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Annex 1.0

TABLES ON WORLD RICE PRODUCTION AND CONSUMPTION

Table 1.0.1. Percentage contribution of rice to total dietary nutrition and protein supplies in developing country regions, 1988-90.

Region	Energy contribution % of regional total	Per capita energy kcal/day	Protein contribution % of regional total	Per capita protein g/day
Africa (developing)	6.4	2204	13.3	53.3
Northwestern Africa	0.3	3007	0.25	78.9
Western Africa	10.2	2233	9.4	50.1
Central Africa	3.6	2050	3.2	43.8
Eastern Africa	5.9	1985	4.8	52.3
South Africa	0.8	2176	0.63	63.3
Latin America	12.1	2689	7.9	66.8
Central America	2.7	2876	2.0	4.2
Caribbean	14.0	3604	11.7	15.1

	Annex 1.0			
25/10/2011				
South America	12.5	2024	10.1	64.4
Near East (developing)	6.8	2924	4.9	77.9
Near East Africa	6.9	2921	5.1	76.4
Near East Asia	6.8	2925	4.8	78.5
Far East (developing)	38.2	2446	28.8	59.3
South Asia	32.2	2215	24.5	54.5
East and Southeast Asia	58.8	2503	44.0	58.4
China	36.3	2646	26.1	64.3
Oceania	14.0	2695	11.6	57.8
Other (developing)	14.0	2697	14.6	58.2

Source: ESN, FAO, 1994.

Table 1.0.1. General information on population demographics in 41 important rice-producing countries.

Selected rice consuming and producing countries	Population			Infant mortality 1994 (per 1000 live births)	Life expectancy at birth 1994 (years)	GNP ^a per capita	
	Estimated 1995	Projected 2000 to 2025				1994(\$)	Average annual growth rate 1985-94 (%)
ASIA	3 443	3 703	4 860	<i>_b</i>	-	-	-
Bangladesh	121	132	182	81	57	-	-
Bhutan	2	2	3	-	-	220	2.0
Cambodia	10	11	16	-	52	400	4.4

25/10/2011

Annex 1.0

China ^c	1 220	1 277	1 497	30	69	-	-
India	934	1 016	1 370	70	62	530	7.8
Indonesia	193	206	265	53	63	320	2.9
Japan	125	127	124	4	79	880	6.0
Korea DPR	24	26	34	-	70	34 630	3.2
Korea, Republic of	45	47	53	12	71	-	-
Lao PRD	5	6	10	92	52	8 260	7.8
Malaysia	20	22	31	12	71	320	-
Myanmar	47	52	73	-	58	3 480	5.6
Nepal	21	24	38	95	54	1 398	25.9
Pakistan	130	148	243	92	60	200	2.3
Philippines	69	77	115	40	65	430	1.3
Sri Lanka	18	19	24	16	72	950	1.7
Thailand	60	65	81	36	69	640	2.9
Vietnam	74	82	117	42	68	2 410	8.6
						200	-
LATIN AMERICA	475	512	686	41	68	3 340	0.6
Brazil	161	172	224	56	67	1 270	-0.4
Colombia	35	38	49	20	70	1 670	2.4
Cuba	11	11	13	-	76	-	-
Dominican Republic	8	8	11	38	70	1 330	2.2
Ecuador	12	13	18	37	69	1 280	0.9
Guyana	1	1	1	-	66	530	0.4
Peru	24	26	36	48	65	2 110	-2.0
Surinam	0	0	1	-	69	860	1.8
Uruguay		3	4	19	73	4 660	2.9
AFRICA	719	821	1431	-	-	-	-
Cote d' Ivoire	14	17	34	90	56	610	-4.6

25/10/2011

Annex 1.0

Egypt	58	563	86	52	62	720	1.3
Guinea	7	8	15	131	44	520	1.3
Liberia	2	3	5	-	53	-	-
Madagascar	13	16	26	90	52	200	-1.7
Mozambique	18	20	40	146	46	90	3.8
Mali	10	12	24	125	69	250	1.0
Senegal	8	10	16	64	50	600	-0.7
Sierra Leone	5	5	10	163	40	160	-0.4
Tanzania, United Rep of	28	33	59	84	51	140	0.8
Nigeria	111	128	217	81	52	280	1.2

Table 1.0.2. General information on population demographics in 41 important rice-producing countries (continued).

Selected rice consuming and producing countries	Population			Infant mortality 1994 (per 1000 live births)	Life expectancy at birth 1994 (years)	GNP ^a per capita	
	Estimated 1995	Projected 2000	Projected 2025			1994 (\$)	Average annual growth rate 1985-94 (%)
EUROPE	731	739	744	-	-	-	-
France	58	59	63	6	78	23 420	1.6
Italy	58	58	54	7	78	19 300	1.8
Spain	39	39	38	7	77	13 440	2.8
AUSTRALIA	18	19	23	6	77	18 000	1.2
USA	263	276	323	8	77	25 880	1.3

REST OF THE WORLD 43	43	55	-	-	-	-	
WORLD	5 692	6 114	8 121	53	674	470	0.9
<i>a</i> Gross national product	<i>SOURCE: IIRI, 1997</i>			<i>IIRI RICESTAT, 1995</i>			
<i>b</i> Data not available	citing the following sources:			<i>SNAR, Agricultural Research Policy;</i>			
<i>c</i> Including Taiwan	<i>CIAT, Trends in CIAT Commodities 1992</i>			<i>International Perspective 1989</i>			
	<i>Country National Statistical Offices</i>			<i>World Bank 1994</i>			
	<i>E. Bos et al. World Population Projection 1994-95</i>			<i>World Bank Development Report, 1996</i>			
	<i>FAO, FAOSTAT, 1995</i>						

Table 1.0.3. Information about rice agriculture and rice consumption in 41 important rice-producing countries.

Selected rice consuming and producing countries	Arable Land 1993 ('000 ha)	Agricultural Research (1981-85) (no.)	Agriculture's share (%)		Average annual growth rate		Daily calorie supply per capita 1992 (no.)	Rice in total supply 1992 (%)	Milled rice consumption per capita 1992 (kg/cap/yr)	Total rice consumption (rough rice equivalent) 1992 ('000 t)
			Labor force 1994	<i>GDP^E</i> 1994	Agriculture 1990-94	Rice 1990-94				
ASIA	428	76 614	57	-	-	-0.4	2 584	35	84	418 459

25/10/2011

Annex 1.0

Bangladesh	369	927	66	30	1.9	-1.4	2 019	74	143	26 266
Bhutan	9 450	-	90	-	-	0.0	-	-	-	-
Cambodia	115	68	68	-	-	-0.6	2 021	80	160	2 165
China	2 350	33 831	64	21	4.1	-2.4	2 734	35	91	166 990
India	93 046	8 389	65	30	2.9	-0.4	2 394	31	70	94 756
Indonesia	166	1 349	45	17	3.0	0.3	2 752	56	136	39 994
Japan	100	14 779	52	17	1.6	0.3	2 752	56	136	39 994
Korea, DPR	18 900	1 330	30	-2.8	-	-	2 887	24	60	11 505
Korea	4 024	1 356	21	-	1.8	-3.1	2 833	38	100	3 473
Republic of	1 700	29	70	7	-	-1.7	3 285	35	102	6 936
Lao DPR	1 877	811	29	51	2.8	0.0	2 259	67	163	1 123
Malaysia	780	267	45	14	5.1	-0.5	2 889	33	93	2 685
Myanmar	1 040	446	91	63	1.3	8.0	2 598	77	195	13 120
Nepal	9 579	2 972	48	44	2.7	-0.1	1 957	35	72	2 293
Pakistan	2 325	1 965	45	25	1.6	-0.1	2 316	5	10	1 895
Philippines	20 790	391	51	22	2.0	0.2	2 255	40	87	8 680
Sri Lanka	5 520	1 676	58	24	3.1	-0.1	2 271	41	89	2 410
Thailand	930	2 113		10	4.5	-0.9	2 434	56	130	11 216
Vietnam	17 600			28		1.9	2 250	70	147	15 726
	5 500									

Table 1.0.3. Information about rice agriculture and rice consumption in 41 important rice-producing countries (continued).

Selected rice consuming and producing countries	Agricultural Arable Land 1993 ('000)	Agriculture's share (%) Research (1981-85) (no.)	Agriculture's share (%) Labor	Average annual growth rate Agriculture sector	Daily calories per capita	Rice in total nutrition 1992	Milled rice consumption per capita (kg/cap/yr) 1992	Total rice consumption (rough rice equivalent) 1992

25/10/2011

Annex 1.0

	ha)		force 1994 1994		1990-94	1990-94	1992 (no.)	(%)		(`000 t)
LATIN	122	9 000	24	10	2.3	2.4	2 746	10	25	17 188
AMERICA	463	3 794	22	13	3.2	3.0	2 824	15	40	9 419
Brazil	42 000	454	25	14	1.4	-5.9	2 677	11	28	1 438
Colombia	3 920	2 191	18	-	-	-13.9	2 833	14	40	665
Cuba	2 610	136	32	15	3.0	1.2	2 286	19	41	475
Dominican Republic	1 000	211	27	12	2.0	7.6	2 583	17	41	700
Ecuador	1 630	50	21	-	2.0	16.8	2 384	31	75	94
Guyana	480	262	33	7	-	6.5	1 882	21	36	1 248
Peru	3 400	22	15	-	-	3.6	2 547	31	81	54
Surinam	57	77	13	8	3.3	14.5	1 750	3	9	45
Uruguay	1 260									
AFRICA	168	9 958	61	-	-	2.8	2 282	7	15	15 741
Cote d' Ivoire	852	201	52	41	-0.9	-5.8	2 491	22	56	1 120
Egypt	2 440	4 246	39	20	1.8	7.4	3 335	10	30	2 514
Guinea	2 450	177	71	24	4.3	7.2	2 389	37	82	774
Liberia	610	33	68	-	-	-23.3	1 640	40	65	276
Madagascar	130	82	75	35	1.5	0.3	2 135	48	96	1 896
Mozambique	2 580	77	80	33	2.4	2.4	1 680	7	11	264
Mali	2 950	275	79	42	1.7	6.4	2 278	14	29	446
Senegal	2 500	174	77	42	1.7	6.4	2 278	14	29	446
Sierra Leone	2 500	174	59	17	-4.9	1.7	2 262	26	57	679
Tanzania,	2 330	46	79	47	0.6	-1.5	1 694	40	72	486
United Rep of	486	276	63	57	5.8	-2.2	2 018	6	11	465
	3 000	1 003		43	2.2	7.0	2 124	10	19	3 353
	29 850									

Nigeria

Table 1.0.3. Information about rice agriculture and rice consumption in 41 important rice-producing countries (continued).

Selected rice consuming and producing countries	Arable Land 1993 ('000 ha)	Agricultural Research (1981-85) (no.)	Agriculture's share (%)		Average annual growth rate		Daily calorie nutrition per capita 1992 (no.)	Rice total calorie nutrition 1992 (%)	Milled rice consumption per capita 1992 (kg/cap/yr)	Total rice consumption (rough rice equivalent) 1992 ('000 t)
			Labor force 1994	<i>GDP^E</i> 1994	Agriculture sector area 1990-94	Rice 1990-94				
EUROPE	122	18 592	8	-	-	-4.2	3 412	1	3	2 550
Prance	174	2 361	4	2	0.4	7.8	3 632	1	3	276
Italy	18 255	2 327	6	3	2.1	2.7	3 549	1	4	401
Spain	9 030	1 249	9	3	-1.0	-8.5	3 705	2	6	341
	14 981									
AUSTRALIA	46 300	4 579	4	3			3 179			215
					-0.1	3.8		2	8	
USA	185	14 366	2	-			3 732			2 704
	742				-	4.0		2	7	
REST OF THE WORLD	268	1 004	11	-			2 812			636
	926	134 113	45	-			2 698	2	31	457 451
					-	-0.2		2	58	
WORLD	1 342									
	826									

a Gross national product

c Including Taiwan

d Excluding permanent crops

e Gross domestic product

Source: IIRRI, 1997 citing the following sources:

CIAT, trends in CIAT Commodities, 1992

ISNAR, Agricultural Research Policy:

International Perspective 1989

25/10/2011

Annex 1.0

f Relate to wet season

Country National Statistical Office

World Bank 1994

g Hybrid rice is 40%*h* Less than 1000 t*E. Bos et al. World Population Projection 1994-95 World Bank Development Report,1996**l* West Malaysia only*j* Difference is changes in domestic stocks. *FAO, FAOSTAT, 1995***Note: Regional totals included****countries not shown****Table 1.0.4. World rice (paddy) production forecast for 1997 as of August 1997.**

Country	1995	1996 Estimated	1997 Forecast
	(.....Million tons).		
ASIA	503.7	518.9	517.5
Bangladesh	26.6	28.1	28.0
China ¹	187.3	196.9	195.0
India	119.6	120.9	121.6
Indonesia	48.5	50.8	52.0
Iran, Islamic Republic of	2.4	2.6	2.4
Japan	13.4	12.9	12.2
Korea, D.P.R.	2.6	2.0	2.0
Korea, Rep. of	6.4	7.2	6.6
Myanmar	18.0	17.0	17.0
Pakistan	5.9	5.4	6.6
Philippines	11.1	11.6	11.7
Saudi Arabia	-	-	-
Thailand	21.3	21.3	21.0

		Annex 1.0	
25/10/2011			
Turkey	0.3	0.3	0.3
Vietnam	26.8	26.9	27.0
AFRICA	14.5	15.7	16.0
North Africa	4.8	4.9	5.1
Egypt	4.8	4.9	5.1
Morocco	1.0	1.0	1.0
Sub-Saharan Africa	9.7	10.7	10.9
Western Africa	5.6	6.6	6.7
Nigeria	2.5	3.1	3.3
Central Africa	0.5	0.5	
Eastern Africa	0.9	0.8	0.8
Ethiopia	-	-	-
Sudan	-	-	-
Southern Africa	2.6	2.8	2.8
Madagascar	2.5	2.6	2.5
South Africa	-	-	-
Zimbabwe	-	-	-

Table 1.0.4. World rice (paddy) production forecast for 1997 as of August 1997 (continued).

Country	1995	1996 Estimated	1997 Forecast
CENTRAL AMERICA	1.7	1.9	1.9
Mexico	0.4	0.4	0.4

25/10/2011		Annex 1.0	
	SOUTH AMERICA	19.1	18.2 18.1
	Argentina	0.9	1.0 1.2
	Brazil	11.2	10.2 9.7
	Columbia	1.8	1.6 1.7
	NORTH AMERICA	7.9	7.8 8.3
	Canada	-	- -
	United States	7.9	7.8 7.3
	EUROPE	2.2	2.9 2.6
	Bulgaria	-	- -
	EC ²	2.2	2.8 2.6
	Hungary	-	- -
	Poland	-	- -
	Romania	-	- -
	CIS ⁴	1.4	1.3 1.5
	OCEANIA	1.2	1.0 1.4
	Australia	1.1	1.0 1.4
	WORLD		
	Developing countries	525.7	567.6 541.4
	Developed countries	26.0	541.8 26.0

¹ Including Taiwan Province.

² Fifteen member countries.

³ In cleaned weight

⁴ Commonwealth of Independent States

Note: Totals computed from unrounded data.

Source: FAO

Table 1.0.5. Rice production in 41 important rice-producing countries.

Selected rice consuming and producing countries	Rough rice (1994)			Area planted to modern varieties 1991
	Production (`000 t)	Area (`000 ha)	Yield (t/ha)	(%)
ASIA	485 077	130 027	3.7	74
Bangladesh	27 537	9850	2.8	47
Bhutan	43	26	1.7	100
Cambodia	1800	1700	1.1	11 ^a
China ^c	178 251	30 373 42	5.9	100 ^{ab}
India	118 400	034 10 646	2.8	66
Indonesia	46 245	2212 600	4.3	77
Japan	14976	1160 639	6.8	100
Korea, PDR	2104	665 477	3.5	100
Korea, Republic of	7056	1450 2107	6.1	100
Lao PDR	1653	3350 825	2.6	2
Malaysia	2040	8482 6500	3.1	90 ^d
Myanmar	19 057		2.9	54
Nepal	3496		2.4	36
Philippines	5269		2.5	42
Sri Lanka	10 150		3.0	91
Thailand	2582		3.1	91
Vietnam	18 447		2.2	68 ^a
	22 500		3.5	80

a Relate to wet season only

b Hybrid rice is 40 %

c Including Taiwan

d West Malaysia only

Note: Regional totals include countries not shown. [Table 1.0.5. Rice production in 41 important rice-producing countries \(continued\).](#)

Selected rice consuming and producing countries	Rough rice (1994)			Area planted to modern varieties 1991 (%)
	Production (`000 t)	Area (`000 ha)	Yield (t/ha)	
LATIN AMERICA	20 036		2.9	40
Brazil	10 582	6 794 4446	2.4	25
Colombia	1679	408 78 104	4.1	87
Cuba	186	361 95 238	2.4	100
Dominican Republic	533	60 134	5.1	81
Ecuador	1366		3.8	59
Guyana	340	7 235 450	3.6	4
Peru	1391	579 1088 45	5.8	73
Surinam	225	1180 121	3.8	92
Uruguay	680	152 78 370	5.1	47
		353 1688		
AFRICA		378 27 238		
Cote d' ivoire	15855		2.2	-
Egypt	701	63	1.6	-

25/10/2011

Annex 1.0

Guinea	4582	122	7.9	-
Liberia	916	1336	0.8	-
Madagascar	50	560	1.1	-
Mozambique	2360		2.0	-
Mali	98	146 452	0.8	-
Senegal	548		2.2	-
Sierra Leone	162		2.1	-
Tanzania, United Rep of	450		1.2	-
Nigeria	614		1.7	-
	3857		2.3	-
EUROPE				
France	2133		5.6	-
Italy	124		4.6	-
Spain	324		5.6	-
	390		6.2	-
AUSTRALIA				
	1017		8.3	-
USA				
	8972		6.7	100
REST OF THE WORLD	1631		2.9	-
WORLD	54 701		3.7	-

Note: Regional totals include countries not shown.

Source: IRRI, 1997, citing the following sources:

CIAT, *Trends in CIAT Commodities, 1992*

Country National Statistical Offices

E.Bos et al. World population Projection 1994-95

FAO, FAOSTAT, 1995

IRRI RICE STAT, 1995

ISNAR, Agricultural Research Policy: International Perspective 1989

World Bank 1994

World Bank Development Report ,1996

Table 1.0.6. Major consumers of rice.

	Population (million)	Consumption per capita	Requirement (million tons)	Import short-fall
World	5,350	55	249.2	15,235
Africa	650	14	9.0	3,760
Cote D'voire	12	24	0.3	380
Egypt	54	28	1.5	0.1
Guinea	6	61	0.4	247
Madagascar	12	104	1.2	60
Liberia	13	98	0.3	128
Nigeria	99	12	1.4	270
Sierra Leone	4	95	0.4	107

Asia	3,157	85	268.3	5,944
Bangladesh	111	155	17.2	39
Cambodia	9	167	1.5	81
China	1,150	94	108	107
India	866	66	57.2	43
Indonesia	181	138	25.0	610
Japan	124	62	7.7	18
Korea DPR	22	125	2.8	50
Korea Rep	43	92	4.0	1
Laos	4	190	0.8	40
Malaysia	18	79	1.4	0.1
Myanmar	43	190	8.2	0
Nepal	19	102	2.0	12
Pakistan	116	19	2.2	*
Philippines	63	99	6.2	1
Sri Lanka	17	94	1.6	237
Thailand	57	128	7.3	0
Vietnam	68	146	10.0	2
Latin America	445	26	116	2,011
Brazil	151	43	6.5	480
Columbia	33	32	1.1	80
Cuba	11.5	48	0.5	300
Dominican Rep	7.0	49	0.3	18
Ecuador	11.0	38	0.4	3

25/10/2011

Annex 1.0

Guyana	1.0	67	1.0	0
Peru	22.0	36	0.8	418
Surinam	0.5	89	0.044	0
Uruguay	3.0	9	0.03	*
Australia	17.0	5	0.1	32
USA	253	6	1.5	175
	833	6	5.0	3,313
Rest of the World				

Source: Table 1.0.7. Basic facts of world rice situation.

	1993/94	1994/95	1995/96	1996/97	1997/98 forecast	Change 1997/98 over 1996/97
WORLD PRODUCTION¹	(.....million tons.....)					(percentage)
Rice (milled)	355	362	370	381	381	-0.1
(paddy)	(529)	(540)	(552)	(568)	(567)	0.0

WORLD IMPORTS²

25/10/2011

Annex 1.0

Rice (milled)	17	21	19	17	18	3.5
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**WORLD
UTILIZATION**

Rice (milled)	359	368	372	381	383	0.6
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WORLD STOCKS³

Rice (milled)	63	55	54	55	51	-7.4
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EXPORT PRICES⁴

Rice (Thai, 100%, 2 nd grade) ¹	250	289	336	352	340 ⁵	-6.8 ⁶
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**OCEAN FREIGHT
RATES⁴** (.....US\$/ton.....)

From US Gulf to Egypt	15.1	19.0	16.8	12.8	14.6	12.3
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¹ Data refer to the calendar year of the first year shown.

² Data refer to the calendar year of the second year shown.

³ Stock data are based on an aggregate of carryovers at the end of national crop years.

⁴ July/June.

⁵ Average of quotations for January-July 1997.

⁶ Change from corresponding period of previous year for which figures are not shown.

Source: FAO, 1997.

Table 1.0.8. Areas of rice harvested, production and yields per unit of area in Africa in 1969-71, 1979-81 and 1988-90 and changes in yields for the period 1969-71 to 1988-90.

Country	Area harvested [1000ha]						Production [1000t]					Yield [kg/ha]		
	69-71			79-81			69-71			79-81			69/70-88/90	
	69-71	79-81	88-90	69-71	79-81	88-90	69-71	79-81	88-89	69-71	79-81	88-89	[kg/ha]	[%]
Group A countries (<1,800 kg/ha)														
Angola	21	20	18	25	20	19	1 188	1 000	1 037	-51	-13			
Benin	3	8	7	4	10	10	1 372	1 171	1 351	-21	-2			
Central African Rep.	14	14	11	9	13	14	649	997	1 374	725	112			
Comoros	9	12	10	9	14	15	1 037	1 117	1 461	424	41			
Congo	3	4	4	3	3	1	887	734	212	-675	-76			
Cote d'Ivoire	286	383	545	335	438	644	1 168	1 147	1 180	12	1			
Gambia	28	23	16	39	37	23	1 414	1 620	1 479	65	5			
Ghana	55	107	58	55	89	77	1 000	837	1 397	397	40			
Guinea	411	486	584	364	438	482	886	900	825	-61	-7			

25/10/2011

Annex 1.0

Guinea Bissau	30	70	91	30	52	156	994	724	1 758	764	77
Liberia	154	203	206	184	254	243	1 194	1 251	1 156	-38	-3
Malawi	23	37	26	23	39	40	1 032	1 153	1 569	537	52
Mali	158	164	228	161	169	334	1 017	1 043	1 463	446	44
Mozambique	76	92	108	99	74	95	1 304	908	874	-430	-33
Sierra Leone	33	403	320	474	504	433	1 431	1 250	1 356	-75	-5
Sudan	4	11	1	5	9	1	1 113	859	1 000	-113	-10
Togo	25	18	22	18	15	27	709	800	1 222	513	72
Uganda	16	12	19	11	16	26	723	1 348	1 351	628	87
Zaire	236	293	372	178	236	338	755	805	911	156	21
Zambia	1	5	11		2	10	451	510	926	475	105
Overall	1 884	2 365	2 657	2 026	2 432	2 990	1 075	1 028	1 125	50	5

Group B countries (1,800-3,500 kg/ha)

Algeria	1		1	3	1	1	1 632	2 738	2 670	38	1
Burkina Faso	40	39	21	35	44	41	869	1 152	1 980	111	128
Burundi	3	4	11	5	13	35	1 605	3 095	3 094	1 489	93
Cameroon	16	21	13	13	48	38	844	2 278	2 850	2 006	238
Chad	44	43	21	42	39	64	963	926	3 020	2 057	214
Gabon					1	1	1 664	2 306	1 999	335	20
Madagascar	992	1 182	1 136	1 894	2 055	2 310	1 911	1 738	2 033	122	6
Niger	16	21	32	34	31	72	2 090	1 517	2 268	178	9

25/10/2011	Annex 1.0										
Nigeria	2/2	517	880	352	1 027	1 967	1 293	1 975	2 235	942	73
Rwanda	1	1	3	1	5	9	2 168	3 162	2 759	591	27
Senegal	91	74	77	118	96	157	1 293	1 288	2 039	746	58
Somalia		5	6		16	16		2 957	2 810		
South Africa 1	1	1	2	3	3	1 538	2 308	2 308		770	50
Tanzania	144	267	365	172	251	692	1 189	949	1 892	703	59
Zimbabwe	3	1		5		1	1 731	588	2 800	1 069	62

Overall 1 624 2 176 2 567 2 676 3 630 5 407 1 648 1 668 2 106 458 28

Group C countries (>3,500 kg/ha)

Egypt	487	416	403	2 567	2 376	2 357	5 275	5 707	6 280	1 005	19
Kenya	6	8	14	27	39	54	4 749	4 661	3 823	-926	-9
Mauritania	1	3	13	1	12	53	1 008	3 660	3 947	2 939	292
Morocco	6	6	6	31	22	23	5 264	3 937	4 959	-305	-6
Swaziland	3	2		7	4	3	2 951	2 588	7 500	4 549	154

Overall 503 435 436 2 633 2 453 2 670 5 235 5 639 6 119 885 17

Africa, Overall 4 011 4 976 5 660 7 335 8 515 11 064 1 829 1 711 1 955 126 7

Source: Oerke, 1994. Table 1.0.9. Areas of rice harvested, production and yields per unit of area in the Americas in 1969-71, 1979-81 and changes in yields in the period 1969/71 to 1988/90.

Country	Area harvested [1000ha]	Production [1000t]
---------	----------------------------	-----------------------

Yield

[kg/ha]

69/70-88/90

	69-71	79-81	88-90	69-71	79-81	88-90	69-71	79-81	88-9	[kg/ha]	[%]
North America											
United States	777	1 345	1 133	3 953	6 968	7 096	5 087	5 167	6 266	1 179	23
Central America											
Belize	2	3	2	4	9	6	1 753	2 581	2 758	1 005	57
Costa Rica	44	73	62	88	224	217	2 019	3 123	3 480	1 461	72
Cuba	164	146	166	309	455	508	1 884	3 106	3 058	1 174	62
Dominican Republic	80	111	101	206	392	433	2 560	3 533	4 277	1 717	67
El Salvador	12	15	15	45	56	60	3 617	3 727	4 138	521	14
Guatemala	11	14	19	25	37	53	2 187	2 819	2 907	720	33
Haiti	38	51	47	81	119	110	2 140	2 324	2 344	204	10
Honduras	11	20	17	15	35	47	1 304	1 740	2 894	1 590	122
Jamaica		1		1	2	2	1 513	2 379	3 360	1 847	122
Mexico	152	153	137	390	528	490	2 560	3 447	3 602	1 042	41
Nicaragua	26	37	38	77	130	104	3 005	3 521	2 710	-295	-10
Panama	105	101	85	144	175	190	1 376	1 766	2 226	850	62
Puerto Rico	3	1	.	2	6	1	727	9 141	5 684	4,957	682

25/10/2011
Trinidad &
Tobago

Annex 1.0

	4	3	4	10	10	10	2 707	3 360	2 689	-18	-1
Overall	652	729	694	1 397	2 178	2 230	2 143	2 988	3 215	1 072	50

South America

Group A countries (<3,500 kg/ha)

Bolivia	54	60	103	80	91	198	1 479	1 505	1 916	437	30
Brazil	4 788	5 932	5 052	6 847	8 533	10 088	1 430	1 436	1 988	558	39
Ecuador	78	123	276	165	378	861	2 109	3 063	3 118	1 009	48
Guyana	109	91	93	195	252	493	1 800	2 779	2 065	265	15
Paraguay	19	26	33	40	47	84	2 138	1 832	2 575	437	20
Venezuela	120	214	116	208	638	365	1 724	2 999	3 164	1 440	81
Overall	5 168	6 446	5 674	7 535	9 939	11 789	1 458	1 542	2 058	620	43

Group B countries (>3,500 kg/ha)

Argentina	89	89	105	347	288	450	3 901	3 261	4 308	407	10
Chile	23	40	38	60	125	161	2 622	3 121	4 217	1 595	61
Colombia	260	428	462	756	1 831	1 998	2 911	4 279	4 408	1 497	51
Fr. Guiana	130	1	4	0	1	17	1 652	4 136	4 286	2 634	159
Peru	130	132	206	539	280	1 062	4 141	4 467	5 154	1 013	24
Suriname	37	65	69	132	258	263	3 539	3 979	3 841	302	9

25/10/2011	Annex 1.0										
Uruguay	34	63	95	132	289	478	3 897	4 569	5 018	1 121	29
Overall	573	818	979	1 966	3 372	4 430	3 431	4 122	4 523	1 092	32
South America	5 741	7 264	6 653	9 501	13 311	16 219	1 655	1 832	2 438	783	47
America, Overall	7 170	9 338	8 480	14 851	22 457	25 545	2 071	2 405	3 012	941	45

Source: Oerke, 1994.

Table 1.0.10. Areas of rice harvested, production and yields per unit of area in Europe and the U. S. S. R.(CIS) in 1969-71, 1979-81 and 1988-90 and changes in yields in 1969/71 to 1988/90.

Country	Area harvested [1000ha]						Production [1000t]					Yield [kg/ha]
	69-71	79-81	88-90	69-71	79-81	88-90	69-71	79-81	88-9	69/70-88/90 [kg/ha] [%]		
Group A countries (<4,500 kg/ha)												
Albania	4	4	3	13	14	9	3 122	3 535	2 864	-258	-8	
Bulgaria	17	16	13	64	71	37	3 849	4 339	3 022	-827	-21	
Hungary	21	16	12	54	35	37	2 252	2 126	3 520	1 268	56	

25/10/2011

Annex 1.0

Portugal	40	52	55	111	151	147	4 580	4 502	4 490	110	5
Romania	28	21	51	67	49	86	2 371	2 353	2 684	313	13
Overall	113	89	112	375	306	318	3 319	3 438	2 836	-482	-15
Group B countries (>4,500 kg/ha)											
France	22	6	17	88	25	90	4 064	3 918	5 397	1 333	33
Greece	17	17	18	84	84	109	4 826	4 884	6 167	1 341	28
Italy	172	176	206	858	989	1 207	4 976	5 606	5 855	879	18
Spain	63	69	76	384	435	473	6 105	6 331	6 193	88	1
Yugoslavia	7	9	7	32	39	34	4 263	4 606	4 379	416	10
Overall	281	277	323	1 446	1 572	1 913	5 146	5 675	5 923	777	15
Europe, Overall	394	366	435	1 821	1 878	2 231	4 622	5 131	5 128	506	11
U. S. S. R. (CIS)	356	637	646	1 272	2 558	2 633	3 573	4 014	4 076	503	14

Source: Oerke, 1994.

Table 1.0.11. Rice production in Indonesia.

	1987/88	1988/89	1989/90	1990/91	1991/92	1991/93*
Harvested area	9 923 0	10 136 0	10 531 0	10 502 0	10 281 0	10 644 0

25/10/2011	Annex 1.0					
Harvested area (million ha.)	9,929.0	10,130.0	10,331.0	10,302.0	10,201.0	10,044.0
Increase/(decrease)		2.1	3.7	(0.3)	(2.1)	3.4
Productivity (tons/ha)	4,039.0	4,111.0	4,247.0	4,302.0	4,350.0	4,382.0
Increase/(decrease)		1.8	3.2	1.3	1.1	0.7
Production (million tons)	27,253.0	28,340.0	30,413.0	29,338.0	29,047.0	30,318.0
Increase/(decrease)		3.8	6.8	(3.7)	(1.0)	4.2

Source: CBS, Indonesia

Table 1.0.12. Rice, evolution of yields in Asia (t/ha).

Country	1961-63	1969-71	1979-81	1988-90	2010
Bangladesh	1.67	1.68	1.95	2.47	3.78
Cambodia	1.05	1.45	1.01	1.35	1.55
China	2.35	3.28	4.24	5.51	-
India	1.50	1.67	1.86	2.59	2.86
Indonesia	1.76	2.35	3.26	4.22	5.23
Korea, Rep of	4.04	4.63	5.51	6.40	6.55
Laos	0.87	1.31	1.42	2.22	2.55
Malaysia	2.11	2.40	2.84	2.78	3.10
Myanmar	1.62	1.671	2.70	2.92	3.40
Pakistan	1.39	2.25	2.47	2.32	3.50
Philippines	1.24	1.68	2.21	2.72	3.99
Thailand	1.75	1.93	1.89	2.07	3.12

Vietnam 2.01 2.05 2.12 2.13 4.95

^a Not available

Source: FAO as cited by Mazaud, 1996.

Table 1.0.13. Rice, production of the principal Asian countries ('000 t) historical data and projections.

Country	1961-63	1969-71	1979-81	1989-90	1990-91	2010
Bangladesh	14 555	16 540	20 125	26 045	26 980	40 840
Cambodia	2 348	3 016	1 248	2 557	2 294	2 193
China	63 463	106 753	142 538	179 524	184 425	-
India	52 939	62 861	74 557	109 399	110 806	15 900
Indonesia	12 228	19 136	29 570	43 860	44 860	62 242
Korea, Rep of	4 611	5 574	6 780	8 027	7 705	7 945
Laos	523	870	1 025	1 300	1 373	2 228
Malaysia	1 135	1 696	2 053	1 860	1 980	1 840
Myanmar	7 432	8 107	12 637	13 647	13 658	21 000
Pakistan	1 707	3 431	4 884	4 841	4 862	7 525
Philippines	3 907	5 456	7 747	9 250	9 484	15 526
Thailand	11 190	13 668	16 967	19 686	19 398	31 516
Vietnam	9 456	9 812	11 808	18 407	19 281	31 982

Source: FAO as cited by Mazaud, 1996.

Table 1.0.14. Food supply in selected Asian countries.

Country	Kilocalories /person /day					All cereals kg/person/year (milled rice included)				
	1961-63	1969-71	1979-81	1988-90	2010	1961-63	1969-71	1979-81	1988-90	2010
Bangladesh	2107	2117	1910	1949	2075	176	173	162	165	173
China	1664	2000	2238	2624	3136	124	153	190	211	221
India	2045	2037	2078	2309	2492	144	147	150	161	164
Indonesia	1839	2053	2448	2628	3040	101	125	158	177	192
Japan	2505	2678	2747	2903	3145	159	148	144	142	129
Korea, Rep of	2216	2819	3120	3283	3324	179	216	201	195	158
Malaysia	2343	2471	2695	2712	3156	152	154	150	128	127
Pakistan	1797	2177	2151	2345	2524	118	152	140	149	141
Philippines	1700	1766	2204	2292	2598	109	112	131	146	154
Thailand	2040	2185	2224	2333	2900	146	157	149	141	138
Vietnam	2065	2189	2103	2182	2519	168	178	157	159	172

Source: Mazaud, 1996.

PAGE < TOC PAGE >

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PAGE < TOC PAGE >

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Annex 2.0

TABLES ON WORLD RICE TRADE

Table 2.0.1. Current information on world imports and exports of milled rices.

IMPORTS EXPORTS

Region/Country	Rice (milled)			Rice (milled)		
	1996	1997 estimate	1998 forecast	1996	1997 estimate	1998 forecast
	(.....million tons)					
ASIA	10.0	8.4		14.4	12.4	
Bangladesh	0.5	0.2				
China ¹	0.8	0.6		0.3	0.5	
Hong Kong	0.3	0.3				
India	-	-		3.6	1.7	
Indonesia	1.2	0.6		-	-	
Iran, Islamic Rep. of	1.3	1.2				
Japan	0.5	0.5		0.1	0.3	
Korea, D.P.Rep.	0.1	0.1		-	-	

25/10/2011

Annex 1.0

korea, rep. of	0.1	0.1		
Malaysia	0.6	0.5		
Myanmar			0.3	0.1
Pakistan	-	-	1.7	1.7
Philippines	0.9	0.7		
Saudi Arabia	1.0	0.9	-	-
Singapore	0.3	0.3		
Sri Lanka	0.3	0.3		
Syria	0.2	0.2		
Yemen	0.2	0.2		
Thailand			5.3	4.8
Turkey			-	-
Viet Nam			3.1	3.2
AFRICA	3.8	3.9	0.3	0.3
South Africa				
North Africa	0.1	0.2		
Algeria	-	-		
Egypt	-	-	0.3	0.3
Morocco	-	-		
Tunisia	-	-		
Sub-Saharan Africa	3.6	3.7		
Cote d'Ivoire	0.4	0.4		
Ethiopia	-	-		
Kenya	-	0.1		

Madagascar	-	0.5
Senegal	0.5	0.5
Sudan	-	-
Zimbabwe		

Table 2.0.1. Current information on world imports and exports of milled rices (continued).

Region/Country	Rice (milled)			Rice (milled)		
	1996	1997 estimate	1998 forecast	1996	1997 estimate	1998 forecast
	(.....million tons))					
CENTRAL AMERICA	1.4	1.3		-	-	
Mexico	0.3	0.3				
	1.4	1.6		1.4	1.6	
SOUTH AMERICA						
Argentina				0.4	0.4	
Brazil	0.9	1.1				
Colombia	0.1	0.1				
Peru	0.4	0.4				
Surinam				0.1	0.1	
Uruguay				0.5	0.7	
Venezuela	-	-				
NORTH AMERICA	0.5	0.6		0.6	0.5	

25/10/2011	Annex 1.0					
	2.0	2.5				
AMERICA	0.5	0.0				
Canada						
United States			2.6	2.5		
EUROPE	1.1	1.0	0.2	0.2		
EC	0.7	0.7	0.2	0.2		
Hungary			-	-		
Poland			-	-		
Romania			-	-		
CIS	0.5	0.4	-	-		
OCEANIA	0.3	0.3	0.6	0.7		
Australia			0.6	0.7		
WORLD	19.1	17.5	18.1	19.5	17.7	18.1
Developing countries	15.9	14.4	15.1	15.9	14.0	14.5
Developed countries	3.2	3.1	3.0	3.6	3.7	3.6

Source: FAO, 1997.

Table 2.0.2. Historical information on production and trade of rice.

Production (paddy)¹ million tons Retained imports (milled)² million tons

1989 1990 1991 1992 1989 1990 1991 1992

25/10/2011

Annex 1.0

World total	515.8	523.3	519.7	527.0	World total	13.8	11.1	11.7	12.9
Developing Countries	491.0	497.6	494.9	499.3	Developing Countries	11.4	9.1	9.5	10.1
Latin America	19.7	15.9	17.7	18.9	Latin America	1.2	1.5	1.9	1.6
Africa	8.7	9.1	9.6	9.6	Africa	2.8	2.5	2.9	2.7
Asia	462.6	472.6	467.6	470.8	Cote d'Ivoire	0.4	0.4	0.4	0.4
China	182.8	193.0	186.4	191.6	Senegal	0.4	0.3	0.4	0.4
India	110.3	112.0	110.9	107.0	Asia	7.2	4.9	4.4	5.6
Indonesia	44.7	45.2	44.3	45.7	Hongkong	0.3	0.3	0.3	0.4
Thainland	20.6	17.2	20.3	20.0	India	0.5	0.1	0.1	0.3
Developed countries	24.8	25.7	24.8	27.7	Indonesia	0.4	0.0	0.2	0.6
United States	7.0	7.1	7.0	7.5	Iran	0.8	0.9	0.6	0.7
					Iraq	0.7	0.4	0.3	0.5
					Malaysia	0.4	0.3	0.4	0.5
					Singapore	0.2	0.2	0.2	0.3
					Developed countries	2.4	2.0	2.2	2.8

Exports (milled)^{2/3} million tons Value of exports

	1989	1990	1991	1992 prov		1989	1990	1991	1992 prov
World total	13.9	11.4	12.0	13.0	World total	4,967	4,071	4,376	-
Developing countries	10.1	8.1	8.8	9.9	Developing countries	3,128	2,376	2,637	-

25/10/2011

Annex 1.0

Latin America	0.6	0.6	0.6	0.5	Latin America	199	206	203	-
Asia	9.4	7.5	8.1	9.2	Africa	7	12	25	-
India	0.5	0.5	0.7	0.4	Asia	2,914	2,138	2,358	-
Pakistan	0.8	0.9	1.3	1.4	India	256	258	270	-
Thailand	6.0	3.9	4.0	4.9	Pakistan	310	242	345	-
Vietnam	1.4	1.7	1.0	1.4	Thailand	1,769	1,086	1,196	-
Developed countries	3.9	3.3	3.2	3.1	Vietnam	290	305	188	-
United States	3.0	2.4	2.2	2.1	Developed countries	1,839	1,695	1,739	-

¹ Production data refer to the calendar in which the harvest or bulk of the harvest took place.

² Excluding trade between EC member countries.

³ Excluding re-exports.

Source: Yap, C. H., 1992.

Table 2.0.3. Production and demand in selected regions by the year 2000 (million tons milled rice)¹.

Region	Production			Demand		
	1987-89	2000	Growth (%)	1987-89	2000	Growth (%)
World	325	409	1.9	324	406	1.9
Africa	6	9	4.2	8	13	4.2
Latin America	12	16	2.3	13	17	2.5
Near East	3	4	0.6	6	8	2.2
Far East	285	360	1.9	279	349	1.8

25/10/2011					Annex 1.0	
North America	5	6	1.8	3	5	4.3
Western Europe	1	2	2.1	2	3	2.2

¹ These are preliminary projections which may be further revised, following consideration of the impact of supply and demand of other food crops. The figures given here are stated in round numbers. Only the main regions are shown.

Source: Yap, C. H., 1992.

Table 2.0.4. Imports and exports by the year 2000 (million tons milled rice)¹.

Region	Imports			Exports		
	1987-89	2000	Growth (5)	1987-89	2000	Growth (5)
World	12.3	17.1	2.8	13.0	17.1	2.3
Africa	2.6	4.0	4.0	-	-	-
Latin America	1.0	1.6	4.3	0.4	0.7	5.7
Near East	2.6	4.3	4.3	-	-	-
Far East	3.0	3.1	0.3	8.4	12.6	3.4
North America	0.3	0.4	2.8	2.5	2.1	1.8
Western Europe	1.6	2.0	2.0	1.1	1.3	1.7

¹ These are preliminary projections which may be further revised, after a fuller consideration of the impact of supply and demand of other food crops. The figures given here are rounded numbers and hence may not add up. Only the main regions are shown in the table.

Source: Yap, C. H., 1992.

Table 2.0.5. Selected world rice exports (thousand tons).

Year	1980	1985	1990	1995	2000
World	1000	1000	1000	1000	1000

25/10/2011	Annex 1.0			
Country	1989	1990	1991	1992 (Forecast in April)
World	15,100	12,054	12,925	13,400
1. Thailand	6,036	3,937	3,989	4,400
2. U.S.	2,973	2,424	2,194	1,900
3. Vietnam	1,400	1,500	1,244	1,500
4. EC 12	963	969	990	1,000
5. Pakistan	779	904	1550	1,250
6. Burma	456	186	165	250
7. India	450	420	628	750
8. China	320	300	689	700
9. Uruguay	251	250	262	350
10. Korea, N.	175	75	-	-
11. USSR	150	150	100	50
12. Taiwan	68	50	200	200

Source: *Iamsuri, 1992.*

Table 2.0.6. Rice export of Thailand in tons from 1960-1992.

Quality	1992	1991	1990	1989	1988	1980	1970	1960	Quality
White rice, 100%	1,035,996	1,447,367	1,643,078	1,736,548	1,335,726	766,883	241,268	202,319	White rice, 100%
White rice, 5%	201,212	289,723	309,514	437,608	206,789	178,471	11,299	147,676	White rice, 5%
White rice,	87,059	126,540	214,898	574,427	178,774	314,716	6,922	31,443	White rice,

25/10/2011

Annex 1.0

	100%	15%	20%	25%	Parboiled	A-1 Brokens	Glutinous	Cargo rice	Others	Total	Percent Exports by Region	Region
White rice,	457,432	338,444	89,341	182,631	260,056	49,412	30,794	49,112	100%	White rice,		100%
White rice,	4,768	4,520	23,557	20,812	2,191	-	327,582	30		White rice,		15%
White rice,	355,536	169,617	256,962	1,083,127	1,140,069	452,053	1,504	1,886		White rice,		20%
White rice,	36,819	90,499	197,795	759,764	223,027	-	856	1,886		White rice,		25%
Special Mix	-	-	-	-	-	505,947	182,344	268,000		Special Mix		
Broken	92,403	108,682	114,838	114,866	137,732	82,206	58,261	53,900		Broken		
Glutinous	586,243	726,127	677,207	750,877	758,839	292,281	156,154	179,039		Glutinous		
Parboiled	31,871	54,430	24,383	6,466	26,241	26,986	5,488	9,299		Parboiled		
Brown	3,153,295	3,993,454	3,926,754	6,037,023	4,782,832	2,668,955	1,022,472	1,190,274		Brown		
Total										Total		

Source: Iamsuri, 1992.

Table 2.0.7. Average white rice exports of Thailand by grade and region.

Region	100%	5-15%	25%	Parboiled	A-1 Brokens	Glutinous	Cargo rice	Others	Total	Percent Exports by Region	Region
Asia											Asia
1975 - 78	19.20	22.22	26.82	9.49	13.93	7.10	0.05	1.19	100.00	60.3	1975 - 78
1979 - 85	33.07	14.88	21.72	4.99	12.47	12.56	0.10	0.21	100.00	42.2	1979 - 85
Africa											Africa
1975 - 78	1.73	8.76	4.66	54.06	17.96	nil	4.01	8.82	100.00	26.2	1975 - 78
1979 - 82	0.56	16.61	1.95	29.92	45.46	0.06	0.60	4.84	100.00	28.2	1979 - 82
Middle East											Middle East

25/10/2011

Annex 1.0

1975 - 78	37.18	13.30	0.39	47.39	0.15	0.02	1.06	0.51	100.00	10.0	1975 - 78
1979 - 82	69.32	11.00	0.06	17.28	0.42	0.36	0.36	1.20	100.00	16.2	1979 - 82
Europe & USSR (CIS)											
1975 - 78	20.23	21.11	3.75	10.17	23.83	1.18	19.73	-	100.00	1.2	1975 - 78
1979 - 82	19.67	47.71	12.37	2.73	10.32	0.36	6.84	-	100.00	9.3	1979 - 82
Western Hemisphere											
1975 - 78	1.64	46.20	37.37	2.28	4.42	0.25	0.25	7.23	100.00	1.0	1975 - 78
1979 - 82	2.45	83.56	3.13	3.48	1.71	3.55	0.11	2.01	100.00	4.3	1979 - 82
<u>Total</u>											
1975 - 78	16.42	17.93	17.86	25.56	13.55	4.31	1.51	3.16	100.00	100.00	1975 - 78
1979 - 82	27.26	20.78	11.01	13.68	19.09	5.56	0.91	1.71	100.00	100.00	1979 - 82

Source: Efferson, 1985.

Table 2.0.8. Variations in rice prices by grade during 1981 to 1984.

Grade	Price per metric ton (US \$) Index (1 st price = 100)					
	Sep 1981			Jun 1984		
	Jul 1982	Jun 1984	Sep 1981	Jul 1982	Jun 1984	
C. & F. Prices, Rotterdam						
U. S. #2, milled 4% broken, 1 bags	600	507	529	100	100	100
U. S. #3, milled 10% broken, in bags	584	480	507	97	95	96
U. S. #3, milled 15% broken in bags	562	472	490	94	93	93

	Annex 1.0					
U. S. #2, brown	460	365	356	77	62	67
4% broken, bulk						
Thai 100% Grade A, in bags	579	349	363	96	69	67
Thai 100% Grade B, in bags	575	320	318	96	63	69
Thai 100% Grade C, in bags	552	317	316	92	62	60
Thai 100% Grade B, brown, bulk	365	295	288	61	58	54
Uruguay brown, bulk	460	360	350	77	71	66
Thai A - 1 Super, broken	300	300	274	50	59	52

Source: Efferson, 1985.

Table 2.0.8. Variations in rice prices by grade during 1981 to 1984 (continued).

Grade	Price per metric ton (US \$)			Index (1 st price = 100)		
	Sep 1981	Jul 1982	Jun 1984	Sep 1981	Jul 1982	Jun 1984
	FOB Export Prices, Bangkok					
White rice, 100%						
1 st grade	530	330	300	100	100	100
White rice, 100%						
2 nd grade	510	300	265	96	91	88
White rice, 100%						

				Annex 1.0		
25/10/2011				96	90	87
3 rd grade	507	297	260			
White rice, super						
5% brokens	505	290	257	95	88	86
White rice,						
5% brokens	465	276	255	88	89	85
White rice,						
10% brokens	440	268	250	83	81	83
White rice,						
15% brokens	420	260	215	79	79	62
Glutinous,						
10% brokens	470	285	220	78	86	73
Brown rice,						
2 nd grade	232	200	218	44	61	73
White brokens,						
A-1 super	285	275	265	54	83	88

Source: Efferson, 1985.

Table 2.0.9. Importers of rice from Thailand as of Jan-July 1992.

1. Africa E.	21. Denmark	41. Israel	61. Mozambique	81. Sweden
2. Africa S.	22. Djibouti	42. Italy	62. Netherlands	82. Switzerland
3. Africa W.	23. Egypt	43. Ivory Coast	63. New Zealand	83. Syria
4. Angola	24. Ethiopia	44. Japan	64. Nigeria	84. Tahiti
5. Australia	25. Fiji Island	45. Jordan	65. Norway	85. Taiwan

6. Austria	26. Finland	46. Kenya	66. Oman	86. Tanzania
7. Bahrain	27. France	47. Korea S.	67. Peru	87. Tobago
8. Belgium	28. Gabon	48. Kuwait	68. Philippines	88. Tongo
9. Benin	29. Germany	49. Lebanon	69. Poland	89. Tunisia
10. Brunei	30. Ghana	50. Macau	70. Qatar	90. Turkey
11. Burkina	31. Greece	51. Madagascar	71. Reunion	91. United Arab
12. Cambodia	32. Guadeloupe	52. Malaysia	72. Romania	92. UK
13. Cameron	33. Guinea	53. Malta	73. Sao Tome	93. U. S.A.
14. Canada	34. Guinea Bisau	54. Marianas	74. Saudi Arabia	94. Yemen
15. Cape Verde	35. Guyana	55. Mauritania	75. Senegal	95. Yugoslavia
16. China	36. Hongkong	56. Mauritius	76. Sierra	96. Zaire
17. Columbia	37. Hungary	57. Martinique	77. Singapore	
18. Comoros	38. Iceland	58. Mayotte	78. Somalia	
19. Congo	39. Indonesia	59. Mexico	79. Spain	
20. Cyprus	40. Iran	60. Morocco	80. Sri Lanka	

Source: *lamsuri*, 1992.

PAGE < TOC PAGE >

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PAGE < TOC PAGE >

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Annex 2.2

TABLES ON RICE QUALITY

Table 2.2.1. Specification for rice - Fair Average Quality (FAQ).

Constituents of admixtures of impurities	Tolerance limit (%)	Rejection limit (%)
Broken		
Raw: Over 1/4 th to 3/4 th with opening	17.00	25.00
1/8 th to 1/4 th	3.00	5.00
	20.00	30.00
Heated: Over 1/4 th to 3/4 th	12.00	20.00
1/8 th to 1/4 th	3.00	5.00
	15.00	25.00
Foreign matter		
(a) Inorganic		
Raw	0.20	0.50
Boiled	0.10	0.50

25/10/2011

Annex 1.0

(b) Organic	Raw	0.50	1.00
	Boiled	0.25	1.00
Damaged grains	Raw	2.00	4.00
	Boiled	2.00	4.00
Chalky grains	Raw	4.00	8.00
	Boiled	-	-
Discoloured grains	Raw	2.00	4.00
	Boiled	3.00	5.00
Red grains	Raw	4.00	8.00
	Boiled	4.00	8.00
Admixture of inferior varieties	Raw	10.00	15.00
	Boiled	10.00	15.00
De-huskedGrains	Raw	10.00	20.00
	Boiled	10.00	20.00
Moisture	Raw	14.00	16.00
	Boiled	15.00	16.00

Table 2.2.1. Specification for rice - Fair Average Quality (FAQ) (continued).

Commodity	Pesticide	Maximum residue limit
Raw cereals	Azinphosmethyl	0.20
	Dichlorvovs	2.00
	Fenithrothion	10.00
	Heptachlor	0.02
	Hydrogen cyanide	75.00
	Hydrogen phosphide	0.10
	Lindane	0.50

Malathion	8.00
Phosphomidon	0.10
Piperonyl butoxide	20.00
Pyrethrins	3.00
Thiobendazole	0.20
Trichlorfon	0.10
Thiophanate-methyl	0.50
Thiometon	0.05
Campechor	0.10
Chinomethionat	0.10
Pirimiphos-methyl	10.00
Quozatine	0.10
Triforine	0.10
Aldrin + dieldrin	0.02 (except rice in the husk)
Bromophos	10.00
Disulfoton	0.20 (except rice and maize)
Chlorpyrifos-methyl	0.10
Carbaryl	5.00

Table 2.2.1. Specification for rice - Fair Average Quality (FAQ) (continued).

Commodity	Pesticide	Maximum residue limit
Rice in the husk	Aldrin-dieldrin	1.02
	Chlorpyrifos	1.10
	Diquat	5.00
	Endosulfan	0.10

	Fentin	0.10
	Paraquat	10.00
	Disulfoton	0.50
Rice, hulled	Diquat	0.20
	Propoxur	0.10
	Pirimiphos-methyl	2.00
	Endrin	0.02
	Iprodione	3.00
Rice, polished	Chlordane	0.05
	Diazinon	0.10
	Paraquat	0.50
	Pirimiphos-methyl	1.00
	Edifenphos	0.02

Note: This list covers only those maximum residue limits (MRLs) recommended by the Codex Alimentarius Commission as of 1983. Limits for other pesticides are under consideration, and those exceeding limits are always under review. The latest information on the situation concerning MRLs for pesticides may be obtained from the Chief, FAO/WHO Food Standards Programme, Food and Agriculture Organization of the United Nations, Rome, Italy.

Source: FAO

Table 2.2.2. Specifications for paddy - Fair Average Quality.

Constituents of admixtures or impurities	Tolerance limit (%)	Rejection limit (%)
Foreign matter:		
(a) Inorganic	1.0	2.0
(b) Organic	1.0	4.0
Admixture of lower grades	10.0	25.0
Damaged, weeviled, immature.	3.0	6.0

shrunken, sprouted and discoloured grains
Moisture

15.0

18.0

Table 2.2.3. Rice-grain apparent amylose content (AC) type preferred in various Asian countries.

Waxy	Low AC	Intermediate AC	High AC
Laos	China (Japonica)	Cambodia	Bangladesh
Thailand	China-Taiwan (Japonica, Indica)	China (Japonica)	China (Indica)
	Japan	India (<i>Basmati</i>)	India
	Korea, South	Indonesia	Pakistan
	Nepal	Malaysia	Philippines
	Thailand (Northeast)	Myanmar	Sri Lanka
		Pakistan (<i>Basmati</i>)	Thailand (North, Central, South)
		Philippines	
		Thailand (Central)	
		Vietnam	

Source: Juliano and Duff 1991; Juliano and Villareal 1993.

Table 2.2.4. Comparison of properties, and energy and utilization in rats, of four yellow milled rice from stackburning of unthreshed panicles plus straw with those of ordinary milled rice.

Property (at 14% moisture)	Yellow rices	White rices
Crude protein (% N x 6.25)	7.4	8.7
Lysine (g/16 g N)	3.1	3.5
Amino acid score (%)	56	64
Energy content (kl/g)	15.4	15.4
Balance data in growing rats		
Digestibility energy (% of intake)	96.0	96.6
True digestibility (% of N intake)	92.0	98.4
Biological value (% of absorbed N)	66.4	67.2
	61.0	66.1
Net protein utilization (% of N intake)		
	52	63
Protein quality ^b (%)		

^a Based on 5.5% lysine as 100% (WHO 1985)

^b Based on amino acid score x TD/100 (FAO 1990)

Source: Eggum et. al 1984; Juliano 1985.

Table 2.2.5. Effects of the environment, processing, and variety on grain quality at different steps in the post-harvest system.

Postharvest process	Environment	Postharvest handling	Variety	Remarks
Harvesting	+	+	+	Growth duration; photoperiod; degree of

				ripeness; dormancy
Threshing	+	+	+	Threshability; shattering
Drying	+	+	+	Crack resistance
Stackburning	+	+	0	Yellowing
Mycotoxins	+	+	+	Hull/husk tightness
Storage/aging	+	+	+	
Pests	+	+	+	Hull tightness, etc.
Dehulling	0	+	+	Hull tightness/content
Milling	+	+	+	Crack resistance
Marketing				
Size and shape	+	0	+	Genetically determined
Degree of milling (whiteness)	+	+	+	Depth of grooves
Head rice	+	+	+	Crack resistance
Translucency	+	+	+	
Aroma	+	+	+	
Pecky grains	+	+	+	Stink bug resistance
Foreign matter	+	+	0	
Shelf life	+	+	0	
Cooking and eating				
Amylose content	+	0	+	Vol. Expansion; texture
Gelatinisation temperature	+	0	+	Cooking time; texture
Gel consistency	+	0	+	Cooked rice hardness
Texture of cooked rice	+	+	+	
Grain elongation	+	+	+	

25/10/2011

Annex 1.0

Grain elongation	+	+	+	
Nutrition				
Protein content	+	+	+	
Vitamin A content	+	+	+	Yellow maize
Oil quality	+	+	+	Unsaturated fatty acids
Seed	+	+	+	Viability, vigour

Source: Juliano and Duff 1991a; Juliano 1993.

Table 2.2.6. Manifestations of quality deterioration in rice at different stages of post-harvest handling chain (from harvest to market).

Postharvest operation	Quality deterioration indicator
Harvesting	Immature grains
	Unfilled grains
	Chalky kernels
	Weed seed and other crop seeds
	Insect/fungus-damaged grains
Field drying	Cracked kernels
	Water-damaged grains
	Germinated grains
Field stacking	Discolored grains
	Insect-damaged grains
	Moldy grains
	Water-damaged grains
	Germinated grains
Threshing	Impurities
	Cracked kernels
Temporary wet storage	Discolored grains

25/10/2011

Annex 1.0

Temporary wet storage

Discolored grains
Insect-damaged grains
Moldy grains
Water-damaged grains
Germinated grains

Drying

Cracked kernels
Impurities

Storage of paddy

Discolored grains
Insect-damaged grains
Moldy grains
Chemical residues

Milling

Broken rice
Impurities
Paddy in milled rice
Red kernels
Low milling degree or whiteness

Storage of milled rice

Yellow kernels
Insect-damaged grains
Moldy grains

Market

Insect-damaged grains
Moldy grains
Aged or malodorous rice
Discolored grains

Source: NAPHIRE, 1997.

Table 2.2.7. Methods of preventing grain deterioration and maintaining rice quality.

Problem	Cause	Solution

Mixed varieties in milling batch	Paddy sourced from different traders or farmers from different areas	Contract growing of rice with the mill giving incentives such as easy-term loans for inputs, assurance of floor gate price based on agreed formula, quality seeds, and technical advice Contract trading where above responsibilities are passed on to traders of paddy
Red rice and other variety admixtures, contamination with weed seeds	Farmers produce their own seeds or have obtained from unreliable sources; farmer indifference Contamination of seeds during handling and planting Germination of residual seeds from previous harvests Pre-mature harvest	Contract growing with seed supply, technical advice and supervision as minimum terms Price incentives for quality paddy harvest Extension work among farmers emphasizing rouging and weeding
Chalky, immature and unfilled grains	Insect, rodent and fungus infestations of rice plants; plant malnutrition; varietal characteristics Prolonged wet weather during rice maturing period causing crop lodging and water-damage to grains	Information on maturity duration of variety and maturity indicators such as clear and firm hulled grain from upper portion of panicle and hard dough stage of grain from base of panicle Apply pest control measures (see section 5); choose good varieties Mechanical harvesting
Grain quality deterioration in the field	Improper field drying	Minimize field drying or confine to dry season; Spread out small bundles in field

Prolonged stacking

Thresh as soon as possible; aerate stacked paddy or make only small stacks

Table 2.2.7. Methods of preventing grain deterioration and maintaining rice quality (continued).

Problem	Cause	Solution
Mechanical damage in threshing	Animal or vehicle trampling, impact threshing and too high speed of threshing drum of mechanical-powered threshers.	Use axial flow thresher or foot threshing method in case of low-volume harvest or for seed grain; avoid beating and animal trampling.
Grain quality deterioration in drying	Delayed and improper sundrying or mechanical drying.	<p>Immediately dry wet grain after harvest, preferably within 24 hours or at least aerate the grain pile to avoid heat accumulation.</p> <p>Avoid overdrying and rewetting of grain as often the case in sundrying system.</p> <p>Avoid fast drying of grain from 18% to 14% moisture content by using low temperature (maximum, 40°C).</p> <p>Practice sanitation during drying to avoid contamination of grains; protect from insects, rodents and birds.</p> <p>Ensure uniform drying by avoiding creation of hot and wet spots and mechanical damage due to handling.</p>
Grain quality deterioration in milling	<p>Fissured grains; improper drying and post drying handling.</p> <p>Immature and chalky grains.</p>	<p>Pay attention to good production, harvesting, and drying practices.</p> <p>Select rice mills recommended for the predominant variety or type</p>

Poor technology.

Improper adjustment of machine

Annex 1.0

(short, medium and long grain; indica or japonica; high or low amylose content).

Technician training in rice milling operation and maintenance.

Practice sanitation during milling and after milling season; general cleaning of mill parts and mill site to prevent harbouring of insects, rodents, birds and fungi (see section 5)

Table 2.2.7. Methods of preventing grain deterioration and maintaining rice quality (continued).

Problem	Cause	Solution
Grain quality deterioration during storage of paddy	Grain moisture content above that of equilibrium with atmospheric conditions - normally 14% in tropical regions.	Practice proper drying; accurately determine and monitor grain moisture content; periodically inspect and sample for infestations - drop sample sack or bag several times to determine infestations of beetles; practice sanitation in storage area and premises.
	Damaged grains.	Proper handling during drying and transport.
	Improper storage structure; inadequate aeration.	Rodent- and insect-proof storage structures; fumigate as and when recommended (see section 5).
	Unevenly dried grain.	Provide aeration to stored grain and stir grain bulk occasionally; keep storage cool and dry.
Grain quality deterioration during	Simultaneous exposure of storage container to different temperatures (e.g. one side of silo or bin exposed to sun).	Turnover stocks fast; do not store too long; practice stock first-in first-out in warehouse management; move stocks in sacks about to discourage pest residence and multiplication.
	Prolonged storage.	Fast turn-over of rice stocks.

25/10/2011

storage of milled
rice

Damaged grains.

Improper storage structure or
container.

Wet and high temperature spots inside
bulk rice due to insect activity and
poor aeration.

Contaminated rice.

Annex 1.0

Reduce damage to grains; grade and clean the rice to remove brokens
and powdery matter.

Aeration.

Sanitation; avoid contamination.

Protection from pests.

Fumigate as and when recommended.

Source: NAPHIRE 1997



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