

PRODUCTION AND CONSUMPTION OF RICE IN THE WORLD

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INTRODUCTION

Rice is a major food crop for the people of the world in general and Asians in particular; nearly 90% of the world's rice is produced and consumed in this region. Furthermore, rice is a staple food for nearly 2.4 billion people in Asia, and except for Pakistan and some parts of India and China, rice provides two thirds of the calories for most Asians with rice-based diets.

Rice cultivation originated in china over 4,000 years ago and remains an important agricultural commodity in many Asian diets. In addition, its low cost and the high caloric value make rice a staple commodity for many poor and developing countries.

Rice from the field is harvested and threshed to produce what is most often called paddy rice or rough rice. Rice is usually harvested at about 18% to 24% moisture and must be dried down to about 12% to 14% so that it can be safely stored. In most developing countries rice is somehow air-dried. The straw and rice can be dried in the field. It is sometimes stacked in a special manner to allow air to pass to through it and cause rain run off quickly. Most often, the paddy rice is spread on some sort of concrete or pavement and raked over until dry. In some developing countries, you will see rice drying all over the roads during harvest season. In more developed countries, rice is dried in farm storage bins that have air chambers underneath that force air to pass up through the rice, or rice is dried in large column dryers where the rice makes two to five passes through the dryer in a continuous flow type system. Drying of the rice (including while in the field prior to harvest) is a critical component in regards to quality. Rice that is cracked during drying will have a lower percentage of head yield and will have a poorer quality after cooking.

PRODUCTION AND CONSUMPTION OF RICE IN THE WORLD

The production and consumption of rice in the world was analyzed for the period from 2008-09 to 2012-13. The production of rice for the above

mentioned period is presented in the Table 1.1 A. Like wise that the descriptive statistics regarding production of rice in the world is presented in Table 1.1A and Table 1.1 C presents data with regard to the prediction in production of rice in the world from 2013-14 up to 2019-20.

Table 1.1A
Production of Rice in World: (000's Tons)

<i>Sl. No.</i>	<i>Countries</i>	<i>2008-09</i>	<i>2009-10</i>	<i>2010-11</i>	<i>2011-12</i>	<i>2012-13</i>
1	Bangladesh	31200	31000	31700	33700	34000
2	Brazil	8570	7929	9300	7888	8160
3	Burma	11200	11642	10528	10816	10666
4	Cambodia	3992	4056	4233	4268	4600
5	China	134330	136570	137000	140700	143000
6	Egypt	4673	4564	3100	4250	4675
7	India	99180	89090	95980	105310	104000
8	Indonesia	38310	36370	35500	36500	37500
9	Japan	8029	7711	7720	7646	7756
10	Korea South	4843	4916	4295	4224	4006
11	Nigeria	2632	2234	2818	2877	2370
12	Pakistan	6900	6800	5000	6200	6000
13	Philippines	10755	9772	10539	10700	11350
14	Thailand	19850	20260	20262	20460	20200
15	Vietnam	24393	24993	26371	27152	27650
16	United States	6546	7133	7593	5866	6334
17	Others	33298	35598	37360	37251	37952
18	World Total	448701	440638	449299	465808	470219

Source: http://www.unido.org/fileadmin/user_media/UNIDO_Worldwide/Offices/UNIDO_Offices/Rice.pdf, pp 8-11.

The data in the above table reveals the production of rice in the world for the past five years, that is, from 2008-09 to 2012-13. As such, the production of rice in the world, except from 2008-09 to 2009-10, has increased gradually. The production of rice decreased by 1.79 per cent in 2009-10 to its previous year and later on it increased by 1.97, 3.67 and 0.95 per cent in 2010-11, 2011-12 and 2012-13 respectively indicating that in 2011-12 it had the highest percentage of increase when compared to other years from 2008-09 to 2012-13. At the same time in 2012-13, the production of rice in the world increased by 4.80 per cent when compared to 2008-09. But with regard to India, it is observed that in 2009-10 and 2012-13 the production of rice has decreased compared to its respective previous years and in rest of the years it has recorded increase in rice production. The data in the Table 1.1 B below represents descriptive statistics regarding production of rice in the world.

Table 1.1B
Descriptive statistics regarding production of Rice in the World: (000's Tons)

<i>Sl. No.</i>	<i>Countries</i>	<i>Average</i>	<i>Std. Dev.</i>	<i>Intercept</i>	<i>Slope</i>	<i>r²</i>	<i>CGR</i>
1	Bangladesh	32320	1423.728	29830	830	0.85	1.73
2	Brazil	8369.4	586.4732	8627.7	-86.1	0.05	-0.98
3	Burma	10970.4	451.6578	11538.6	-189.4	0.44	-0.97
4	Cambodia	4229.8	237.3146	3801.4	142.8	0.91	2.88
5	China	138320	3474.615	131879	2147	0.95	1.26
6	Egypt	4252.4	667.1996	4345.4	-31	0.01	0.01
7	India	98712	6552.905	90954	2586	0.39	0.95
8	Indonesia	36836	1087.258	37283	-149	0.05	-0.43
9	Japan	7772.4	148.8331	7955.7	-61.1	0.42	-0.69
10	Korea South	4456.8	401.1268	5166.6	-236.6	0.87	-3.72
11	Nigeria	2586.2	278.9179	2550.5	11.9	0.00	-2.08
12	Pakistan	6180	762.8892	6900	-240	0.25	-2.76
13	Philippines	10623.2	566.3786	9987.8	211.8	0.35	1.08
14	Thailand	20206.4	222.1144	19936.4	90	0.41	0.35
15	Vietnam	26111.8	1389.357	23509.9	867.3	0.97	2.54
16	United States	6694.4	677.866	7201.7	-169.1	0.16	-0.66
17	Others	36291.8	1888.225	33003.5	1096.1	0.84	2.65
18	World Total	454933	12518.53	434471.2	6820.6	0.74	0.94

Source: Table 1.1A http://www.unido.org/fileadmin/user_media/UNIDO_Worldwide/Offices/UNIDO_Offices/Rice.pdf, pp 8-11.

From the data in the Table 1.1 B, it can be seen that, the average production of rice in the world is 454933000 tons while India's is 98712000 tons which means India is producing around 21.70 per cent of total rice in the world.

The major rice producing countries in the world is China followed by India. These two countries produce about 52 per cent which means more than half of the total rice in the world where China produces about 30 per cent while India produce around 22 per cent of the total rice production of the world.

The average production of rice in the world is 454933000 tons with standard deviation of 12518530 tons. In the same way the average production of China and India are 138320 and 98712 thousand tons with a standard deviation of 3474.62 and 6552.91 thousand tons respectively. This indicates that China is more consistent in production of rice when compared to India. Further, these two major rice producing countries are followed by Indonesia, Bangladesh, Vietnam and Thailand, whose average production is 36836, 32320, 26111.8 and 20206.4 thousand tons respectively.

With respect to the r^2 value which denotes the percentage of explainable variation, it is observed that Vietnam, China and Cambodia have a got very

strong positive relation where more than 90 per cent of the variations are explainable leaving only a small per cent to unexplainable variation. These countries are followed by South Korea and Bangladesh which account for more than 85 per cent but less than 90 per cent. However, with respect to India it is not satisfactory as its r^2 value is only 39 which means only 39 per cent of variation is explainable leaving 61 per cent of variation unexplainable. All these indicate that the predictions made with regard to rice production in Vietnam, China and Cambodia will be more appropriate or very close to accuracy when compared to other countries. At the same time the r^2 value is satisfactory with respect to the world indicating a strong positive relationship.

With regard to compound growth rate regarding rice production in the world, it is observed that, Cambodia recorded the highest growth rate at 2.88 per cent per annum followed by Bangladesh, China, Thailand and India. Cambodia is the only country having a growth rate higher than that of the world in rice production. On the other hand, Brazil, Burma, Indonesia, South Korea, Nigeria, Pakistan and United States have a negative growth rate which indicates that production of rice has decreased. This is evident from the data in the table 1A where the production of rice in these countries has decreased by 4.78, 4.77, 2.11, 17.28, 9.95, 13.04 and 3.24 per cent in 2012-13 when compared to 2008-09 indicating that the decrease is highest in South Korea followed by Pakistan in comparison to other countries where rice production has decreased.

All the above facts indicate that the average production of rice for the past five years in India is around 98712 thousand tons with compound growth rate at 0.95 per cent as against the production of rice in the world which is around 454933 thousand tons with 0.94 per cent of compound growth rate. In other words, it can be stated that on an average for the last five years India is producing around 21.69 per cent of total rice production of the world while china is producing about 30.40 per cent of total rice produced in the world.

The column graph 1.1 in the following page represents the production of rice by various countries in the world from 2008-09 up to 2012-13. The columns in the graph given below clearly show that China and India are the major rice producing countries in the world followed by Indonesia and Bangladesh. Similarly the graph also clearly shows that Nigeria, Cambodia followed by South Korea, Egypt and Brazil are the least rice producing countries in the world. On the other hand Vietnam, Thailand, Philippines, United States, Japan and Burma are other rice producing countries in the world. It can be noticed from the graph that the production of rice in China is increasing continuously while the production of rice in India decreased in the year 2009-10 when compared to 2008-09 and then increased from 2009-10 up to 2011-12 and then again decreased in 2012-13.

Graph 1.1: Column graph representing production of rice in the world

Source: Table 1.1A

Table 1.1C
Prediction regarding production of Rice in the World: (000's Tons)

<i>Sl. No.</i>	<i>Countries</i>	<i>2013-14</i>	<i>2014-15</i>	<i>2015-16</i>	<i>2016-17</i>	<i>2017-18</i>	<i>2018-19</i>	<i>2019-20</i>
1	Bangladesh	34810	35640	36470	37300	38130	38960	39790
2	Brazil	8111.1	8025	7938.9	7852.8	7766.7	7680.6	7594.5
3	Burma	10402.2	10212.8	10023.4	9834	9644.6	9455.2	9265.8
4	Cambodia	4658.2	4801	4943.8	5086.6	5229.4	5372.2	5515
5	China	144761	146908	149055	151202	153349	155496	157643
6	Egypt	4159.4	4128.4	4097.4	4066.4	4035.4	4004.4	3973.4
7	India	106470	109056	111642	114228	116814	119400	121986
8	Indonesia	36389	36240	36091	35942	35793	35644	35495
9	Japan	7589.1	7528	7466.9	7405.8	7344.7	7283.6	7222.5
10	Korea South	3747	3510.4	3273.8	3037.2	2800.6	2564	2327.4
11	Nigeria	2621.9	2633.8	2645.7	2657.6	2669.5	2681.4	2693.3
12	Pakistan	5460	5220	4980	4740	4500	4260	4020
13	Philippines	11258.6	11470.4	11682.2	11894	12105.8	12317.6	12529.4
14	Thailand	20476.4	20566.4	20656.4	20746.4	20836.4	20926.4	21016.4
15	Vietnam	28713.7	29581	30448.3	31315.6	32182.9	33050.2	33917.5
16	United States	6187.1	6018	5848.9	5679.8	5510.7	5341.6	5172.5
17	Others	39580.1	40676.2	41772.3	42868.4	43964.5	45060.6	46156.7
18	Total World	475394.8	482215.4	489036	495856.6	502677.2	509497.8	516318.4

Source: Table 1.1A http://www.unido.org/fileadmin/user_media/UNIDO_Worldwide/Offices/UNIDO_Offices/Rice.pdf, pp 8-11.

The data in the table shown above which represents the predicted values regarding production of rice in the world from 2013-14 up to 2019-20 reveals that, on an average the rice production in the world might be 495857 thousand tons, which is about 9 per cent more than the present production of rice in the world, with a growth rate of 8.61 per cent in 2019-20 when compared to 2013-14. Like wise the average production of rice in China and India might be 151202 and 114228 thousand tons which is about 9.3 and 15.72 per cent more than the present production with a growth rate of 8.90 and 14.57 per cent in 2019-20 when compared to 2013-14 indicating that India might record more production of rice than China in the future. Further, based on the above facts, it can be stated that Asian countries are the major rice producing countries in the world when compared to other countries of the world.

With respect to the consumption of rice in the world, the data in the above table exhibits that there is a gradual increase in the consumption of rice year by year. In other words, rice consumption increased by 0.21 per cent in 200-10, 1.69 per cent in 2010-11, 3.14 per cent in 2011-12 and 2.26

Table 1.2A
Consumption of Rice in the World: (000's Tons)

<i>Sl. No.</i>	<i>Countries</i>	<i>2008/09</i>	<i>2009/10</i>	<i>2010/11</i>	<i>2011/12</i>	<i>2012/13</i>
1	Bangladesh	31200	31600	32400	34300	34500
2	Brazil	8400	8477	8200	7928	7900
3	Burma	10800	10890	10100	10200	10200
4	Cambodia	3220	3270	3370	3450	3615
5	China	133000	134320	135000	139600	144000
6	Egypt	4270	3940	3300	3620	3900
7	India	91090	85508	90206	93334	96100
8	Indonesia	37100	38000	39000	39550	40000
9	Japan	8326	8200	8200	8050	8250
10	Korea South	4789	4701	5175	4905	4612
11	Nepal	2880	3060	2713	3224	3320
12	Nigeria	4220	4350	5000	5400	5700
13	Philippines	13100	13125	12900	12850	12925
14	Thailand	9500	10200	10300	10400	10500
15	Vietnam	19000	19150	19400	19650	20100
16	United States	4082	4016	4317	3470	3810
17	Others	50568	52370	53923	56188	57500
18	World Total	437179	438108	445507	459477	469850

Source: http://www.unido.org/fileadmin/user_media/UNIDO_Worldwide/Offices/UNIDO_Offices/Rice.pdf, pp 8-11.

per cent in 2012-13 to their respective previous years indicating that the percentage of increase in consumption of rice in 2011-12 is more when compared with other years from 2008-09 to 2012-13. Similarly, the consumption of rice increased by 7.47 per cent from 2008-09 to 2012-13. On the other hand, increase in the consumption of rice is more than the percentage of increase in the production of rice in the world as the consumption of rice has increased 7.47 per cent against the 4.79 per cent increase in the production of rice in the world.

The average consumption of rice in the world is around 450024 thousand tons with a standard deviation of 14229 thousand tons, which is just 1 per cent less than the total production of rice in the world, for the above said period. Quite naturally, the consumption of rice is seen more again in Asian countries than the other countries of the world. Again the highest consumption of rice is recorded in China followed by India, Indonesia and Bangladesh. The average consumption of rice of these countries is accordingly 137184, 91248, 38730 and 32800 thousand tons. China consumes around 30 per cent of the total rice produced in the world. Similarly India, Indonesia and Bangladesh consume around 20, 8.6 and 7.3 per cent of the total rice produced in India. However, the consumption of rice in China and India is slightly more than its production while the consumption of rice in Indonesia and Bangladesh is slightly less than its production. Further, Nepal, Cambodia, Egypt and United States are the least rice 'consuming countries in the world by comparison.

Table 1.2B
Descriptive statistics regarding consumption of Rice in the World: (000's Tons)

<i>Sl. No.</i>	<i>Countries</i>	<i>average</i>	<i>std. dev.</i>	<i>intercept</i>	<i>Slope</i>	<i>r²</i>	<i>CGR</i>
1	Bangladesh	32800	1525	30010	930	0.93	2.30
2	Brazil	8181	264	8645.7	-154.9	0.86	-1.22
3	Burma	10438	375	11005	-189	0.63	-1.14
4	Cambodia	3385	156	3094	97	0.96	2.34
5	China	137184	4549	129000	2728	0.90	1.60
6	Egypt	3806	365	4124	-106	0.21	-1.80
7	India	91248	3935	85893.8	1784.6	0.51	1.08
8	Indonesia	38730	1178	36525	735	0.97	1.52
9	Japan	8205	101	8295.8	-30.2	0.22	-0.18
10	Korea South	4836	218	4881.4	-15	0.01	-0.75
11	Nepal	3039	248	2726.2	104.4	0.44	2.88
12	Nigeria	4934	644	3731	401	0.97	6.20
13	Philippines	12980	124	13167.5	-62.5	0.63	-0.27
14	Thailand	10180	396	9520	220	0.77	2.02
15	Vietnam	19460	435	18650	270	0.96	1.13
16	United States	3939	319	4266	-109	0.29	-1.37
17	Others	54110	2803	48805.2	1768.2	1.00	2.60
18	World Total	450024	14229	424010.9	8671.1	0.93	1.45

Source: Table 1.2A http://www.unido.org/fileadmin/user_media/UNIDO_Worldwide/Offices/UNIDO_Offices/Rice.pdf, pp 8-11.

As the standard deviations in India and Japan are maximum and minimum respectively, it can be stated that India experiences maximum fluctuations and Japan minimum when compared to other countries of the world. On the other hand with regard to the r^2 value, it is observed that except for Egypt, Japan, South Korea, Philippines and the United States rest all the other countries have a strong positive relation with time element.

With respect to the compound growth rate, it is noticed that around 41 per cent of the countries that is 7 countries out of 17 countries, have recorded a negative growth while the rest of the countries show positive growth indicating that those countries with a negative growth rate, have a decreasing trend in rice consumption. As such the data in table 1.2A reveals that in Egypt, United States, Brazil, Burma, South Korea and Japan the consumption of rice decreased by 8.67, 6.66, 5.95, 5.56, 3.70 and 0.97 per cent respectively. The column graph in the following page represents rice consumption of various countries in the world from 2008-09 up to 2012-13.

Keeping the above mentioned facts in mind, it can be stated that China, India, Indonesia and Bangladesh are the major rice producing countries and major rice consuming countries, where on an average, China and India have produced 0.828 and 8.18 per cent of more rice than they consumed

while Indonesia and Bangladesh produced -5.14 and -1.485 per cent less rice than they consumed.

Graph 1.2: Bar graph representing consumption of rice in the world

Source: Table 1.2A http://www.unido.org/fileadmin/user_media/UNIDO_Worldwide/Offices/UNIDO_Offices/Rice.pdf, pp 8-11.

Table 1.2C
Prediction regarding Consumption of Rice in the World: (000's Tons)

<i>Sl. No. Countries</i>	<i>2013-14</i>	<i>2014-15</i>	<i>2015-16</i>	<i>2016-17</i>	<i>2017-18</i>	<i>2018-19</i>	<i>2019-20</i>
1 Bangladesh	35590	36520	37450	38380	39310	40240	41170
2 Brazil	7716.3	7561.4	7406.5	7251.6	7096.7	6941.8	6786.9
3 Burma	9871	9682	9493	9304	9115	8926	8737
4 Cambodia	3676	3773	3870	3967	4064	4161	4258
5 China	145368	148096	150824	153552	156280	159008	161736
6 Egypt	3488	3382	3276	3170	3064	2958	2852
7 India	96601.4	98386	100170.6	101955.2	103739.8	105524.4	107309
8 Indonesia	40935	41670	42405	43140	43875	44610	45345
9 Japan	8114.6	8084.4	8054.2	8024	7993.8	7963.6	7933.4
10 Korea South	4791.4	4776.4	4761.4	4746.4	4731.4	4716.4	4701.4
11 Nepal	3352.6	3457	3561.4	3665.8	3770.2	3874.6	3979
12 Nigeria	6137	6538	6939	7340	7741	8142	8543
13 Philippines	12792.5	12730	12667.5	12605	12542.5	12480	12417.5
14 Thailand	10840	11060	11280	11500	11720	11940	12160
15 Vietnam	20270	20540	20810	21080	21350	21620	21890
16 United States	3612	3503	3394	3285	3176	3067	2958
17 Others	59414.4	61182.6	62950.8	64719	66487.2	68255.4	70023.6
18 World Total	472570.2	480941.8	489313.4	497685	506056.6	514428.2	522799.8

Source: Table 1.2A http://www.unido.org/fileadmin/user_media/UNIDO_Worldwide/Offices/UNIDO_Offices/Rice.pdf, pp 8-11.

The perusal of table 1.2C reveals the predicted consumption of rice in the world from 2013-14 to 2019-20. As such, it is observed that the average consumption of rice in the world, for the above said period, might be 497685 thousand tons with 10.63 per cent of growth in 2019-20 when compared to 2013-14 where again China and India might be the major rice consuming countries. In the same way regard to growth rate maximum growth is expected to be recorded by Nigeria with 39.20 per cent followed by Nepal with 18.68 per cent of growth in 2019-20 when compared to 2013-14. On the other hand the consumption of rice might decrease in United States, Egypt, Brazil and Burma by 18.11, 18.23, 12.04 and 11.44 per cent by 2019-20 when compared to 2013-14. Similarly, in Philippines, Japan and South Korea the consumption of rice might decrease slightly by 2.93, 2.23 and 1.88 per cent respectively by 2019-20 when compared to 2013-14.

CONCLUSION

Rice is one of the important food items consumed by human beings. Especially in Asian countries the consumption and production of rice is seen more when compared to other parts of the world. As such to study the production and consumption pattern of rice in the world by different countries an attempt is made with the help of data in Table 1.1A for which descriptive statistics like mean, median, 1st and 3rd quartile, standard deviation, coefficient of variation, compound growth rate and so on have been calculated and presented in Table 1.1B. According to the data in Table 1.1B it is observed that Asia countries are the major rice producing as well as consuming countries in the world where China and India are the foremost rice producing and consuming countries in the world followed by Bangladesh and Indonesia. With respect to China and India the production and consumption of rice is almost equal, which means that they produce that much of rice which they consume, whereas in Bangladesh and Indonesia the total rice production is slightly less than what they consume. On the other hand, with regard to production of rice in the world, it is noticed that in Cambodia, Bangladesh, China, India, Philippines, Thailand and in Vietnam the production of rice had an increasing trend as their compound growth rates were positive and in remaining countries there was a negative compound growth rate which indicated the decreasing trend in production of rice. Thus, with respect to consumption of rice, Brazil, Burma, Egypt, Japan, South Korea, Philippines and United States the consumption of rice had a decreasing trend as their compound growth rates were negative and the remaining countries had a positive compound growth rate which denoted the consumption of rice increased year by year in these countries.

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