IMPACT OF WTO ON INDIAN AGRICULTURE

Contemporary Concern Study

Report Submitted to Professor Dr. Rupa Chanda

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2 BACKGROUND

In the 1980s, the highly protectionist agri-business in industrial countries fueled by the agricultural export subsidies were dumping surplus production and was thus distorting the world markets. There was a need to negotiate a new set of multilateral trade agreements. As the Uruguay Round concluded in December 1993, the WTO designed an Agreement on Agriculture to minimize the distortion and maximize the agricultural trade across multiple nations. It was aimed to utilize the food surplus effectively and minimize both the extremes - food dumping and hunger. It was intended to make the agricultural markets more accessible to the farmers around the world by cutting down on tariffs, reducing domestic support and eliminating export subsidies. The act was ratified in Morocco next year and was implemented from January 1, 1995. The agreement called for reduction commitments by both developed and developing countries over a fixed deadline(Year 2000-Developed and Year 2004-Developing), whereas LDCs-Least developed countries were exempted. There was a special and differential treatment clause to address the concerns raised by developing countries. However, the implementation did not turn out to be a fair deal for the developing nations. Although Developed countries were asked to reduce the tariffs by 36% in 6 years as compared to 24% for developing countries in 10 years, the former was starting from a soaring high level as compared to latter. Instead of an equal trading market which was proposed, the lopsided Agreement on agriculture was drifting developing nations in an unjust state. Worst affected by this development were the farmers with small landholdings and peasants with their income dependent on agriculture from developing countries since their products can now be substituted with cheaper imports. Industrialized economies were able to protect their producers with the existing support whereas the relatively behind-markets of developing nations were opened for trade liberalization.

3 EVENTS TIMELINE

In Mar 2003, countries missed the deadline to decide the formula for reduction along the three pillars of AoA. WTO Reports in 2003[1] argued that the agricultural subsidies in the developed countries are not meant for poor and vulnerable farmers rather to top corporations in the agribusiness. Further, for the developed countries, a large chunk of reduction in subsidy was attained through transferring prohibited (Amber) subsidies to Permitted (Green and Blue Box) subsidies.

The Fourth Ministerial conference in Doha, 2001 introduced the Doha Development agenda to address the disagreements in agriculture. The member countries were divided into two factions: developed nations led by EU, US, Canada and Japan and the developing countries led by India, China, Brazil and South Africa. Till 2008, multiple attempts were made (2004 - Geneva, 2006 - Hong Kong), but no compromise was reached between the two sides on issues in agreement on agriculture. A G-33 group led by India submitted a proposal to WTO for exemption of the 10% subsidy support ceiling in requirement for their food security programs. The Bali package was rolled in December 2013 to address a portion of the Doha round but the implementation was further postponed due to varied views on the food security and public stockholding between the WTO and Developing countries. Finally, a temporary arrangement was agreed upon in the form of a 'Peace Clause' providing time to resolve the existing disagreement. The peace clause which concludes in 2017 provided a temporary protection to the developed countries from breaching the subsidy limits for the food security programs. There have been studies (Sharma, 2016), (Rashmi Banga, 2015), (Pal, 2001) etc. which argue that India has been able to be within the de minims level till now. However, going forward the trends in minimum support

[1] WTO Annual Report 2003, page 22

price, increasing procurement level and widening food security requirements will restrict the policy space for India in the coming years. Nirmala Sitharaman, the current commerce minister in her latest meeting with the director general WTO (July 20, 2017) has stressed that the outcome of the eleventh ministerial conference must find a stable resolve to the problem of food security obligations and public stockholding of grains.

4 INDIAN AGRICULTURE

Agriculture is the foundation of the Indian economy. India stands at number two across the world in agricultural produce. More than half of the population is dependent on the rural economy as the source of employment. Agriculture activities contributes around 17.3% of the GVA (Gross value added) during 2016-17. Landholdings are scattered, smaller in size (Almost 3/4th of the landholdings are less than 2 hectare). Resources of irrigation are limited with only 35% of the total agricultural land under irrigation. Inputs for production are lesser developed. Hence the crop yield is low. (Yield of Rice is almost one third of the United States). These low income small landholding farmers with limited irrigation facilities and relatively less developed inputs of production(power, fertilizer, seeds) require government support. In the past, Indian agriculture policy has been to keep the food prices low for the end consumers and incentivize production by providing domestic support and subsidies. This agricultural policy has been successful for India. India turned from a food deficit country to a food surplus country even with an increasing population(Population increased almost 4 times from 1950 to 2012, India's food production has grown five times becoming a sixth largest net exporter worldwide.)

Moreover, India is a home to a population of 1.3 billion people with a 1.5% annual growth rate. GHI Report published in 2015 ranked India as one of the leading countries in a serious hunger of situation. In 2013, National Food Security Act (NFSA) was signed by the Indian government to ensure subsidized food grains availability to two-third of the population. The Public Distribution System will ensure five kg per person per month at a highly subsidized price. To meet this requirement and to ensure access to food for the Indian population is a humongous challenge and responsibility of the Indian government.

Given this scenario of the Indian agriculture, it is imperative to provide domestic support to Indian farmers. The developing nations have repeatedly negotiated for a "*food subsidy box"* to not include the domestic support in the Permitted subsidy calculations. However, WTO has negated any such box formation. It is concerned that once the green box is tampered with other activities which are listed in the box will be deemed irrelevant and difficult to implement. Also, stocks which might be procured for food security might end up reaching the world market distorting the international trade.

The following table from agreement on agriculture addresses this concern as:

Annex 2, Para 1	Green Box	the support shall not have the effect of providing price support
Annex 2, Para 3	Green Box	Food Security Stocks- "expenditures (or revenue foregone) in relation to the accumulation and holding of stocks of products which form an integral part of a food security program identified in national legislation" Conditioned to 1. the volume and accumulation of such stocks shall correspond to predetermined targets related solely to food security 2. the process of stock accumulation and disposal shall be financially transparent 3. food purchases by the government shall be made at current market prices and sales from food security stocks shall be made at no less than the current domestic market price for the product and quality in question 4. Allow the selling of products at subsidized prices with the objective of meeting food requirements of urban and rural poor in developing countries on a regular basis. 5. If purchases are at "administered prices," then the "difference between the acquisition price and the external reference price is accounted for in the AMS [aggregate measure of support]."

Figure 1: Snapshot of Green box subsidy and concerned agricultural issues on food security

The external reference price is the 1986-88 world price. Since the MSP has been lower than the world price, the level of support has been negative for India over a large period. However, as the minimum support price goes up (Put trend here) and the Food security obligations are to be met, India aggregate measurement of support might breach the existing AoA amber box permitted subsidies restriction.

5 Challenges with Agreement on Agriculture (AoA) Perspective of developing countries

Agriculture is seen as a source of growth and means of livelihood by the developing countries. The extent of economic development for any nation thrives on the performance of agriculture sector. This sector has received special treatment in every aspect either due to food security program, large dependence of rural areas, prevalence of socio-political landscape etc. However, the same treatment has resulted in distorted trade practices. Under the regime of GATT, international trade in agriculture faced issues limited market access due to high import barriers, over production of template crops due to large domestic subsidies, dumping practices caused by export subsidies, etc. Pre-Uruguay rounds, the commodity prices in agriculture were depressed, and farm exporters from the developing countries found it difficult to compete in the international market.

AoA aimed at inducing discipline in the agricultural trade by asking member countries to reduce tariffs, convert non-tariff barriers to tariff barriers, and calling for cuts in domestic support and export subsidies. It was expected that with AoA's proposed structural change, the international trade will deepen with

increasing share of exports from developing countries, transparency in trade, and spatial distribution of agricultural production. (Pal, 2001)

However, as observed from the comparison in the agricultural trade between developing and developed countries, AoA have fallen short of expectations. The international prices declined due to large export subsidies and domestic support provided by the developed countries to its producers. It is argued that the failure of AoA in liberalizing agricultural trade lies in its design and implementation schemes. It fails on three frontiers of market access, domestic support and export subsidies.

5.1 Design Issues

AoA in its policies have ignored the differences among the macro-economic setting of countries in their respective agriculture sector. It assumes that the developing and developed countries will experience benefits alike from similar liberalization policies. As observed from the works of *Xiaozhen et al*. the fundamental problem with AoA is that it assumes that condition under which production and agricultural trade in developed nations are operated are prevalent by large in developing nations as well (Xiaozhen Li, June 2008). From policy perspective, it must be realized that the agriculture is practiced as source of livelihood and survival in developing nations. Hence, the provisions under AoA should be designed fairly that imparts more protection to the developing economy rather developed economy.

The provision of special safeguards (SSG) is another point of contention in the design of AoA. SSG were introduced as a design element to help member nations protect their agriculture trade from unexpected surge in import volume or low prices due to conversion of non-tariff barriers to tariff barriers. This allowed nations to impose additional import duty as SSG while converting non-tariff barriers to tariff barriers. At the time of operation, only 22 member countries (16 developed EU nations) had non-tariff trade barriers. The developing nations were allowed to avail SSG benefits only on 31.8% of products as compared to 68.2% for developed nations (Actionaid). The SSG mechanism was significantly skewed in the interests of developed nations.

5.2 Implementation Issues

Inherent problems with the design elements of AoA have resulted in unfair favor to developed countries. Implementation of AoA have allowed developed nations to continue to heavily support their domestic agriculture and exports while manipulating tariffs on imports. The failure in implementation were is aspect of market access, domestic support and export subsidies.

5.2.1 Market Access:

The developed nations leveraged the loopholes in the AoA to benefit most by manipulating tariff cut provisions. The AoA didn't specify the process for conversion of non-tariff barriers to tariff barriers. This resulted in high equivalent tariff conversions. This distorted the very level playing field intention of AoA. Though the developed countries were required to make steeper cuts, the levels of tariffs were significantly higher than the developing counterparts. This resulted in on an average a higher deduction in tariffs from developing nations than developed countries.

The tariff cut imposed on the member nations were applicable on overall tariff levels and thus varied significantly with each product. Developed nations exploited this by reducing tariffs marginally on key products and significantly on products which availed no benefits to their economy. At an aggregate level, they were able to meet their tariff cut obligations.

Exports from the developing countries stagnated due to high import tariffs. Also tariff reduction resulted in higher prices for agricultural products. Most of the developing countries are dependent on agricultural imports, removal of non-tariff barriers will result in high prices having a negative impact on their economy. Thus the developing countries found themselves at the losing side of the international trade. Improved market access is still a distant reality for the developing world.

5.2.2 Domestic Support and Export Subsidies

Once AoA was implemented, developed countries were obligated to reduce their domestic support under Amber box category. However, most of the developed countries resorted to manipulating subsidies and progressively shifted them from Amber box to Green / Blue box.

Substantial support of developed economies to their agriculture lead to dual of problem of overproduction and dumping activities. Export subsidies to farm producers reduced the gap between the domestic and world prices whereas domestic supported the higher costs of production in developed nations. As a result, the production levels were abnormally high which resulted in the dumping activities in developing economies. These resulted into threefold problems for developing economies – depressed market prices, misplaced exports, and low domestic production levels.

5.3 Impact of AoA on India

One of major contentions between the international communities has been the domestic support and export subsidies that are distorting the international trade. The massive domestic support of ₹1.4 Trillion rupees ($21 Billion) per year for the India's recently rolled out national food security program have raised concerns among the developed nations.

At the centre of the negotiations two key issues stem out from Indian point of view. The first is with due to food security program which is perceived to bring in trade distortions. There is a growing concern that with increasing population and food consumption, India's food subsidy bill will rise breaching the de Minimis level under its WTO commitments.

The objection from developed countries against India's massive public stockholding of food grains stems from the possibility of distortion in trade practices and dumping of food stock procured for domestic consumption. However, a study conducted by Center for WTO, IIFT (Rashmi Banga, 2015) refutes the proposition that the NFSA bill distort the international prices as the procurement levels will barely meet the consumption requirements. At the current level of procurement levels, the possibility of distortion of agriculture trade seems remote with growing domestic consumption. Also the analysis in the same study (Rashmi Banga, 2015) highlights the difference in the procurement cost and export unit value for wheat. This establishes the fact that Indian procurement activities do not have any distortionary value as perceived by developed countries.

Apart from the issue of public stockholding of grains, the developed member nations are rooting for capping the minimum support price as well as the reducing the input subsidies provided by Indian government to its farmers. India provides domestic support to its farmers in the farm of direct price support as MSP (Minimum price support) and indirect product subsidies like fertilizer, fuel, seeds etc. The average support in form subsidy received by an Indian farmer is in the range of ₹ 1000-1500 ($ 20-22) when compared with the average support of $ 2500 to a US farmer.

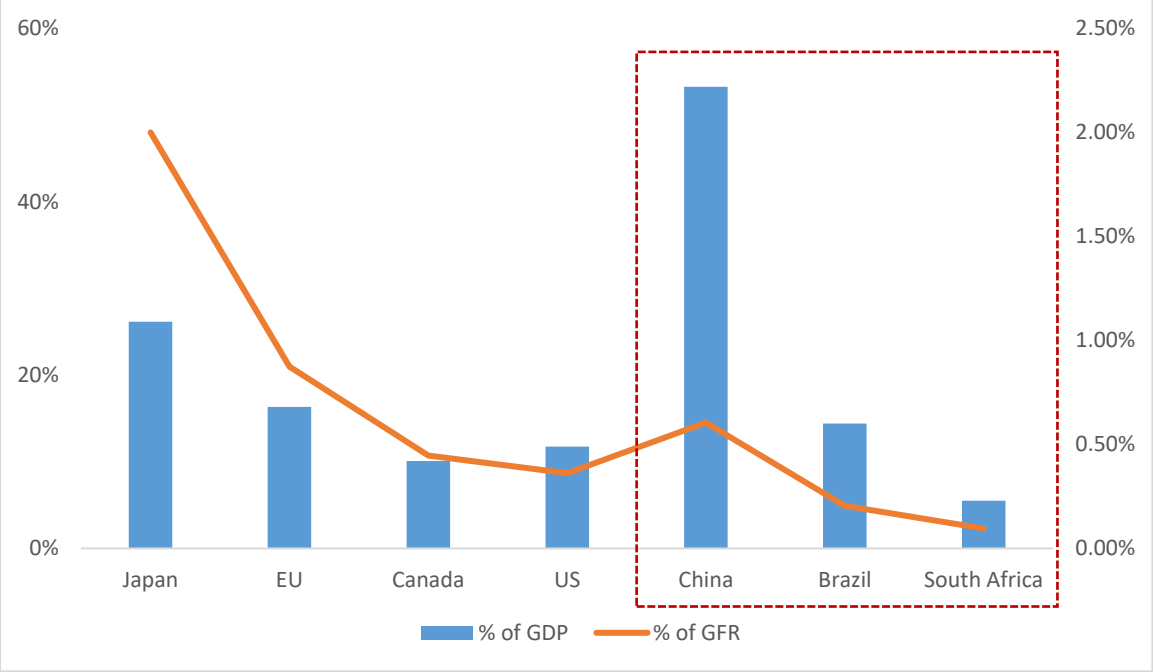


Figure 2: Comparison of average support as % of GDP, GFR between developing and developed countries. Source: PSE estimate from OECD

Based on the extent of supported provided, India provides less support then compared to its counterparts US and EU. However, the point of concern is that majority of Indian subsidies related to procurement and indirect product based fall under amber box category. This is putting a pressure on Indian Government to reduce its input and price support subsidies. However, if these subsidies do not act as incentive to cover the costs of production and cannot be observed from the same lens of "distorted trade" subsidies. Removal of input subsidies however will create an upward pressure on cost of production, thereby raising the food prices. Higher food prices will translate into a socio-economic problem for India where 30% of population belong to marginalized section of society.

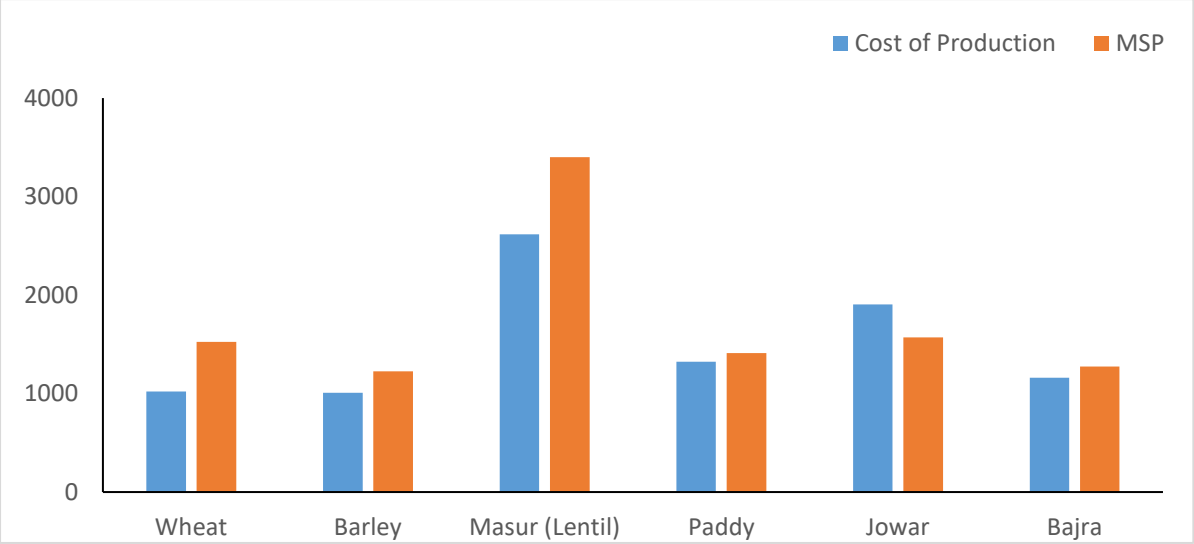


Figure 3: MSP vs. cost of production for major agricultural commodities (2016). Prices are in INR / Quintal. Source: INDIASTAT.com, Agricultural Statistics at a glance 2016

Another issue from Indian point of view is the method used for calculation of AMS. WTO method for calculation uses a fixed external reference price (ERP) from a base year (1986-88 for India) to assess

the level of price support. India chose to notify the ERP in the base year in domestic currency. This measure is flawed as it ignores, inflations and exchange rate fluctuations in its calculations. Notification in domestic currency prevented any exchange fluctuations to be considered in calculation for AMS. This doesn't capture true level of support because MSP which is linked to cost levels of production are based on current prices whereas ERP is based on prices three decades old.

6 MODEL FRAMEWORK TO FORECAST THE REQUIRED SUBSIDY SUPPORT

Therefore, the basic aim of our study is to estimate the level of true domestic support provided under the amber box category. The objective of our model is to forecast the required domestic subsidy support by Indian Farmers for the next few years. Aggregate measurement of support is to be estimated for the increasing procurement levels to support the national food security program. We will evaluate that whether these increasing AMS levels would breach the Agreement on Agriculture permitted subsidies (Amber box) and the policy space available for India to implement the PDS model. We have chosen rice for our analysis since it is a major export agricultural commodities. Spices and other cereals though as a group have higher share in exports by value, individual components have lesser value share.

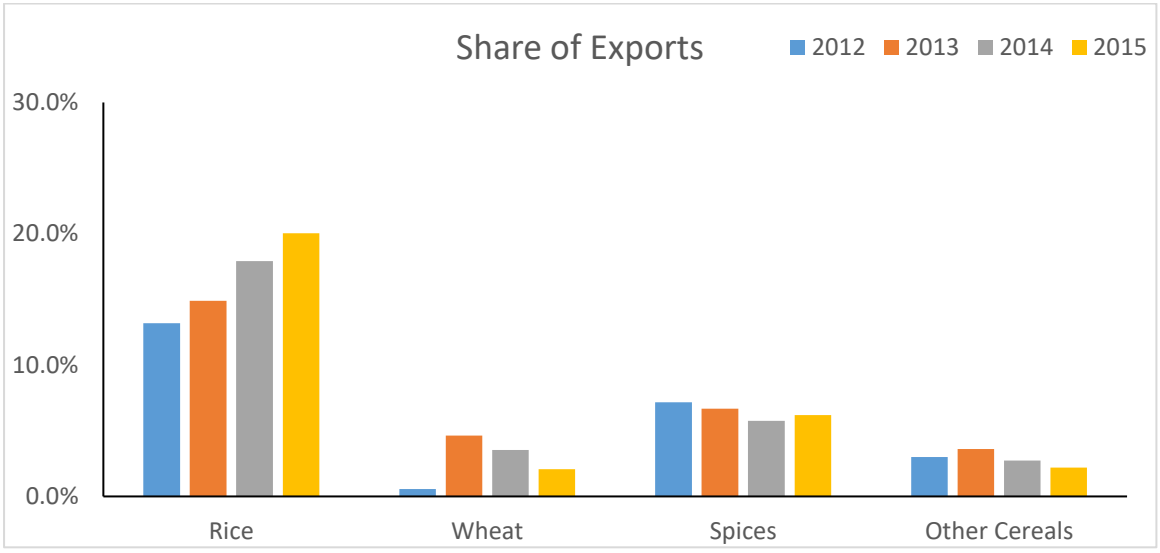


Figure 4: Share of exports of major agricultural commodities by Value. Source: Agricultural Statistics at a glance 2016

Estimating production levels:

The Production level O_t is the product of crop area A_t and its yield Y_t. We have treated Area and Yield exogenous due to limited scope of our project. The Production level forecast would be based on mathematical extrapolation of the past data.

$$O_t = A_t \times Y_t \quad (1)$$

Total demand would be the sum of urban and rural demand.

$$\text{Demand} = \text{Demand}_{\text{Rural}} + \text{Demand}_{\text{Urban}} \quad (2)$$

We will estimate the procurement levels to meet the demand due to food security obligations. For example: an estimate would be procurement to meet 75% rural demand and 50% urban demand. Given the current procurement levels, we estimate government to procure ~50% of the demand for food security. Based on past levels these estimates would be obtained.

Given the procurement level to meet the demand from the current production level we will estimate the aggregate measurement of support needed for this procurement levels as a percentage of total agricultural output based on AoA norms. We will identify the breach level, if any and the Year of breach as per the regulations under Amber box.

Forecasting Area under Cultivation and Total Rice Production

We used data of area under cultivation of rice and total rice production from year 1950 to 2015 to generate future forecasts for the years 2016 to 2022. Forecasting was done using time series Auto Regressive Integrated Moving Average (ARIMA) modelling technique. In the literature, this model was used by (Prabakaran, 2014) and was validated on the available data. The technique ARIMA (p,d,q) involves transforming the existing time series to a stationary(d) series, identifying the required order of Auto regression(p) and moving average(q). Criterion such as AIC and BIC are the used to identify the best model.

Using our data from 1950 to 2015 (Area under cultivation in '000 Hectares and Total Rice Production in '000 tonnes), we identified that ARIMA (1, 1, 1) provides the least AIC values. Below is the forecasted output of our model:

Year	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Area under Rice cultivation Forecast ('000 Hectares)	44153	44383	44592	44800	45007	45215	45422

Year	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Total Rice Production Forecast ('000 tonnes)	107895	108947	110276	111574	112875	114176	115477

The details of the each of the forecasting model is provided in Appendix.

Forecasting Demand for Rice

The demand for rice can be broken down into direct and indirect consumption. Direct refers to the domestic consumption of rice whereas indirect refers to industrial usage, seed and waste. The indirect demand is referred as SFW demand. The demand is forecasted using the per capita expenditure and modelling per capita consumption accordingly. The indirect demand is extrapolated based on the historic trends. Forecasting of direct demand is mentioned below:

Predicting the per capita consumption of rice is broken down into following three steps:

1. Estimating the expenditure elasticity of rice
2. Predicting India's total household food consumption
3. Share of rice in total food consumption

Most of the studies predict demand for agricultural products either using linear expenditure system (LES) or quadratic almost ideal demand system (QUAIDS) (Ganesh Kumar A, 2012). LES is a subset of QUAIDS and is therefore used for the demand estimation owing to simplicity of equation.

The LES model estimates elasticities for agricultural products using following equation:

$$S_i = \alpha_i + \sum_j \beta_{ij} \, Ln \, FP_i + \gamma_i f\left({}^{Ln\, PC}/_{GI}\right) + \mu A \qquad (3)$$

S_i is portion of i^{th} product in household food consumption, Fp_i is the price, and Pc is per capita consumption and GI is denoted by stone geometric price Index[2].

The per capita consumption is based on the per capita income levels. This is forecasted using the following equation:

$$Ln\ Pc = a + b_i LnP_f + b_2 LnP_{nf} + f(c_i Ln\ Y) + dZ \quad (4)$$

P_f is the price index of food items whereas P_{nf} is the index for non-food items and Y is per capita Income measured as net national product (NNP) per capita at factor cost.

Ganesh Kumar et al. in their study segmented population based on rural and urban regions and by income levels. The coefficients obtained after regression were different for different income classes and different region. However they did not found any statistical difference between their elasticities (Ganesh Kumar A, 2012). They estimated the elasticity for Rice with respect to food expenditure as -0.21. We observe from the past data that the per capita consumption of rice is declining. This validates the use of -0.21 as Rice elasticity. Ganesh Kumar et al. (Ganesh Kumar A, 2012) estimated the per capita consumption with respect to the per capita income using following equation

$$Ln\ PC = -0.88 - 0.35 LnP_f + 0.61 LnP_{nf} + 4.9(Ln\ Y) - 0.49\ Ln\ Y^2 \quad (5)$$

The R^2 for this regression was observed to be 0.99 (Ganesh Kumar A, 2012)

The food consumption elasticity based on the above equation with respect to per capita income was estimated as 0.77.

The demand is forecasted by assuming the per capita income growth to varying as per following scenarios 4% growth, 5% growth and 6% growth level.

Based on this per capita income level growth rate, the forecasted values for per capita food consumption in growth percentage are tabulated below:

Scenario (per Capita)	2015	2020	2025
4% income growth	3.05%	2.66%	2.29%
5% income growth	3.35%	2.92%	2.58%
6% income growth	3.62%	3.16%	2.74%

Table 1: Forecasts for per capita food consumption growth rates. (Ganesh Kumar A, 2012)

Using forecasted elasticity for Rice, and growth in per capita consumption depending on the scenarios the following per capita demand for next ten years for Rice is estimated:

Year	Scenario 1 (4%)	Scenario 2 (5%)	Scenario 3 (6%)
2018	5.70	5.66	5.63
2019	5.67	5.62	5.58
2020	5.63	5.58	5.54
2021	5.59	5.54	5.50
2022	5.56	5.51	5.46
2023	5.59	5.55	5.50

Table 2 Demand forecast for per capita consumption of Rice

[2] $\ln(GI) = \Sigma_{n\,i=1} \ln(S_i FP_i)$ (R Green, 1990)

From the study if Ganesh Kumar et al. the indirect demand for rice is estimated to be 4.4% of total demand consumption. Assuming a population growth rate for India to be 1.2%, the total annual demand for rice (direct and indirect) is estimated to be

Year	Scenario 1 (4%)	Scenario 2 (5%)	Scenario 3 (6%)
2018	95.4	94.6	93.8
2019	95.9	95.0	94.2
2020	97.7	96.9	96.1
2021	98.3	97.4	96.6
2022	99.0	98.0	97.1
2023	99.6	98.6	97.6

Table 3: Forecast for total annual demand in Million metric tonnes

Product Specific Support Calculations

We used the methodology developed by Sharma S. K., 2016 to calculate the rice specific product support in India. The aggregate minimum support level is calculated for the procurement of the demand levels above. Given the procurement levels, we calculated the eligible production.

Value of Production = Admiinistered Price x Production
Product Sepcific support = (Administered Price – External Reference Price) x Eligible Production
Where Eligile Production = Procurement Level x Production
We calculated Product Specific supoprt as a percentage of the value of production.

Year	Administered Price ($/Ton)	External Reference Price ($/Ton)	Eligible Production (mn ton)	Production (mn ton)	Value of Production (mn $)	Product Specific Support (mn $)	PS/VOP
2016	324.8	262.5	47.18	107.90	35044.30	2938.53	8.39%
2017	324.8	262.5	47.43	108.95	35385.99	2954.72	8.35%
2018	324.8	262.5	47.70	110.28	35817.64	2971.00	8.29%
2019	324.8	262.5	47.96	111.57	36239.24	2987.37	8.24%
2020	324.8	262.5	48.86	112.88	36661.80	3043.69	8.30%
2021	324.8	262.5	49.17	114.18	37084.36	3062.99	8.26%
2022	324.8	262.5	49.48	115.48	37506.93	3082.40	8.22%

For the adminstered prices we have used the 2015-2016 levels. If the situation worsens further and India fail to negotiate during the Peace clause discussion, these administered price levels will be decreased.

Policy space for India given the 10% Amber box limit:

From our calculations we estimated that remaining within the Amber box levels, India can procure 56.26 million tonnes of rice assuming 2015-2016 administered price levels. It is 52% of the current production levels. Also within the current requirement, there is a scope to increase the administered price till $340.4 per tonne.

7 CONCLUSION

Using rice, given the current procurement levels and the forecasted demand, we have estimated that India will not violate the *de Minimis* limit for the amber box product specific support till 2022.

Our estimate on this study is limited by multiple assumptions. The production and the area under cultivation is modelled using ARIMA time series technique. Demand estimate incorporates population and per capita income growth rates. Administered prices at 2015-2016 levels are utilised for the calculation. Although currently India is within the Amber box limit, the 10% restriction has restricted the policy space. Agriculture support is necessary for the marginalised farmers in India and it is about time when the support will go beyond the permissible levels. When India will negotiate the signed peace clause in Buenos Aires in December, 2017 the product specific support limit has to be negotiated which is imperative for meeting the food security obligations for India and other developing countries.

8 APPENDIX

Below are the details about each of the forecasting models:

Area under cultivation:

The Mean Absolute Percent Error (MAPE) is 2.017 with an R-Square of 93.9%

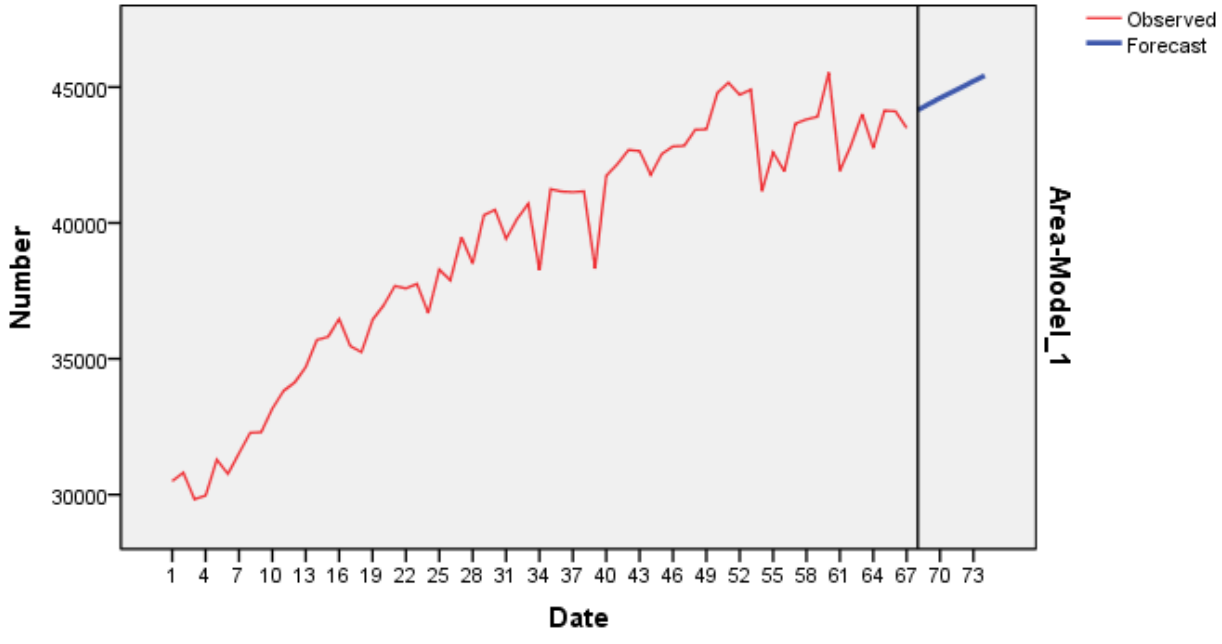
Model Statistics

Model	Number of Predictors	Model Fit statistics: Stationary R-squared	Ljung-Box Q(18): Statistics	Ljung-Box Q(18): DF	Ljung-Box Q(18): Sig.	Number of Outliers
Area-Model_1	0	.235	22.608	16	.125	0

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile 5	10	25	50	75	90	95
Stationary R-squared	.235	.	.235	.235	.235	.235	.235	.235	.235	.235	.235
R-squared	.939	.	.939	.939	.939	.939	.939	.939	.939	.939	.939
RMSE	1106.338	.	1106.338	1106.338	1106.338	1106.338	1106.338	1106.338	1106.338	1106.338	1106.338
MAPE	2.017	.	2.017	2.017	2.017	2.017	2.017	2.017	2.017	2.017	2.017
MaxAPE	9.705	.	9.705	9.705	9.705	9.705	9.705	9.705	9.705	9.705	9.705
MAE	785.098	.	785.098	785.098	785.098	785.098	785.098	785.098	785.098	785.098	785.098
MaxAE	3996.069	.	3996.069	3996.069	3996.069	3996.069	3996.069	3996.069	3996.069	3996.069	3996.069
Normalized BIC	14.208	.	14.208	14.208	14.208	14.208	14.208	14.208	14.208	14.208	14.208

Forecast Chart



Total rice production

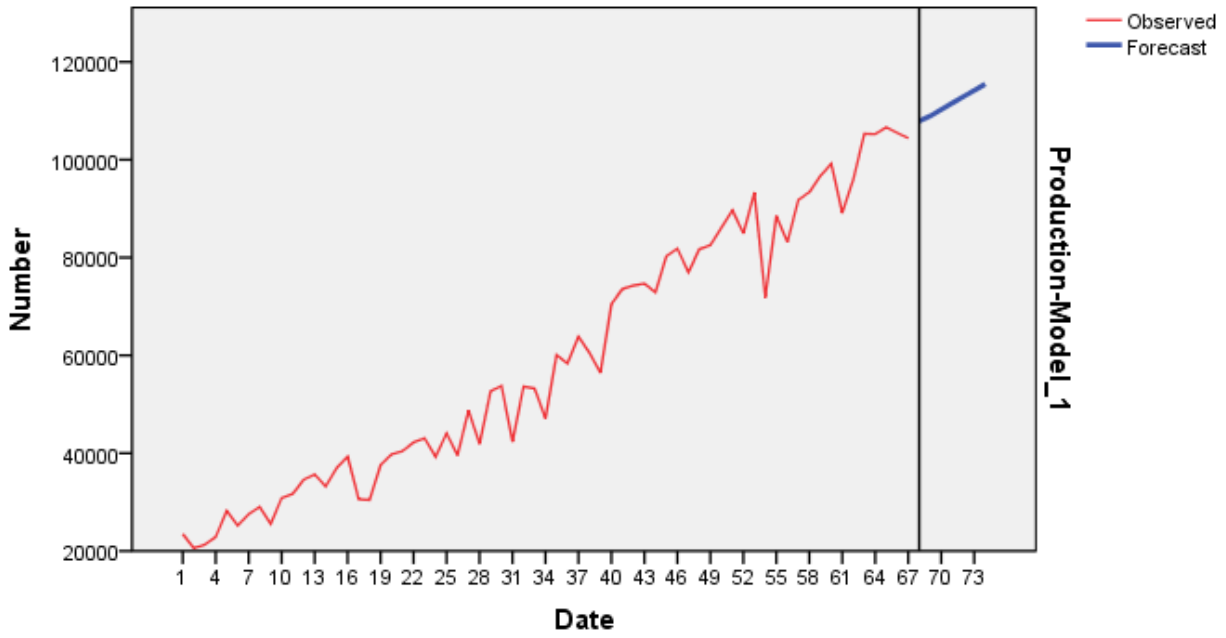
The Mean Absolute Percent Error (MAPE) is 6.866 with an R-Square of 96.6%

Model Statistics

Model	Number of Predictors	Model Fit statistics	Ljung-Box Q(18)			Number of Outliers
		Stationary R-squared	Statistics	DF	Sig.	
Production-Model_1	0	.395	12.458	16	.712	0

Model Fit

Fit Statistic	Mean	SE	Minimum	Maximum	Percentile						
					5	10	25	50	75	90	95
Stationary R-squared	.395	.	.395	.395	.395	.395	.395	.395	.395	.395	.395
R-squared	.966	.	.966	.966	.966	.966	.966	.966	.966	.966	.966
RMSE	4940.404	.	4940.404	4940.404	4940.404	4940.404	4940.404	4940.404	4940.404	4940.404	4940.404
MAPE	6.866	.	6.866	6.866	6.866	6.866	6.866	6.866	6.866	6.866	6.866
MaxAPE	29.529	.	29.529	29.529	29.529	29.529	29.529	29.529	29.529	29.529	29.529
MAE	3586.444	.	3586.444	3586.444	3586.444	3586.444	3586.444	3586.444	3586.444	3586.444	3586.444
MaxAE	18973.051	.	18973.051	18973.051	18973.051	18973.051	18973.051	18973.051	18973.051	18973.051	18973.051
Normalized BIC	17.201	.	17.201	17.201	17.201	17.201	17.201	17.201	17.201	17.201	17.201



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