

ECONOMIC CONTRIBUTION OF RICE PRODUCTION AND FOOD SECURITY IN INDONESIA

Sadique A. Tumrani*

Pervez A. Pathan†

Bugti M. Suleman‡

Abstract

This paper analyzes how Indonesia has achieved the food security and allocated targets of economic development. Whereas rice is the staple food of Indonesia, the share of Indonesia is about 10% in the world rice production but known as until importer country because rice is being used by 93% of its population. To cope with this situation, Indonesia pays heavy amount on importing of rice that imbalances its economy. To get rid of related problems, Indonesia has adopted the economic and sustainable policy of rice production to make sure the self sufficiency in food grains. The study estimates rice import's responses in food security conditions along with addressing its economic impact in Indonesia during the period of 1960 to 2010.

This research has pursued a descriptive choice of method and in this regard the relevant data has been collected from the secondary source and analysed by mathematical process. The results indicate that Indonesia has adopted the green revolution policy in 1970 that improved production of Rice by allowing the subsidy on fertilizers, seeds, irrigational assistance, and machinery essential that has played a pivotal role in Indonesian economy. The study also concentrated to draw some do able example that could be used as policy in the context of agriculture sector.

Keywords: Rice Production, Food Security, Economic Growth, Indonesia.

Introduction

Rice is a cereal grain grown in marshy areas and a tropical crop which developed by three main types such as Indica, Japonica and

* Ph.D Student, Area Study Centre (FESEA), University of Sindh, Jamshoro

† Dean, Faculty of Social Sciences, University of Sindh, Jamshoro

‡ Assistant Professor, Government Degree College D. M Jamali, Baluchistan

Javanica with the taste of aromatic and non-aromatic. Rice provides more than 80 percent of daily caloric intake of 3 billion people that is nearly half of the world's population. Rice cultivation suited in the areas where the climate is hot, humid. It grows on the large number of deltas across Asia's tropical and subtropical areas. Rice occupies about 11 percent of world's agricultural land and ranks second in terms of cultivation area. Asia is responsible for more than 90% of rice production and consumption (Virk, 2004).

Rice is dominant staple food of Indonesia where about 12 million hectares arable land is devoted for rice production out of total agriculture land. Indonesia was a major rice importer country during 1960-70s, to strive for self-sufficiency by mid of 1980s. The total production of rice in Indonesia between the periods of 1984 to 1996 was higher than domestic consumption; this shows self sufficiency in serial food, in response of this achievement FAO has given "*self sufficiency*" award to Indonesian President Suharto in 1984 (FAO, 2010).

In the first decade of 21st century a remarkable growth in rice production was recorded with the production of 57.05 million tons in 2007 which reached at level of 60.33 million tons in 2008. Indonesia has declared, the self-sufficiency on rice again in 2008, this was great achievement in rice production in 2007-08 mainly due to high yield and favorable climate (Sudaryanto, 2009).

Indonesia is 7th largest rice importer although it is among top ten global rice producing nations, but its annual consumption of per capita was more than 150 kg as recorded in 2010. Rice production in Indonesia has crossed from 72 million tons of paddies 48 million tons of milled rice in 2013. Yield of per hectare in Indonesia has increased to 90 percent during 1970 to 2010; it was 2.35 tons/hectares in 1970 and rose up at the level of 4.9 tons/hectares in 2010, (USDA, 2011).

Literature Review

Achmad (1996) has publicized that Indonesia is a developing country today but 25 years ago Indonesia was a poorest country with 50 US \$ per capita of Indonesia. Now Indonesia's per capita income is 4200 US \$ with the 5 percent growth rate. Indonesia has implemented several basic elements in development strategy such as: (i). Substantial Investment (ii). Improve the productivity. (iii). Reforms in trade (iv). Capital Intensive Activity.

Ngu (2007) presented a brief summary that Rice is the staple food of 3000 million people and the global rice production became unstable in 1999, the surge in rice price since 2007 has affected food security in several rice food based countries. Global rice production was 215 million tons in 1961, after 45 years it was 644 million tons in 2006, Global rice production was decreased in 1999-2002 because of sharp decrease in global rice harvested but rice production has recovered since 2003.

The environmental and socio-economic condition of rice production vary greatly from location to location, rice is grown under different climates including different temperature, sub-tropical and tropical, based on soil-water conditions, and in the different ecosystem. The top most rice producing countries in the world are: China (with 33 percent), India (with 26 percent), Indonesia (with 10.2 percent), Bangladesh (with 7.5 percent), and Vietnam (with 7 percent) of rice total production.

Muterr and Fairhurst (2010) presented the situation of rice in ASEAN as following: Production 123.5 m/t, Supply 150 m/t, Domestic Utilization: 106.7 m/t, Imports 2.71 m/t, and Exports 15.7 m/t. ASEAN has increased 7% in 2009-10 and Indonesia, Malaysia and Philippine are improved 22% food security. Indonesia has per hectare yield is better than other countries. Indonesia is known as 2nd largest per hectare yield producer in ASEAN.

Erna (2006) has publicized various food plan through which Indonesia used to stimulate the farmers: System of Rice Intensification (SRI), (OPSUS), INSUS and INMUM, in 1979. High yielding rice varieties by the use of chemicals, subsidies have been one of the keystones of Indonesia's rice development program: The strategies of "High Yield Verities (HYVs) "Modern varieties" (MVs) that has released IR-8 and IR-5 through BIMAS 1960.

Indonesian agriculture minister (2006) presented report, in international conference on co-operation on agrarian reform and rural development (ICCARD) at Brazil. Indonesia is the largest archipelago country offers 120.2 million hectares of territorial land as farm jungle and rest of land with coverage (i.e. 70.8 million hectares). Its 37 percent is terrestrially utilized for farms cultivation such as paddy crops to poverty alleviation as well as food security.

Main paddy field use based on areas of irrigation and rainfed such as: Sumatra has produced 30 Percent, as 997060 hectares Irrigated Paddy and 1,332,040 hectares Rain fed; Java & Bali have produced 44 percent as 2,442,100 hectares irrigated paddy and 3,430,698 hectares Rainfed and Kalimantan 13 percent as 228,850 hectares irrigated paddy and 772,890 hectares Rainfed paddy.

Research Methodology

The study has pursued a descriptive choice of method in which inductive technique has been applied on objectives, resources and choice of method with a two tier approach which was comprising of collecting information from secondary sources on pre-determined indicators for example surfacing through math collecting, published information and etc. The second tier, however, will be synchronized between structured and un-structured data collective modes. The data has collected according to parameters through the secondary source based on published, books, reports and surfacing through internet. Research concentrated on the economic impact of rice

imports along with addressing of food security in Indonesia. The results provide base to plan the deployment of modern technology for the farm management, and to follow Indonesian agriculture policy approach to this end for the enhancement of rice production.

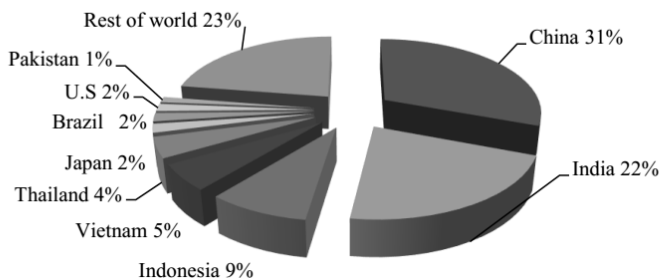
The main key indicators used are Rice Production, Rice Self-sufficiency, Employment, and Economic Stability. The analytical tools used is the measurements of parameters done by the statistical methods of inferential trends along with descriptive methods.

Result and Discussion

A) Rice Production

The literature review has represented the global position of rice production that human consumption accounts for 85 percent of total production for rice, compared with 72 percent % for wheat and 19 percent for maize. Rice provides 21 percent of global human per capita energy and 15 percent of per capita protein. The world average consumption of rice in 1999 was 58 kg, with the highest intake in some Asian countries; such as Bangladesh, Vietnam, Indonesia and Myanmar, with annual average consumes of residents as 150 to 200 kg, which accounts for two thirds of caloric intake and about 60 percent of daily protein consumption (UNDP, 1997).

The data shows that global rice production was 215 million tons in 1961 after 45 years it was 644 million tons in 2006 and first time global rice was decreased during 1999-2002 because of sharp decrease in global rice harvested area but rice production has recovered since 2003. Milled rice production is 463.9 million tons: China 140.7 million tons, India 103.4 and Indonesia 36.3 million tons milled rice produced in 2012. Rice production in Indonesia was 72 million tons in 2012 that is about 10 percent of total world rice production and it made Indonesia included in top ten rice producer countries in the world (FAO, 2012).

Figure 1, Global Rice Productions in 2010, Ranking in Percentage.

Rice is the main staple food for more than 95 percent of the Indonesian population. Indonesian government has intervened heavily on rice production, marketing, trade, and pricing policies. During the green revolution of the 1970-1990, production grew significantly at the rate of 4.3 percent per year. During the period of 2000 to 2010, rice production was grew with the rate of 2.51 percent per year, and the production has increased with an impressive growth of 5.04 percent in 2011-12 and it has key importance to Indonesia's national and household level of food security. Indonesian Archipelago has used 60 percent arable area for the rice growing and produced 68 million tons rice with 5 percent to 8 percent annual increase by the cultivating 12 million hectares of land. Rice production had increased from 12 million to over 40 million tons. Bellow Table 1 has represented the statistical figures of population trend and rice development.

Table 1: Descriptive Analysis of Rice Production in Indonesia

Year	Analysis	Population (Mill)	Area (Mill)	Production (Mil/ton)
1961-70	Mean	102.11	7745.89	17053.78
	Min	92.20	7285	14953
	Max	112.80	8155	19012
	Variance	50.68	74895.36	1909056.20
	Std. deviation	7.12	273.67	1381.69

Year	Analysis	Population (Mill)	Area (Mill)	Production (Mil/ton)
1971-80	Mean	129.42	8721.30	24866.30
	Min	114.10	8135	19324
	Max	143.20	9262	31780
	Variance	102.49	128118.45	16209166.90
	Std. deviation	10.12	357.94	4026.06
1981-90	Mean	163.20	9860.40	38762.70
	Min	145.50	9382	31774
	Max	178.60	10200	44005
	Variance	138.37	72566.26	19802299.34
	Std. deviation	11.76	269.38	4449.98
1991-2000	Mean	191.57	10840.44	57581.67
	Min	181.10	10282	44680
	Max	201.60	11400	50873
	Variance	49.03	169708.03	4111776.75
	Std. deviation	7.00	411.95	2027.75
2000-2010	Mean	219.25	11882.50	53673.08
	Min	203.4	11476	50973
	Max	240.20	12075	56349
	Variance	189.88	44243.54	3143242.99
	Std. deviation	13.78	210.34	1772.92

Source: FOA and Study Result, 2013.

B. Increased the Yield to Secure the Self-Sufficiency

Rice is important food crop in the country with cultivated area about 12.2 million hectares accounting for 30 percent of total agricultural land, per acre rice yields had increased from 2.14 tons of paddy per hectare to 4.23 tons per hectare in 2010 (USDA 2011).

The below Table 2 has indicated the difference in the yield of rice over the past five decades. It is observed that the change of yield per hectare has remain same specially after 1990; whereas during 1960-1980 it was more than 20 percent increased. This is due to green revolution programme introduced in 1960s aiming at addressing famine and straw wish issues in developing countries as Indonesia.

Table 2: Indonesia Secure to Self-Sufficiency in Rice since 1960 to 2012, (Million tons)

Year	Population (Mill)	Milled rice production	Yield Per/hec	Total Consumed	Per capita intake (kg)	Consumption Change	Import (MT)	Import Change
1960	90.6	10168	2	11204	154	.65%	1064	9.5%
1970	114.1	13140	2	13634	155	.65%	516	3.8%
1980	145.5	22286	3	21504	156	.64%	543	2.5%
1990	181.1	29042	4	30121	156. 5	.32%	192	.64%
2000	205.9	32960	4	35877	157	.32%	1500	4.2%
2010	240.2	35500	5	39000	160	1.9%	3098	7.9%
2011	242.9	36500	5	39550	160.5	.31%	1960	4. 9%
2012	245.6	36900	5	40000	161	.31%	800	2.0%
Source: Indexmundi & FAO, 2012.								

Table 2 highlights the population trend, per capita intake and consumption of rice in Indonesia, from 1960 to 2012. It should be remembered that the era of 1960s was the period of best agro policy shift whereas Indonesia has adopted green revolution late in 1970s. Indonesia was a major rice importer with about 10 percent in the decade of 1960 which has covered after 1980s but the standard position was not same; Indonesia has slipped back in to importer dependence because of natural catastrophes and diversification of other commodities and subsidy was gradually reduced and finally discontinued that has affected the standard level of rice production. But now a days Indonesia has covered the gap of rice production to meet with population need of food grain for that Indonesia is again near to achieve self-sufficiency position in rice.

IRRI estimates that Indonesia will need 38 percent more rice in the next 25 years; the average yield of 4.6 tons per hectare must rise to more than 6 tons per hectare to fill the gap. The yield of Asia was

1.86 ton in 1961 has that increased to 4.22 tons per hectare; Indonesia's rice yield has been raised 90 percent, from 2.35 to 4.6 tons per hectare between 1970 and 2006 (FAO, 2013).

C) Indonesian Economic Stability Trends

The figures of economic development depict that in past decades Indonesia has begun to emerge as an economic power in Southeast Asia. Rice crop production has increased that boosted the Indonesian economy to the level of 4.2 percent in 1983, and continued to maintain the average of 5.0 percent during the period of 1984 to 1988, and 7.5 percent in 1989. However, the growth of GDP gradually decreased to 7.2 percent in 1990, 6.9 percent in 1991 and stopped at the level of 6.4 percent in 1992 – 1993. During the Asian financial crises of 1997-98, GDP growth declined and reached backward -13.1 percent, after that, special focus has been given to return back at the previous level. In response of the special focus that the growth rate of GDP reached at 6.3 percent in 2007 and 6.1 percent growth in 2008 and 6.2 percent to 6.5 percent in 2011. This trend has been shown in Table No. 3

Table 3: Economical Maturity in Indonesia by Sector wise during 2001-10										
Economic Indicators	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
GDP Growth	3.6%	4.5%	4.8%	5.1%	5.7%	5.5%	6.3%	6.0%	4.5%	6.1%
Labour Force (Mill)	88.0	99.0	105.7	111.5	94.2	108.2	109.9	112.0	113.7	116.5
Unemployment	8.1%	10.6%	8.7%	9.2%	11.8%	12.5%	9.1%	8.4%	8.1%	7.1%
Per Capita Income	3000	3100	3200	3500	3600	3900	3600	3900	4000	4200
Below to Poverty	23%	22%	19.3%	16.7%	17.3%	17.8%	15%	15.4%	14.5%	13.3%

Economic Indicators	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Imports (Bill)	40.4	38.1	32.1	40.22	45.07	62.02	77.73	116	84.35	111.1
Exports (Bill)	64.7	56.5	52.3	63.89	69.86	83.64	102.3	139.3	119.5	146.3
Foreign Exchange Reserves (Bill)	321.0	331.7	355.6	358.2	345.8	430.4	569.2	516.4	661.2	962.1
Source: Indonesia Central Bureau of Statistics (CBS).										

D) Employment

The trends of employment in the agriculture sector shows ups and downs, the share of food crops accounted for 62 percent, tree crops for 16 percent, livestock 10 percent, and fisheries and forestry equally for the remaining 12 percent in 1988. The Employment has been reduced from 46.4 percent to 38.3 percent recorded from the total employments in Indonesia during 2002 to 2010 as it was previously 68 percent during 1971-1980 and further decreased to 40 percent to 38 percent in 1996 and 2001. In contrast of that the current open unemployment rate in Indonesia was 6.14 percent in 2012 and to reach 5.3 percent in 2014. Indonesian unemployment rate recorded on average of 6.17 percent from 1982 to 2013 (CBS Indonesia, 2013).

Conclusions

The result of the study discussed in the manuscript show that the green revolution left good signs on Indonesian economy and resulted to creep from importing country to self sufficient state for rice in the mid of 1980s by using land extensive method as well as land intensive method that has improved and increased production of Rice by allowing the subsidy on fertilizers and irrigational assistance. The production of rice has increased from 12 million tons to 40 million tons within 50 years span of time and improved per hectare yield from 2.14 in 1960 to 4.23 tons of paddy in 2010.

Indonesia has also maintained economic growth at the level of 7 percent per annum and increased per capita income from 50 US dollars in 1993 to 4200 US dollars in 2010.

The analysis offered in this research paper pointed out that Indonesia has slipped back into the status importing country for rice because of natural catastrophes and diversification of other commodities which has affected the standard level of rice production.

It is recommended that Indonesian government should have retain and develop a policy framework by providing subsidy on rice farming, and give much focus on land intensive method because the country will need 38 percent more rice with 6 tons per hectare yields in coming 25 years.

References

- Achmad, S. (1996). *Agricultural Research and Development in Indonesia, Policy, Investments, and Institutional Profile*. International Food Policy Research Institute, Agricultural Science and Technology.
- Badan Pusat Statistik BPS. (2012). *Agriculture of Indonesia. Agriculture Survey*, Jakarta.
- CBS Indonesia. (2013). *International Development Group Building & Construction Report: The General Information and Advice of any Kind*. Indonesia International Development Group Building & Construction Authority.
- Chand, V. (2005). *The Home of Soft Commodities: Indonesia Agriculture Sector and Rural Development*. Vinay Chand Associates Marketing Consultancy. Retrieved from www.ruraldevelopment.inf/Agri.
- Cristina, D. (1994). *Modern Rice Technology and Income Distribution in Asia. Modern Variety Adoption, and Income Distribution: The Case of Tamil Nadu in India, Agricultural Innovations and Adoption of IRRI Varieties*. ISBN 9712200434

- Erna, M. (2006). *Status and Prospects of Feed Crops in Southeast Asia*. New York: Economic and Social Commission for Asia and the Pacific, United Nations.
- Food and Agriculture Organization (FAO). (2012). *The Rice Crisis Markets, Policies and Food Security*. London: The Food and Agriculture Organization of the United Nations, Earthscan.
- Food and Agriculture Organization (FAO). (2013). *Rice Market Monitor Trade and Markets Division*. London: Food and Agriculture Organization of the United Nations.
- International Conference on Agrarian Reform and Rural Development (ICARRD). (2006). Agriculture Minister of Indonesia has presented the report at International Conference on Agrarian Reform and Rural Development (ICARRD) at *Porto Alegre, Brazil Organized by International Fund for Agricultural Development, USA*
- MDGs. (2010). *Rice for Poor. The Achievement of the Millennium Development Goals: Indonesia Country Report*. Ministry of National Development Planning Agency.
- Muter & Fairhurst, (2010). *Developments in Rice Production in Southeast Asia. Rice in Southeast Asia: facing risks and vulnerabilities to respond to climate change*. Philippine: Plant Production and Protection, IRRI.
- Ngu, V. (2007). *Sustainable Intensification of Rice Production for Food Security in Near Future. Rice is the Staple Food: A Summary Report*. International Rice Commission, FAO.
- Peter, T. (2004). *Food Security in Indonesia: Current Challenges and the Long-Run Outlook*. *Indonesian Food Journal*.
- Sudaryanto, T. (2009). *Policy Response to the Impact of Global Food Crisis in Indonesia*. Indonesia: Indonesian Center for Agriculture Socio Economic and Policy Studies.
- Sushil, P. & Derek, B. (2010). *Rice in the Global Economy: Strategic Research and Policy Issues for Food Security*. Manila: International Rice Research Institute, IRRI.

- United Nations Development Programme (UNDP). (1997). Rice as a Global Staple Food of 70% World's People. *Human Development Report*. New York: The United Nations Development Programme (UNDP).
- United States Department of Agriculture (USDA). (2011). *Stagnating Rice Production Ensures Continued Need for Imports in Indonesia*. United States Department of Agriculture, USDA.
- United States Department of Agriculture (USDA). (2012). Assessments of Commodity and Trade Issues. *GAIN Global Agricultural Information Report*. United States Department of Agriculture.
- Vermani, S. (1994). Rice: Hybridization. *Hybrid Rice Technology Aims To Increase Yield Potential, New Developments And Future Prospects Of Rice: Selected papers from International Rice Research Conference Laguna*. Philippines: Collaboration of IRRI.
- Virk. (2004). Progress in Ideotype Breeding to Increase Rice Yield Potential. *Field Crops Research*, 108(1).
- Walter, P. (1991). Food Security in Indonesia: Defining the Issues, Using climate Models to Improve Indonesian Food Security. *Bulletin of Indonesian Economic Studies*, 2.
- Wikipedia. (2014). *Archipelago Indonesia: The Largest Archipelago in the World*.