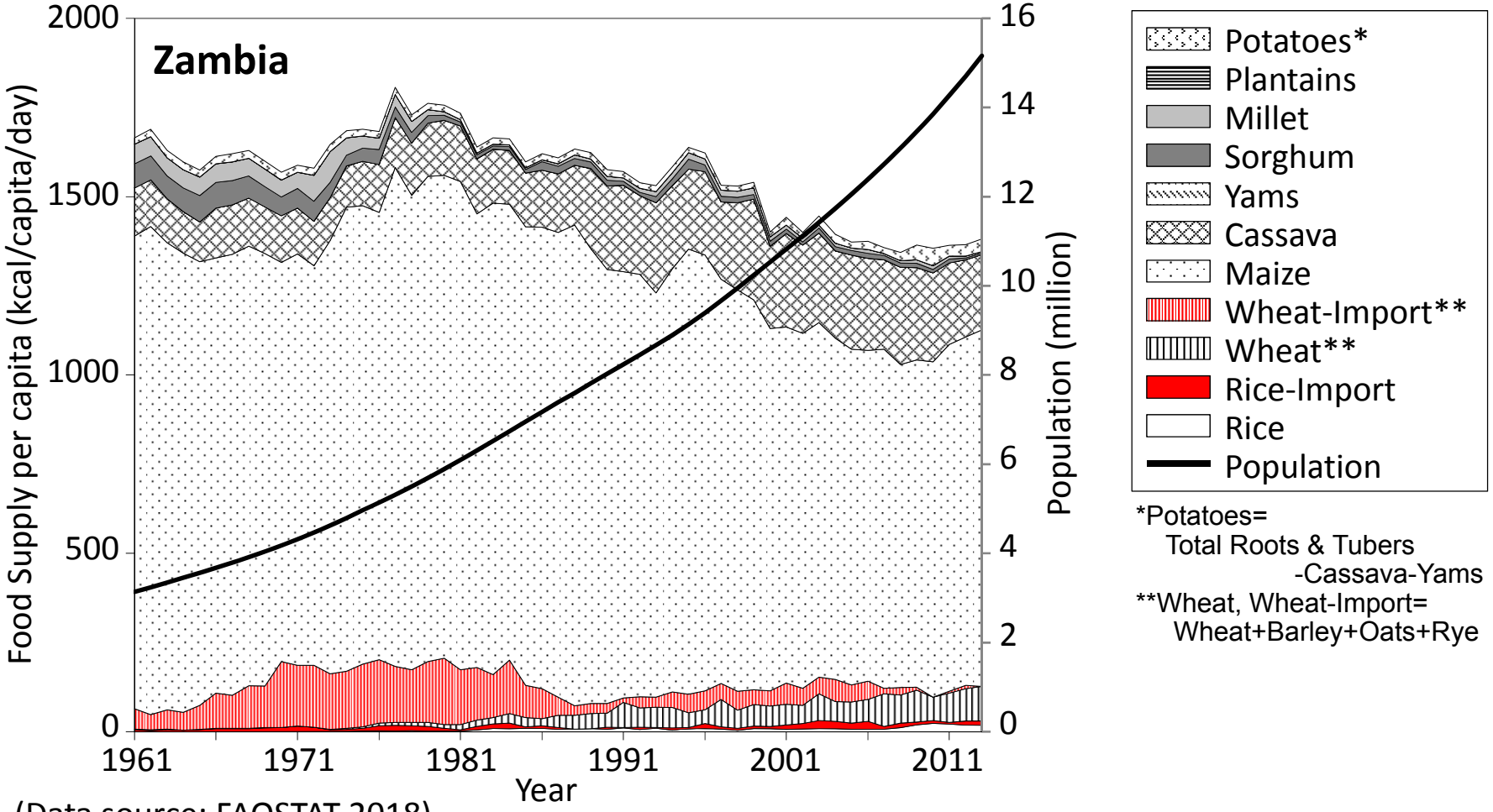
*Potatoes=
Total Roots & Tubers
-Cassava-Yams
**Wheat, Wheat-Import=
Wheat+Barley+Oats+Rye

(Data source: FAOSTAT 2018)

Fig. Various Food Production & Import (kg/person) in Zambia (No.28 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.

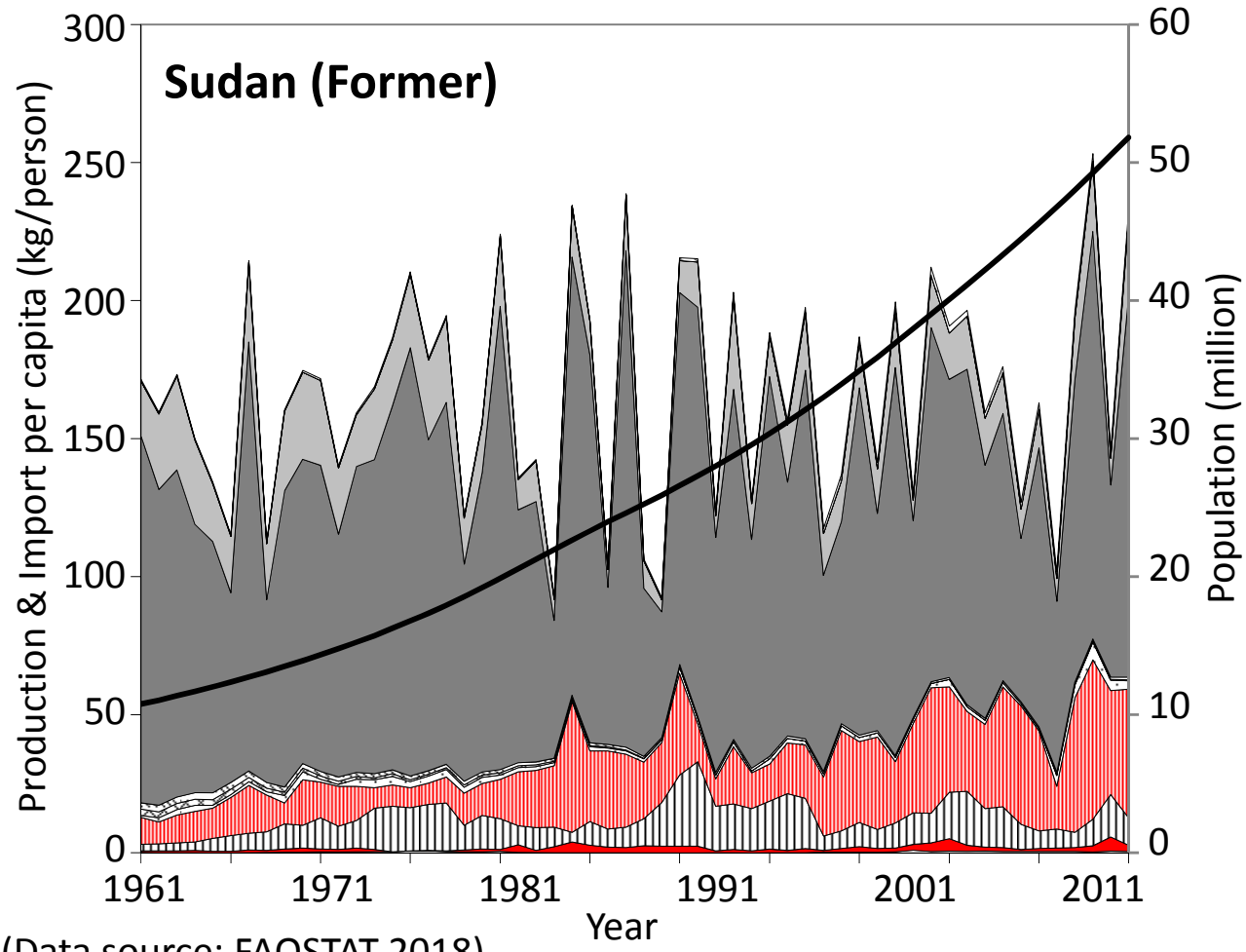
Maize is staple food. However, the production per capita has been unstable and decreased during 1980-2005. Rice production has started quite recently and still very small small. Wheat production has been increasing.



(Data source: FAOSTAT 2018)

Fig. Various Food Supply (kcal/capita/day) in Zambia (No.28 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.



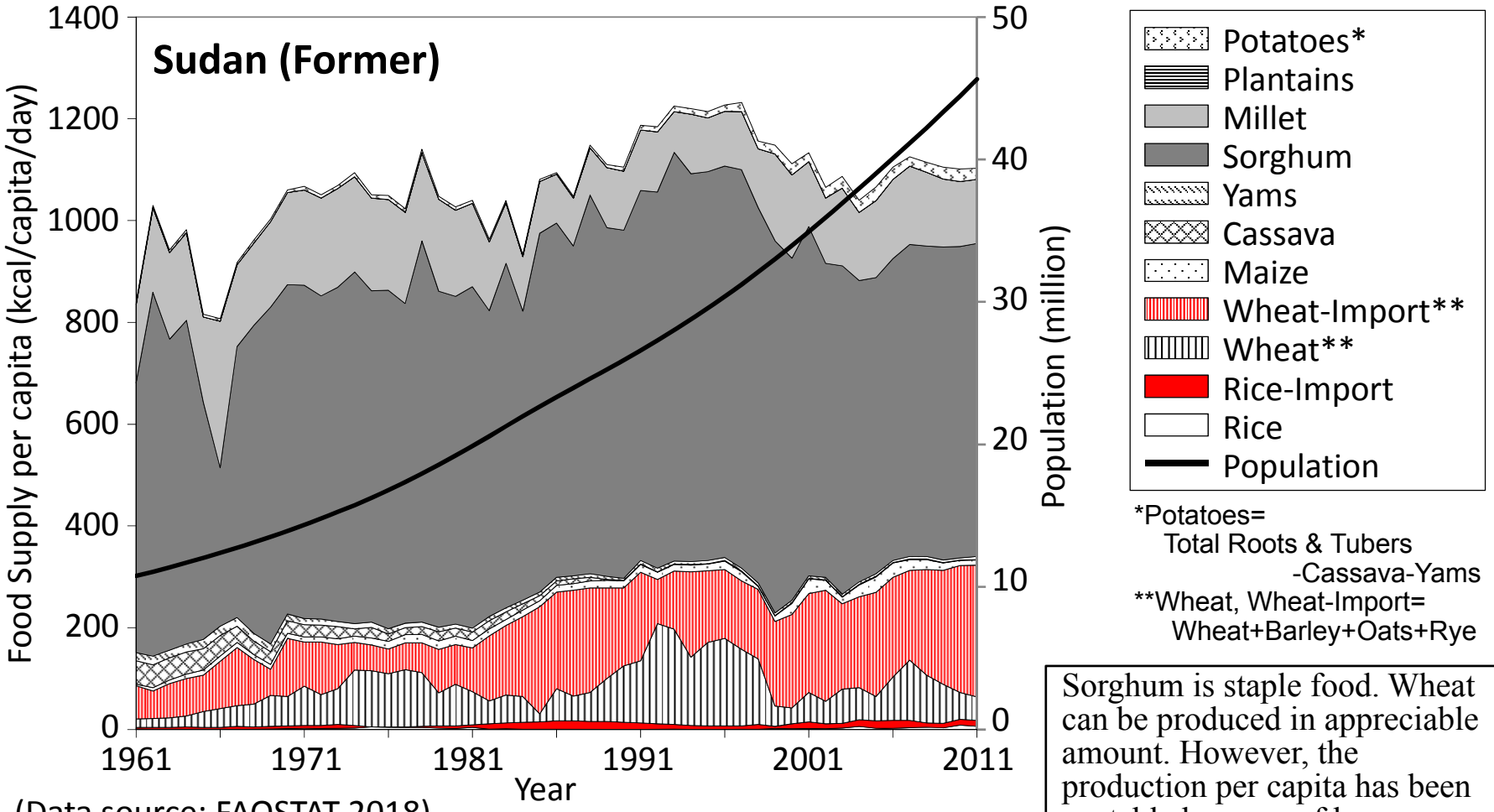
*Potatoes=
Total Roots & Tubers
-Cassava-Yams
**Wheat, Wheat-Import=
Wheat+Barley+Oats+Rye

(Data source: FAOSTAT 2018)

Fig. Food Production & Import (kg/person) in Sudan (Former) (No.32 rice producing country in SSA) during 1961-2016. (Import data of South Sudan in 2012-2013 not available.)

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 cultivation of sorghum and wheat at flood plains and inland deltas are main cereal productions. The agricultural production is stagnant and unstable by war such as recent Darfur conflict and the independence of South Sudan. South Sudan has the vast swamp called "Sudd" and the very large Nile flood plain. The potential of the rice production is extremely high as much as Chad.



*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 Sudan (Former) (No.32 rice producing country in SSA) during 1961-2011.

Sorghum is staple food. Wheat can be produced in appreciable amount. However, the production per capita has been unstable because of long continuing social and political problems. Rice production ecologies, flood plains and inland delta, are also huge.

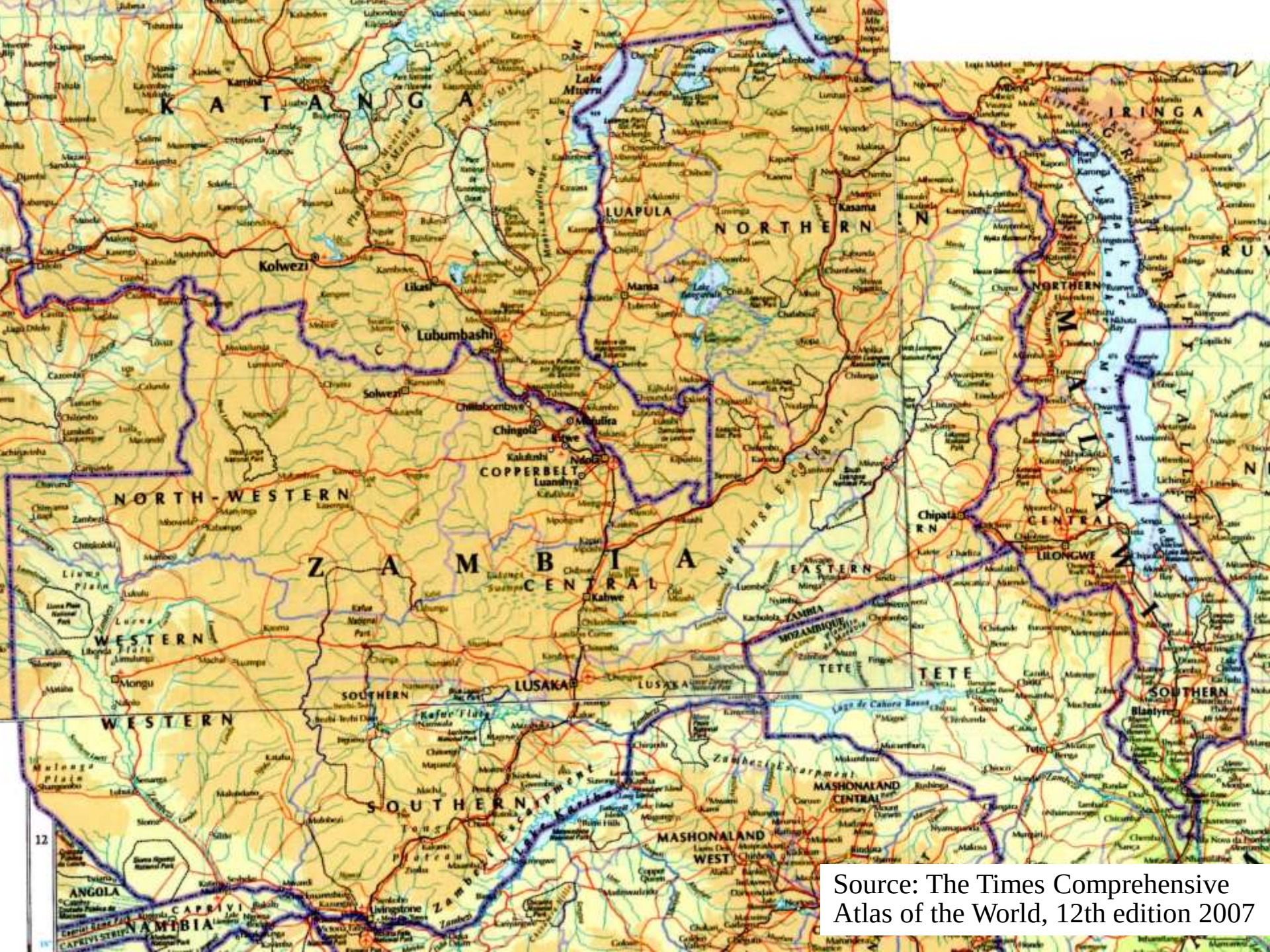
We used that the cereals' equivalent coefficients of 1/8 for Cassava and Plantains as well as 1/5 for Yam and Potatoes. These conversion factors can be tentatively verified if we compare figure on per capita production and importation amounts in kg and per capita consumption in kcal.

Table. Rice Value Trends in Zambia (No.28 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.

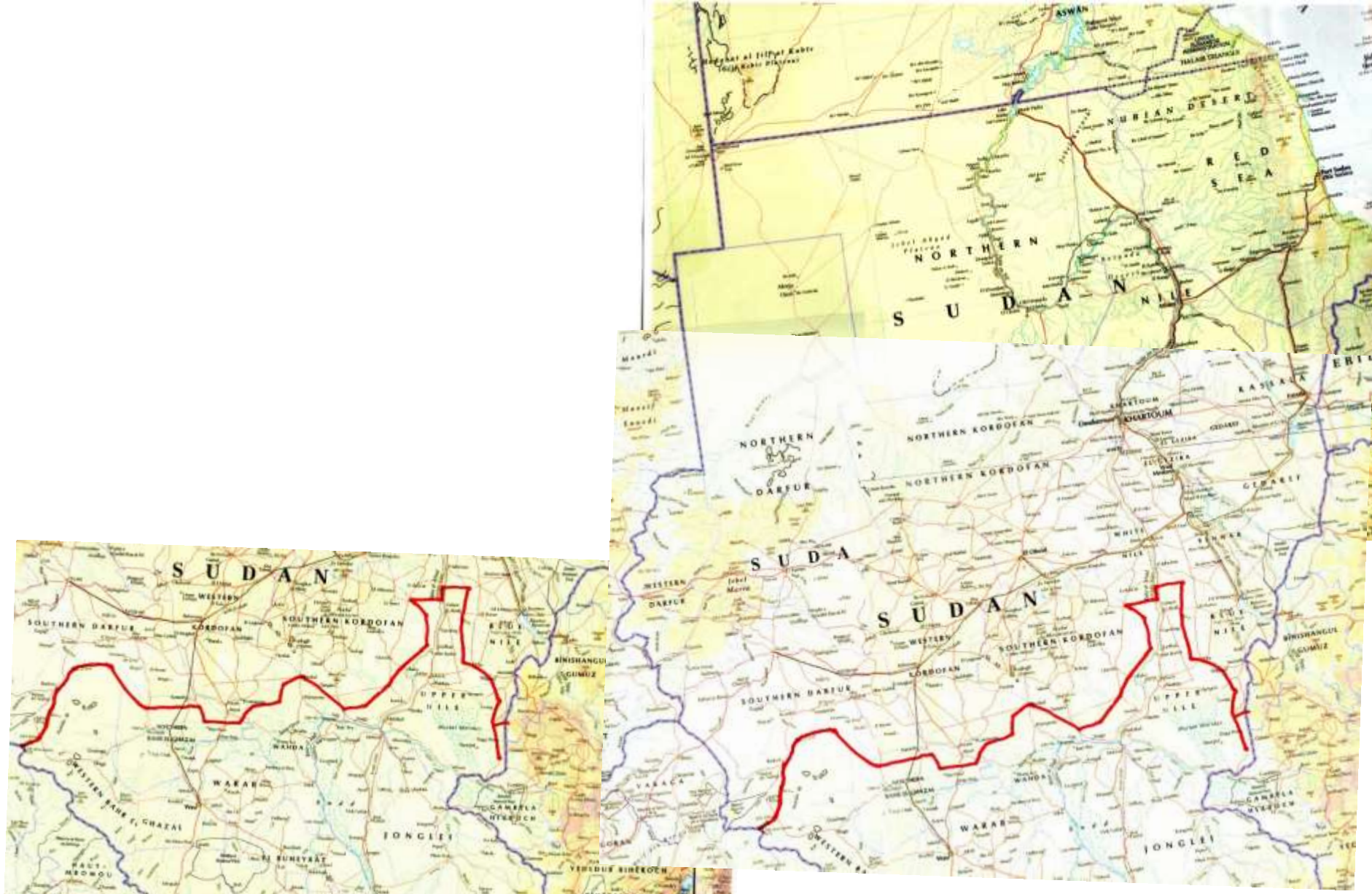
	1961 -1965	1966 -1970	1971 -1975	1976 -1980	1981 -1985	1986 -1990	1991 -1995	1996 -2000	2001 -2005	2008	2006 -2010	2011 -2015	2016
Population (million)	3.35	3.92	4.64	5.51	6.52	7.60	8.68	10.0	11.4	13.1	13.1	15.2	16.6
Area harvested (1,000 ha)	-	0.87	1.04	3.29	7.55	10.4	11.7	12.0	10.7	17.4	20.0	28.7	22.1
Index (%) of area harvested (100 for mean of 1971-1980)	-	40.2	48.2	152	349	481	541	552	495	802	926	1324	1020
Irrigated rice area harvested (1,000 ha)	-	0.13	0.26	0.82	1.89	2.60	8.27	9.40	9.29	17.1	19.7	28.5	
Index (%) of irrigated area (100 for mean of 1971-1980)	-	24.1	48.2	152	349	481	1528	1737	1717	3152	3637	5262	
Percent of Irrigated rice area harvested (%)	-	25.0	25.0	25.0	25.0	25.0	70.6	78.6	86.6	98.2	98.2	99.3	
Paddy production (1,000 ton)	-	0.35	0.80	2.25	7.62	10.0	11.1	12.2	14.2	24.0	30.0	42.9	26.7
Index (%) of paddy production (100 for mean of 1971-1980)	-	23.2	52.5	147	499	656	725	796	932	1573	1963	2811	1747
Production (1,000 ton, milled rice)	-	0.22	0.50	1.41	4.76	6.26	6.92	7.60	8.90	15.0	18.7	26.8	16.7
Paddy yield (ton/ha)	-	0.40	0.72	0.75	0.97	0.96	0.96	1.02	1.32	1.38	1.44	1.52	1.21
Index (%) of paddy yield (100 for mean of 1971-1980)	-	55.1	98.4	102	133	132	131	139	180	189	196	207	165
Yield (ton/ha, milled rice)	-	0.25	0.45	0.47	0.61	0.60	0.60	0.64	0.83	0.86	0.90	0.95	0.75
Imported quantity (1,000 ton, milled rice)	1.74	3.86	4.41	7.16	6.22	2.89	3.65	8.06	20.5	16.2	15.4	13.8	7.94
Self-Sufficiency ratio (%)	0.00	2.95	11.1	16.9	44.2	73.3	65.4	48.6	30.8	48.1	53.2	65.9	67.7
Imported rice price ($/ton, milled rice)	165	187	345	342	341	264	682	392	372	695	535	553	614
Consumption per capita (kg/person, milled rice)	0.52	1.01	1.07	1.57	1.67	1.21	1.22	1.58	2.56	2.39	2.60	2.69	1.48

Table. Rice Value Trends in Sudan (former) (No.32 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)	11.4	13.1	15.3	18.0	21.3	24.6	28.1	32.1	37.0	42.2	42.2	48.1	51.8
Area harvested (1,000 ha)	1.22	2.57	5.79	10.4	4.98	1.04	1.47	4.87	6.47	6.72	6.55	9.00	7.14
Index (%) of area harvested (100 for mean of 1971-1980)	15.1	31.7	71.4	129	61.4	12.8	18.1	60.0	79.7	82.8	80.7	111	88.0
Irrigated rice area harvested (1,000 ha)	0.43	0.46	0.48	0.49	0.49	0.52	0.85	3.23	2.86	2.57	2.57	2.57	
Index (%) of irrigated area (100 for mean of 1971-1980)	90.0	94.7	99.1	101	102	108	177	670	593	532	532	533	
Percent of Irrigated rice area harvested (%)	35.5	17.7	8.2	4.7	9.8	50.0	58.2	66.3	44.2	38.2	39.2	28.5	
Paddy production (1,000 ton)	1.21	2.43	6.28	9.80	4.48	1.10	1.33	5.00	18.1	30.0	25.0	24.6	28.0
Index (%) of paddy production (100 for mean of 1971-1980)	15.0	30.2	78.1	122	55.7	13.7	16.5	62.2	226	373	311	306	348
Production (1,000 ton, milled rice)	0.76	1.52	3.92	6.13	2.80	0.69	0.83	3.13	11.3	18.8	15.6	15.4	17.5
Paddy yield (ton/ha)	1.12	0.85	1.09	0.95	0.93	1.06	0.96	0.91	2.72	4.46	3.81	3.10	3.92
Index (%) of paddy yield (100 for mean of 1971-1980)	110	83.8	107	93.4	91.0	104	94.1	89.1	267	438	373	304	384
Yield (ton/ha, milled rice)	0.70	0.53	0.68	0.60	0.58	0.66	0.60	0.57	1.70	2.79	2.38	1.94	2.45
Imported quantity (1,000 ton, milled rice)	4.40	7.92	7.87	5.14	27.9	36.0	25.8	22.4	46.5	36.6	52.9	67.7	71.8
Self-Sufficiency ratio (%)	15.0	13.6	42.5	61.0	14.1	1.93	3.99	13.4	19.3	33.9	27.4	22.9	19.6
Imported rice price ($/ton, milled rice)	141	190	278	394	399	318	406	447	277	454	468	567	412
Consumption per capita (kg/person, milled rice)	0.45	0.71	0.78	0.62	1.43	1.49	0.96	0.79	1.55	1.31	1.65	1.70	1.72



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



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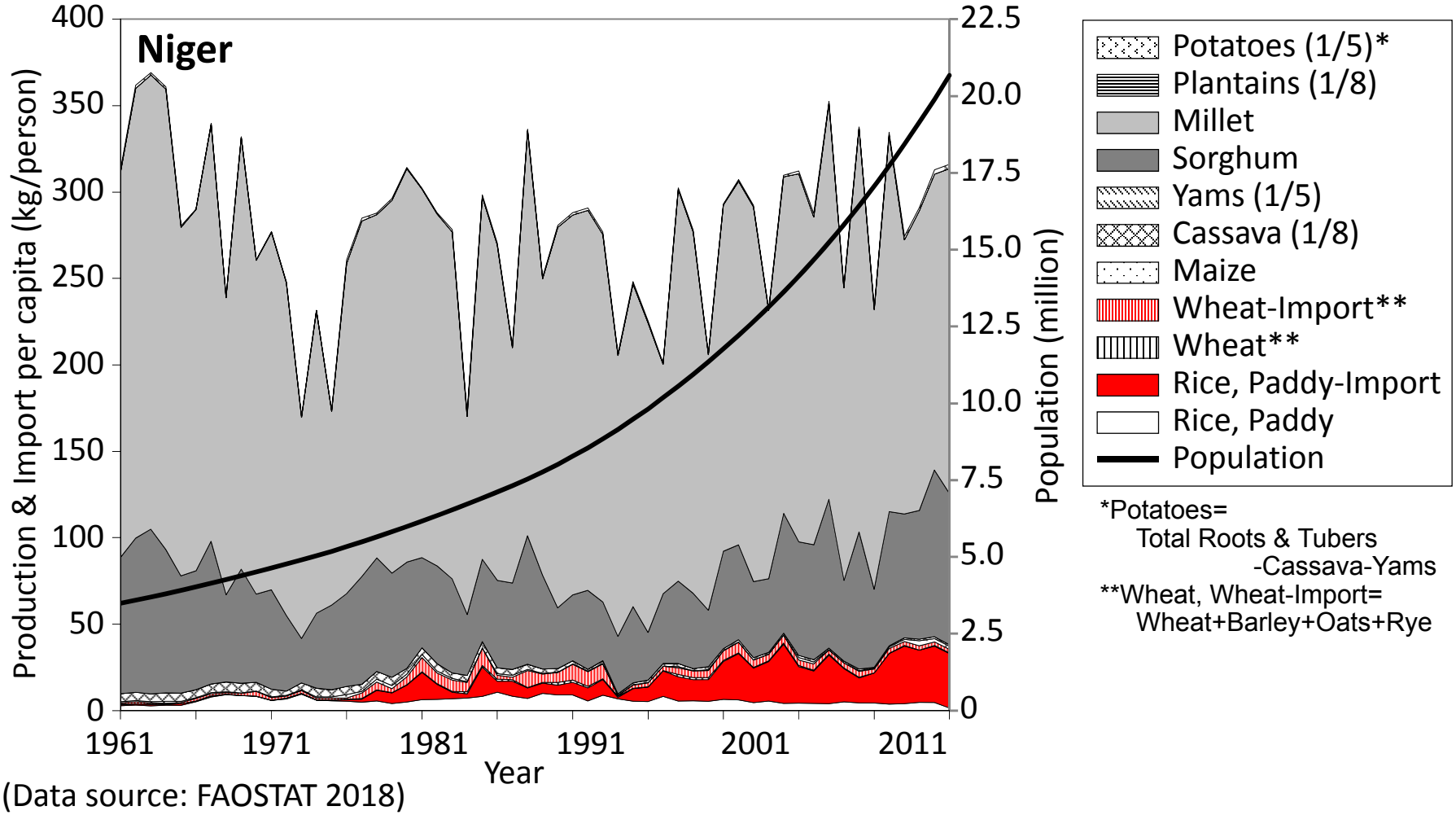
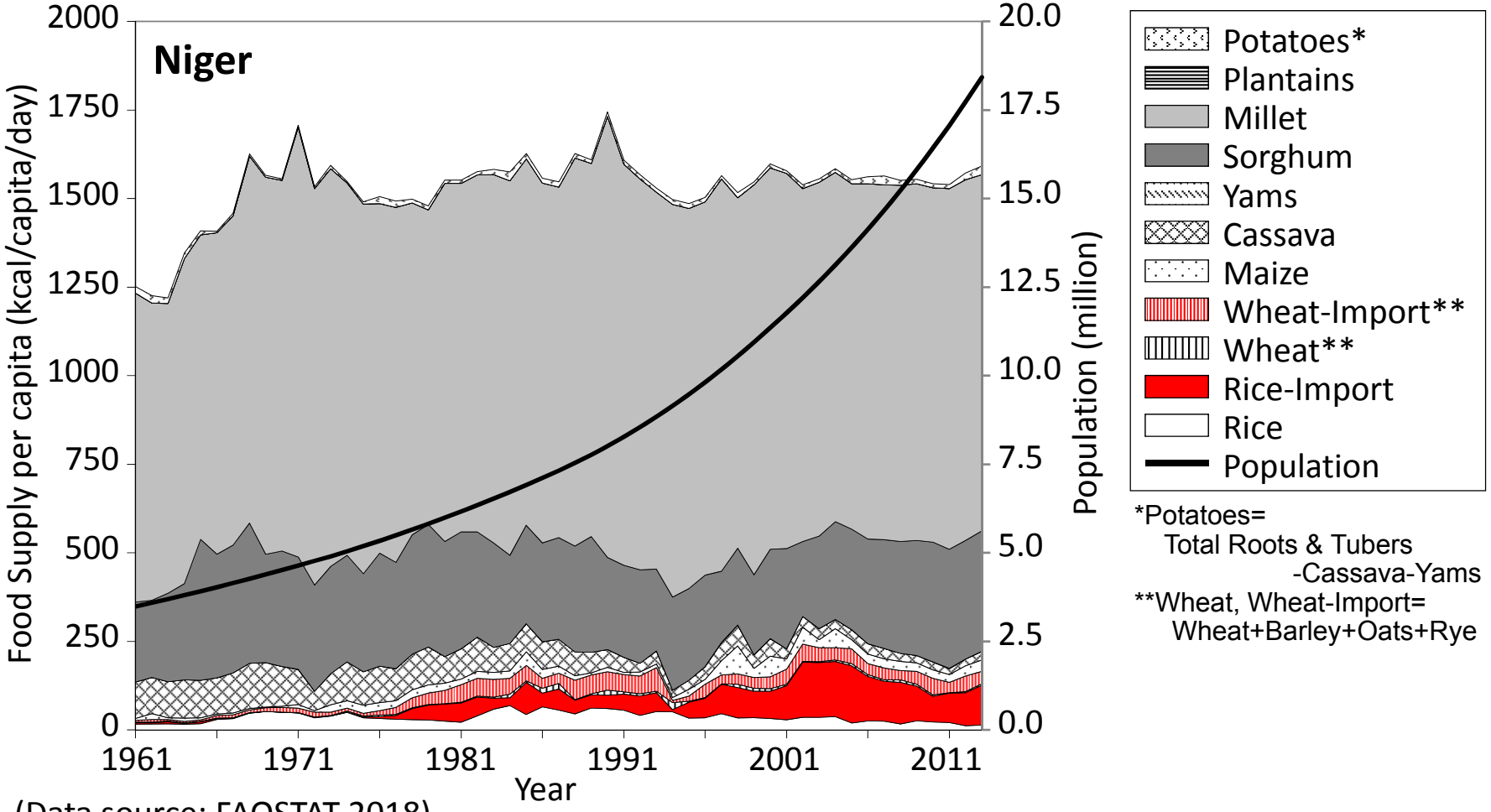


(Data source: FAOSTAT 2018)

Fig. Various Food Production & Import (kg/person) in Niger (No.25 rice producing country in SSA) during 1961-2016.

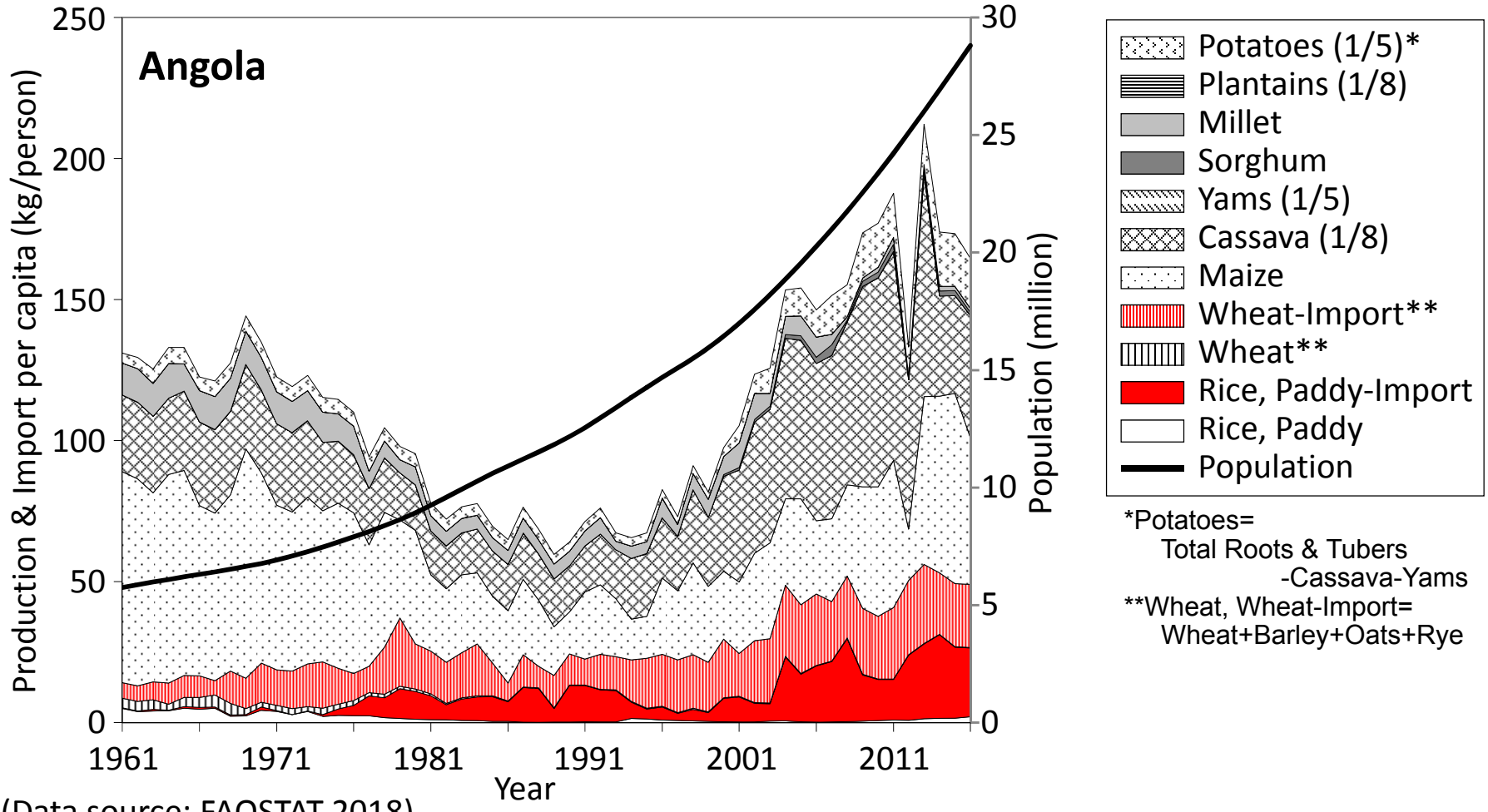
Cereal equivalent amounts of calories per kg are one fifth for Potato & plantain, one fourth for Yam and cassava (FAO Food composition data). In addition to these, postharvest and storage losses are estimated 2 times bigger than cereals for Cassava, 1.6 times for plantain, 1.3 times for Yam, and 1.0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



(Data source: FAOSTAT 2018)

Fig. Various Food Supply (kcal/capita/day) in Angola (No.25 rice producing country in SSA) during 1961-2013.

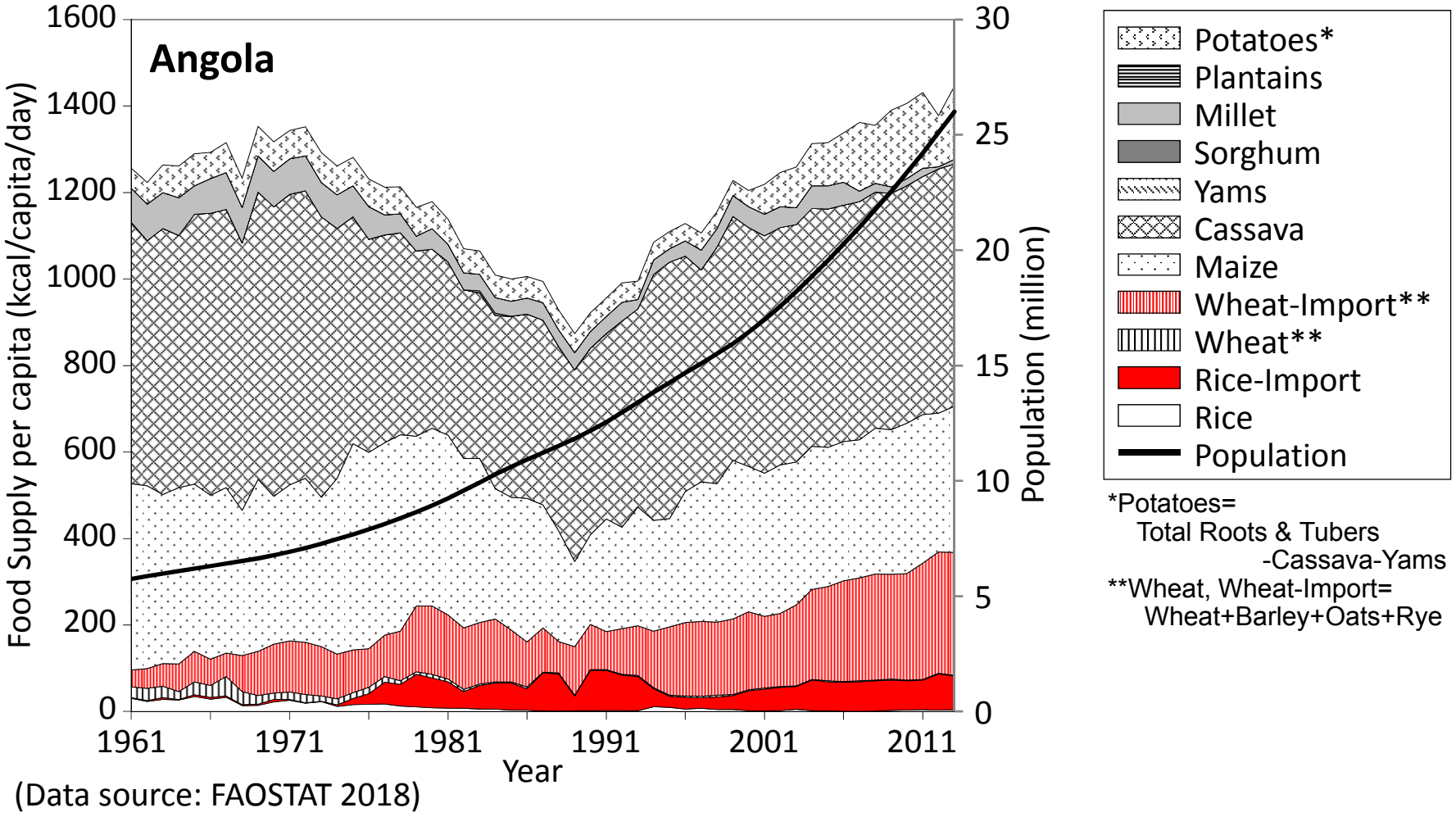
We used that the cereals' equivalent coefficients of 1/8 for Cassava and Plantains as well as 1/5 for Yam and Potatoes. These conversion factors can be tentatively verified if we compare figure on per capita production and importation amounts in kg and per capita consumption in kcal.



(Data source: FAOSTAT 2018)

Fig. Various Food Production & Import (kg/person) in Angola (No.29 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.



(Data source: FAOSTAT 2018)

Fig. Various Food Supply (kcal/capita/day) in Angola (No.29 rice producing country in SSA) during 1961-2013.

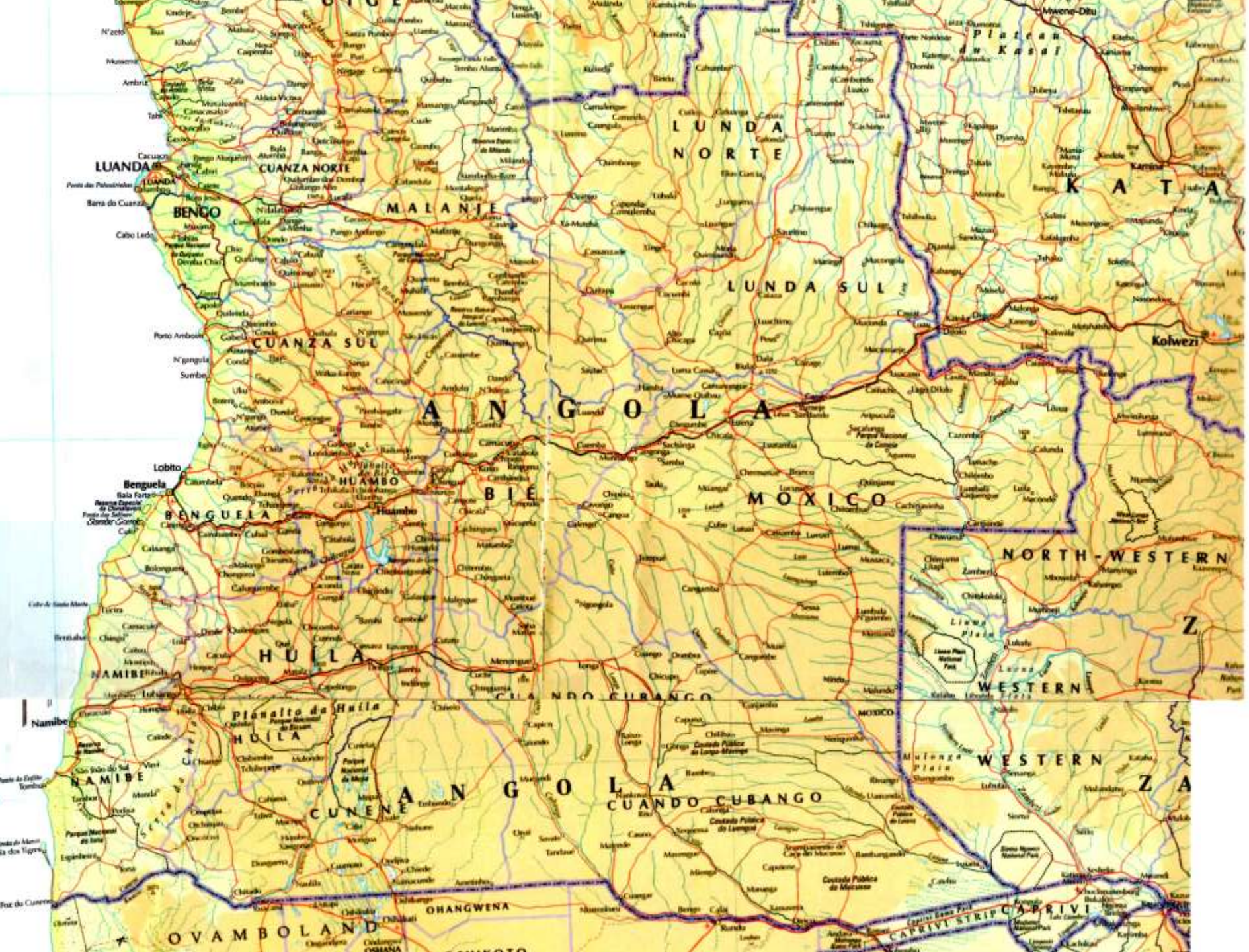
We used that the cereals' equivalent coefficients of 1/8 for Cassava and Plantains as well as 1/5 for Yam and Potatoes. These conversion factors can be tentatively verified if we compare figure on per capita production and importation amounts in kg and per capita consumption in kcal.

Table. Rice Value Trends in Niger (No.25 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)	3.70	4.27	4.91	5.66	6.53	7.55	8.86	10.6	12.7	15.2	15.3	18.5	20.7
Area harvested (1,000 ha)	9.14	13.6	16.8	21.9	20.6	23.1	22.9	25.9	21.7	16.0	16.2	14.5	11.4
Index (%) of area harvested (100 for mean of 1971-1980)	47.2	70.1	86.8	113	106	119	118	134	112	82.6	83.4	74.6	59.0
Irrigated rice area harvested (1,000 ha)	2.61	3.88	4.80	6.27	5.89	8.89	11.1	12.9	14.4	13.3	13.4	14.5	
Index (%) of irrigated area (100 for mean of 1971-1980)	47.2	70.1	86.8	113	106	160	200	233	260	240	242	261	
Percent of Irrigated rice area harvested (%)	28.6	28.6	28.6	28.6	28.6	38.5	48.4	49.7	66.4	83.0	83.0	100	
Paddy production (1,000 ton)	10.9	33.4	33.0	28.1	46.1	67.6	62.8	63.0	67.7	61.0	66.7	79.3	30.2
Index (%) of paddy production (100 for mean of 1971-1980)	35.5	109	108	92.0	151	221	206	206	222	200	218	260	98.8
Production (1,000 ton, milled rice)	6.79	20.9	20.6	17.6	28.8	42.3	39.2	39.4	42.3	38.1	41.7	49.6	18.9
Paddy yield (ton/ha)	1.19	2.46	1.96	1.29	2.24	2.95	2.82	2.68	3.19	3.81	4.17	5.62	2.64
Index (%) of paddy yield (100 for mean of 1971-1980)	73.3	152	121	79	138	182	174	165	197	235	257	346	163
Yield (ton/ha, milled rice)	0.74	1.54	1.22	0.80	1.40	1.84	1.76	1.68	1.99	2.38	2.61	3.51	1.65
Imported quantity (1,000 ton, milled rice)	1.61	0.57	0.59	17.8	38.7	30.7	35.1	82.2	201	267	193	332	407
Self-Sufficiency ratio (%)	81.0	96.9	97.3	56.1	48.9	57.8	55.9	32.7	18.1	12.5	18.3	13.6	4.42
Imported rice price ($/ton, milled rice)	132	249	258	384	456	360	397	338	269	472	395	434	374
Consumption per capita (kg/person, milled rice)	2.27	5.01	4.33	6.18	10.3	9.69	8.44	11.5	19.1	20.1	15.4	20.5	20.6

Table. Rice Value Trends in Angola (No.29 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)	5.98	6.53	7.29	8.40	9.93	11.5	13.4	15.5	18.2	21.8	21.8	26.0	28.8
Area harvested (1,000 ha)	21.4	21.2	19.2	16.2	9.20	3.83	10.1	5.70	7.82	16.6	16.2	28.7	39.4
Index (%) of area harvested (100 for mean of 1971-1980)	121	120	108	91.5	52.0	21.6	56.9	32.2	44.2	93.5	91.4	162	223
Irrigated rice area harvested (1,000 ha)													
Index (%) of irrigated area (100 for mean of 1971-1980)													
Percent of Irrigated rice area harvested (%)													
Paddy production (1,000 ton)	27.0	24.8	22.8	15.8	8.20	3.00	10.4	9.84	8.54	8.41	9.77	34.0	61.0
Index (%) of paddy production (100 for mean of 1971-1980)	140	129	118	81.9	42.5	15.5	53.9	51.0	44.3	43.6	50.6	176	316
Production (1,000 ton, milled rice)	16.9	15.5	14.2	9.88	5.13	1.88	6.50	6.15	5.34	5.26	6.11	21.2	38.1
Paddy yield (ton/ha)	1.26	1.16	1.19	0.97	0.89	0.77	1.01	1.70	1.18	0.51	0.57	1.17	1.55
Index (%) of paddy yield (100 for mean of 1971-1980)	117	107	110	89.7	82.0	71.6	93.4	158	110	47.0	52.9	108	143
Yield (ton/ha, milled rice)	0.79	0.72	0.75	0.61	0.55	0.48	0.63	1.06	0.74	0.32	0.36	0.73	0.97
Imported quantity (1,000 ton, milled rice)	1.47	2.66	3.28	40.6	48.1	70.8	73.4	44.5	142	401	276	390	439
Self-Sufficiency ratio (%)	92.1	85.2	83.5	22.2	10.2	3.18	11.2	14.3	4.36	1.30	2.38	5.22	7.99
Imported rice price ($/ton, milled rice)	188	219	393	383	357	274	335	298	273	650	463	545	442
Consumption per capita (kg/person, milled rice)	3.06	2.79	2.40	5.96	5.35	6.29	6.04	3.23	7.92	18.7	13.0	15.7	16.6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