

Welfare Effects of Lifting Subsidies on Date Palm Sector in Kingdom of Saudi Arabia

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ABSTRACT: Date palm is considered as the main agricultural sector in The Kingdom of Saudi Arabia (KSA). Although the agricultural policy of subsidizing date production succeeded in increasing the area and production of this script, but it puts a high pressure on the water sector, which is considered a highly scarce resource. The KSA does not have rivers or lakes, so it depends on the depleted groundwater. This study aims at evaluating the effect of lifting producers' subsidies to consumers, producers, the government spending and the society as a whole. The Partial Market Equilibrium Model was used to evaluate the effects of lifting-in the producers' subsidies on the different related sectors in KSA. This model is based on the changes of consumers' and producer surpluses caused by the policy. The analysis showed that the level of supply during the selected period had dropped due to eliminating the producer subsidies, more over this elimination caused an increase in consumer prices which causes a decrease in the quantity demanded. The net social efficiency losses in production and consumption and total efficiency loss were positive. From the efficiency point of view the benefit of the producers was higher than for the consumers. On the other hand, the producers loss was higher for the producers than the consumers. While the dead weight gain reached about 571 million Rial Saudi as an average of the period 2007-2012, and total gain of the government (budget gain) was 514 million Saudi Rial during the same period.

Key Words: Consumer Surplus, Producer Surplus, Dead Weight Loss, Partial Market Equilibrium Model, Producer Subsidy.

INTRODUCTION

World date palm production had witnessed a remarkable increase during the last five decades. In 1965, it was 1.85 million tons, increased to 2.7 million tons in 1985, and then it reached 8.3 million tons in 2011.

Asia is leading continent in dates' production in the world, then comes Africa (57.2% and 42% respectively in year 2011)

Egypt is the main producing country for dates (About 19% of total production in 2011), then comes Saudi Arabia with a share of 15% of the world trade then comes Iran (14%).

Date palm is considered the main agricultural sector in The Kingdom of Saudi Arabia (KSA), about 156 thousand hectares was planted with this crop, it comprises about 19.8 % of the total crop area in the Kingdom in 2011. Dates are the most important crop in the food security situation. The average per capita consumption of dates in the kingdom was 35 kg.

The Kingdom of Saudi Arabia (KSA) had established an export program under the umbrella of the Saudi Fund for Development in 1999, which aimed at encouraging Saudi dates exports to expand in existing export markets, and have access to new markets to contribute to diversifying the sources of national income. However, exports of Saudi dates are still weak, the amount of dates exported was about 7.7 % of the volume of production in 2011 (about 78 thousand tons only).

In general, there is a surplus of production of dates in Saudi Arabia, which was estimated at about 400 thousand tons in 2010 and is expected to increase to about 600 thousand tons in 2020, this led to a decline in the wholesale price of dates received by the farmers.

The private sector has played a major role in Saudi Arabia's agricultural development. This is mostly due to government programs that offered long-term, interest-free loans, and technical support services, low-cost water, fuel and electricity, and reduced duties on imports of raw materials and machinery.

Moreover, the government represented by the Ministry of Agriculture and the Agricultural Development Fund (ADF) to provide subsidies to producers of dates in the United Kingdom (UK) to buy the machines, pumps for irrigation and agricultural equipment) up to 55% of the value, and the granting of production subsidy rate of 0.25 Saudi riyal³ per kg is produced from dates and providing services to control pest free palm holdings of small and medium enterprises, and the establishment research centers to develop the production, manufacture and marketing of dates. The producers' subsidies were restructured to include equipment and supplies carried on farms, which are related to the agricultural production operations and direct marketing, including commercial refrigerated establishments and refrigerated trucks and sorting and grading and packing equipment. The government grants a subsidy of 25% of the loan value offered to date palm farmers. (WTO, 2011)

Justifications and Objectives

Despite its relatively small share of total real Gross Domestic Product (GDP) (4.6% in 2010), agriculture is of key importance in the economy because of Saudi Arabia's food security objective. This is to be achieved mainly through relatively low customs tariffs (3.5%, major division 1 of ISIC, Revision 2). In order to increase food security, Saudi Arabia has encouraged private companies to invest in farm projects abroad. The private sector has played a major role in the development of Saudi agriculture, mostly due to government programs that offer, inter alia, long-term, interest-free loans; low-cost water, fuel and electricity; and reduced duties on imports of raw materials and machinery, the date palm sector got high fraction of these subsidies.

Although the agricultural policy of subsidizing dates production succeeded in increasing the area and production of this crop, but it put a high pressure on the water sector, which is considered highly scarce resource. The KSA does not have rivers or lakes, so it depends on the depleted groundwater.

This study aims at evaluating the effect of lifting producers' subsidies to consumers, producers, the government spending and the society as a whole.

Literature Cited

A study estimated Saudi dates market share in selected countries. The export price elasticity was computed as a weighted average of the import demand elasticities in each individual country-product destination market, using the elasticities of substitution across has imported types. The results show that the price elasticity of demand was more than one in Germany, India, USA and Pakistan; this means that it could not be possible to increase Saudi Arabian dates' prices in these countries, because other countries will substitute Saudi Arabia. On the other hand, the short run elasticities were found inelastic, except in Jordan. This result indicates that there is a possibility of increasing Saudi dates exports in the selected countries, except in Jordan, in the short-run, while in the long-run, the only country which has elastic elasticity was India, which indicated that there is a possibility to increase the Saudi market share in the selected countries in the long run, except in India. (Abdulmuhsen, A. et.al).

Riley, G. (2012) in his article "producer subsidies" defined and listed different types of producers' subsidies, then discussed the effect of the consumer subsidy using producer and consumer surplus tools.

METHODOLOGY

In this research all data used were secondary data, most of it was collected from the FAOSTAT site on the internet, the rest were data from the ministry of Agriculture in Saudi Arabia.

The Partial Market Equilibrium Model

The Partial Market Equilibrium Model was used to analyze the welfare effect of lifting the subsidies for the date palm sector in Saudi Arabia.

In this model the impact of the macroeconomic policies on producers, consumers, taxpayers, and society could be analyzed. Concepts and instruments such as supply, demand and economic efficiency are used to analyze the role of the public and private sectors in achieving economic efficiency. The social benefit is divided into two parts: the value which goes to the consumer and called "consumer surplus" and the value which goes to the producers and called "producers surplus", the data that we need to measure the changes in producer and consumer surpluses created by a given change in price are: producer prices, quantities consumed and produced at this price, quantities of exports, and imports, world prices, official exchange rate, and the elasticities of supply and demand (Table 1). (Crugman, P. and Obsfeld, M. (2006).

¹One US\$= 3.75 RS

The Effect of Producer Subsidy on Consumer and Producer Surplus

In this section, we will explain the producer subsidy effect on both consumer and producer surpluses, gains or losses by the consumers and producers, gains and losses by the government, and gains and losses for the society, i.e. dead weight loss.

Partial equilibrium indicators used to assess the impact of a price intervention or of policies that shift the supply and/or demand curves are: (FAO, no date)

Welfare Effects

The impact of consumer welfare is measured by the change in consumer surplus (ΔCS), and the impacts on producer welfare of the change in producer surplus (ΔPS). This analysis could be disaggregated among consumer and producer groups if they have different initial shares in total consumption and production, and/or different price elasticities of demand and supply. For instance, poor consumers typically have a higher elasticity of demand for food with respect to price, and a higher share of their total consumption expenditures on food than rich consumers. Small farmers typically have a lower elasticity of supply response and a larger share of their total production in food crops than large farmers.

Government Budget Effect (ΔB)

Import tariffs and export taxes are sources of government revenues. Producer and consumer subsidies are sources of government outlays. The net of these revenues and expenditures is calculated to give the effect on the government budget.

Rent Effect (ΔR)

When quantity restrictions apply to exports or imports, a commodity is transformed from a tradable to a non-tradable. The rents the export or import quotas create are appropriated by exporters or imports instead by government, unless these quotas are auctioned under competitive bidding. If exporters or importers compete among each other to appropriate these rents, they may dissipate in rent-seeking expenditures up to the whole value of the rent.

Efficient Effects

The net social gain or loss (NSG, NSL) to a country is measured as the total of the changes in consumer surplus, producer surplus, government budget effect, and rent effect. As we will see below, a NSL can typically be decomposed between a NSL in production (NSLP) and a NSL in consumption (NSLC).

Balance of Payment Effect (ΔBoP)

Changes in exports and imports induced by the policy change are measured. Changes in import costs and export earnings are also measured, and the net gives the change in the balance of trade or payments.

Analytical Framework of the Model

The Partial Market Equilibrium Model was used to evaluate the effects of lying-in the producers' subsidies on the different related sectors in KSA.

The effect on equilibrium quantity in the market depends on the price elasticity of demand for date, i.e. if demand is inelastic, then lower prices for dates are unlikely to cause much of an expansion in market demand, the output effect of the subsidy will be limited. If demand is elastic, a given unit subsidy is likely to bring about a greater increase in the quantity bought and this will increase the total spending on the dates farmer subsidy. In Saudi Arabia, the elasticities of demand and supply were inelastic (-0.186 and 0.1).

The subsidy provides a financial incentive for palm dates farmers to increase their output in the expectation of higher profits. Producers' subsidies represent payments to producers by the government, which reduces their variable costs of production and encourages them to expand their output.

The subsidy causes the firm's supply curve to shift to the right because the firm's costs are reduced. This means that more can be supplied at each price. Equilibrium price falls from P_1 to P_0 and quantity traded expands from Q_1 to Q_0 . (Figure 1)

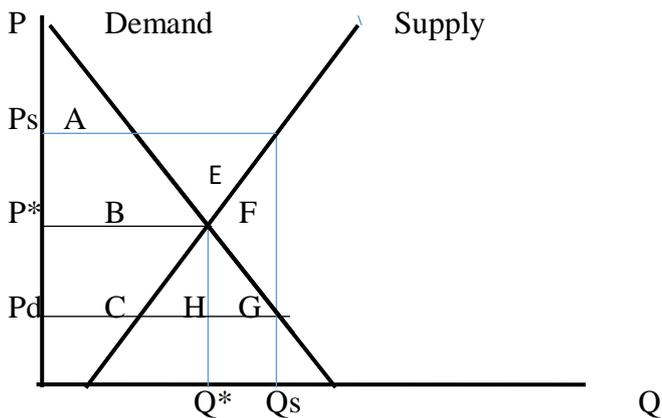


Figure 1. Eliminating the Per-Unit Producers' Subsidies for Date Palm Sector in Saudi Arabia

Table 1 outlines the changes in the variables of interest before and after lifting the per-unit subsidy. In this case the returns to producers will decrease, they sell less units with less price. Moreover, the consumers will pay higher prices. Assuming that we assume that the market equilibrium price with subsidy is P_s , which includes per unit subsidy, the quantity Q_s . Lifting all types of producers subsidies will move the supply curve upwards, i.e. decrease supply, while the price will shift up to P^* and the quantity will decrease to Q^* . The distance between the two supply curves is the value of the subsidy per one ton of production.

Partial equilibrium indicators which are used to assess the impact of a price intervention or of policies that shift the supply and demand curves are; welfare effects in which the impact of consumer welfare is measured by the change in consumer surplus (ΔCS), and the impacts on producer welfare of the change in producer surplus (ΔPS), the government budget effect (ΔB) in which import tariffs and export taxes are sources of government revenues. Producer and consumer subsidies are sources of government outlays. The net of these revenues and expenditures is calculated to give the effect on the government budget and efficient effects in which the net social gain or loss (NSG, NSL) to a country is measured as the total of the changes in consumer surplus, producer surplus, government budget effect, and net trade effect. A NSL can typically be decomposed between a NSL in production (NSLP) and a NSL in consumption (NSLC).

Table 1. Evaluating the Lifting of the Producer's Subsidies for the Date Sector in Saudi Arabia

Variable	With Subsidy	Without subsidy	Change
Demanders' Prices (RS/ton)	P_d	P^*	$P^* - P_d > 0$
Sellers' Prices (RS/ton)	P_s	P^*	$P^* - P_s < 0$
Quantity Traded (tons)	Q_s	Q^*	$Q^* - Q_s < 0$
Consumer Expenditure (RS)	$P_d \cdot Q_s$	$P^* \cdot Q^*$	$P^* \cdot Q^* - P_d \cdot Q_s > 0$
Producer Revenue (RS)	$P_s \cdot Q_s$	$P^* \cdot Q^*$	$P_s \cdot Q_s - P^* \cdot Q^* < 0$
Consumer Surplus	$A+B+C+G+H$	$A+B$	$C+G+H < 0$
Producer Surplus	$B+C+D+E$	$C+D$	$B+E < 0$
Gains/Losses From Trade	$A+2B+2C+D+E+G+H$	$A+B+C+D$	$-(B+C+E+G+H)$
Government Expenditure	$B+C+E+F+G+H$	0	$-(B+C+E+F+G+H)$
Deadweight Loss/Gain	$A+B+C+D+F$	$A+B+C+D$	$-F < 0$

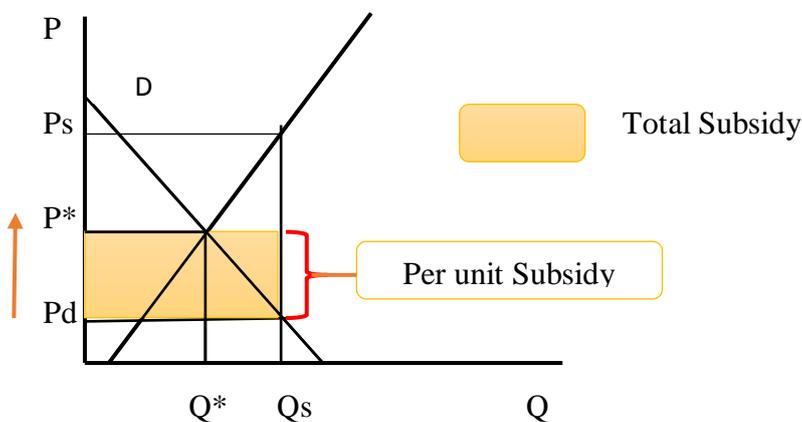


Figure 2. The Effect of Lifting Producers' Subsidies on Supply Demand, Prices and Quantities of Dates in Saudi Arabi

The Nominal Protection Coefficient (NPC) is equal to the ratio of the domestic Price of a commodity to its border price using the official exchange rate

$$NPC = p_d / p_b$$

Where:

P_d= domestic price

P_b= boarder price

Alternatively, this can be written as the Nominal Rate of Protection (NRP).

$$NRP = (p_d / p_b + 1) = S$$

$$p_d = p_b * NPC = p_b (1+S)$$

Since (S) is a per unit subsidy that will be eliminated, then it is considered positive,

$$S = (p_d - p_b) / p_b$$

For the purpose of quantitative analysis, it is important to measure the efficiency, welfare, government revenue, and balance of trade effects as follows:

The Net Social Loss in Production (NSLP), which can be measured as:

$$\begin{aligned} NSLP &= \\ &= -\frac{1}{2} \left[\frac{(q - q^b)}{(p - p^b)} * \frac{p^b}{q^b} \right] * \left[\frac{q^b}{p^b} (p - p^b)(p^b - p) \right] \\ &= -\frac{1}{2} * Es \left(\frac{p - p^b}{p^b} \right) * p^b q^b \end{aligned}$$

Where:

$$Es = [(q - q_b) / (p - p_b)] (p_b/q_b)$$

Proceeding in similar fashion, we obtained the following measures:

Efficiency effects

$$NSLP = -\frac{1}{2} * Es * S^2 * p_b * q_b$$

Net Social Loss in Consumption (NSLC)=

$$NSLC = \frac{1}{2} * Es * S^2 * p_b * c_b$$

Net Social Loss (NSL)

$$NSL = NSLP + NSLC > 0$$

Welfare effects

Welfare gain of producers (ΔP_s)

$$\Delta P_s = q * (p - p_b) - NSLP > 0$$

Welfare gain or loss of consumers (ΔC_s)

$$\Delta C_s = -c * (p - p_b) - NSLC < 0$$

Government budget effect

$$\Delta B = (q^* - q) (p_b - p) > 0$$

To calculate the degree to which prices influence consumed and produced quantities

First the percentage difference between world (boarder) price and producer price was calculated using the following formula:

$$[(1 - NPC (pp)) / NPC (pp)] * 100$$

Also the percentage difference between boarder price and consumer price was calculated using the following formula:

$$[(1 - NPC (pc)) / NPC (pc)] * 100$$

To calculate the changes in quantity supplied

the following formula is used:

$$(\text{The elasticity of supply}) * (\text{actual production}) * (\text{the \% difference between } P_d \text{ and } P_b)$$

To calculate the changes in the quantity demanded

of dates, the following formula is used:

$$(\text{The elasticity of demand}) * (\text{apparent consumption}) * (\text{the \% difference between } P_c \text{ and } P_b)$$

To calculate the supply level at the no intervention outcome,
 the following formula is used: (Production + Change in output without intervention)

To calculate the demand level at the no intervention outcome
 the following formula is used: (Apparent Consumption⁴+ Change in onsumption with no intervention)

To calculate the export level at the no intervention outcome,
 the following formula is used: (Supply-demand) under no intervention outcome

To calculate the efficiency loss in production
 we used the following formula:
 $(-0.5 * (\text{supply with no intervention} - \text{production}) * (P_p - P_b))$

To calculate the efficiency loss in consumption
 the following formula is used:
 $(0.5 * (\text{demand with no intervention} - \text{apparent consumption}) * (P_c - \text{boarder price}))$

Total efficiency loss
 efficiency loss in production – efficiency loss in consumption

To calculate the consumer gain/loss
 the following formula is used:
 $((\text{demand with no intervention} * (P_c - P_b) + \text{efficiency loss in consumption})$

To calculate the producer gain/loss
 the following formula is used:
 $((\text{production} * (P_p - P_b) + \text{efficiency loss in production})$

To calculate the government revenue/expenditure
 the following formula is used: $((\text{consumer gain/loss} - (\text{production} * (P_p - P_b)) - \text{efficiency loss in consumption}))$

RESULTS AND DISCUSSIONS

Table 2 presents the basic data needed for the partial equilibrium model, they include: elasticities of supply and demand, the level of production, the level of exports and imports, world prices (CIF price for export duties), producers' price, the official exchange rate, and consumers' price.

Dates' production had increased during the studied period 2007-2012 with an average of 8028 tons annually, while exports had increased by lower rates, i.e. 8371 tons annually during the same period. (Figure 3)

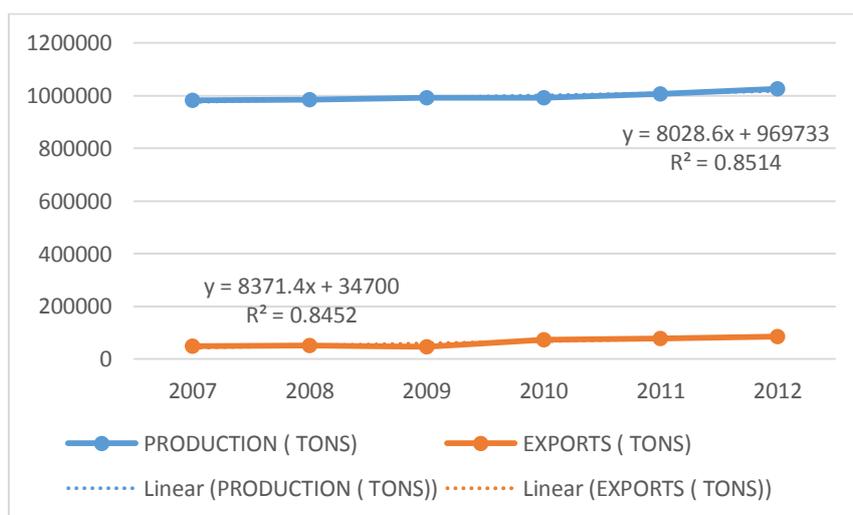


Figure 3. Production and Exports oinates in Saudi Arabia for 2007-2012

²Apparent Consumption= production + Imports – Exports – waste and loss (1%)

Table 2. Basic Data for The Partial Equilibrium Model for Date Palm Sector in Saudi Arabia

ITEM	YEAR					
	2007	2008	2009	2010	2011	2012
ELASTICITY OF SUPPLY	0.900	0.900	0.900	0.900	0.900	0.900
ELASTICITY OF DEMAND	-0.186	-0.186	-0.186	-0.186	-0.186	-0.186
PRODUCTION (TONS)	983000	986000.000	992,000	992000	1008000	1026000
EXPORTS (TONS)	48800	50900.000	47100	73400	77800	86000
IMPORTS (TONS)	1568	876	876	4053	2998	3602
World price (Pw) CIF US\$	560	574	578	588	598	608
OFFICIAL EXCHANGE RATE (Rial/US\$)	3.750	3.750	3.750	3.750	3.750	3.750
BOARDER PRICE (Bp) (Rial/TON)	2100	2151	2169	2206	2242	2279
PRODUCER PRICE (Pp) (Rial/TON)	1509	1651	1669	1706	1742	1779
CONSUMER LOCAL PRICE (Cp) (Rial/TON)	1875	2008	2011	2061	2053	2074

Table 3. **Error! Unknown switch argument.** The Partial Equilibrium Model Resulin Saudi Date Palm Sector in Saudi Arabia

Item	2007	2008	2009	2010	2011	2012
NPCp	-0.70	-0.75	-0.75	-0.75	-0.76	-0.76
NPCc	-0.91	-0.93	-0.93	-0.93	-0.92	-0.91
SHIFT TO NO INTERVENTION						
Movement from PPd to Pw (%)	-2.435	-2.342	-2.337	-2.330	-2.323	-2.316
Movement from PCd to Pw (%)	-2.096	-2.071	-2.079	-2.070	-2.092	-2.099
Increase/Decrease in Output (MT)	2154315	2078229	2086624	2079995	2107097	2138439
Increase/Decrease in Consumption (MT)	-360924	-356754	-361875	-351487	-359234	-364345
NO INTERVENTION						
Supply (MT)	3137315	3064229	3078624	3071995	3115097	3071781
Demand (MT)	565014	569362	573981	561246	563884	568997
EFFICIENCY LOSS IN PRODUCTION (M rial)	636	520	522	520	527	511
EFFICIENCY LOSS IN CONSUMPTION (M rial)	-41	-25	-29	-25	-34	-37
TOTAL DEADWEIGHT LOSS (M rial)	595.58	494.11	492.95	494.50	492.77	474.14
CONSUMER GAIN/LOSS (M rial)	-127	-81	-91	-81	-107	-117
PRODUCER GAIN/LOSS (M rial)	-581	-493	-496	-496	-504	-513
GOVERNMENT REVENUE/ EXPENDITURE ((M rial))	581	493	496	496	504	513

All prices, border, production and consumers, have positive trends during the studied period, Their annual increase was 35 tons, 34 tons and 47 tons respectively.

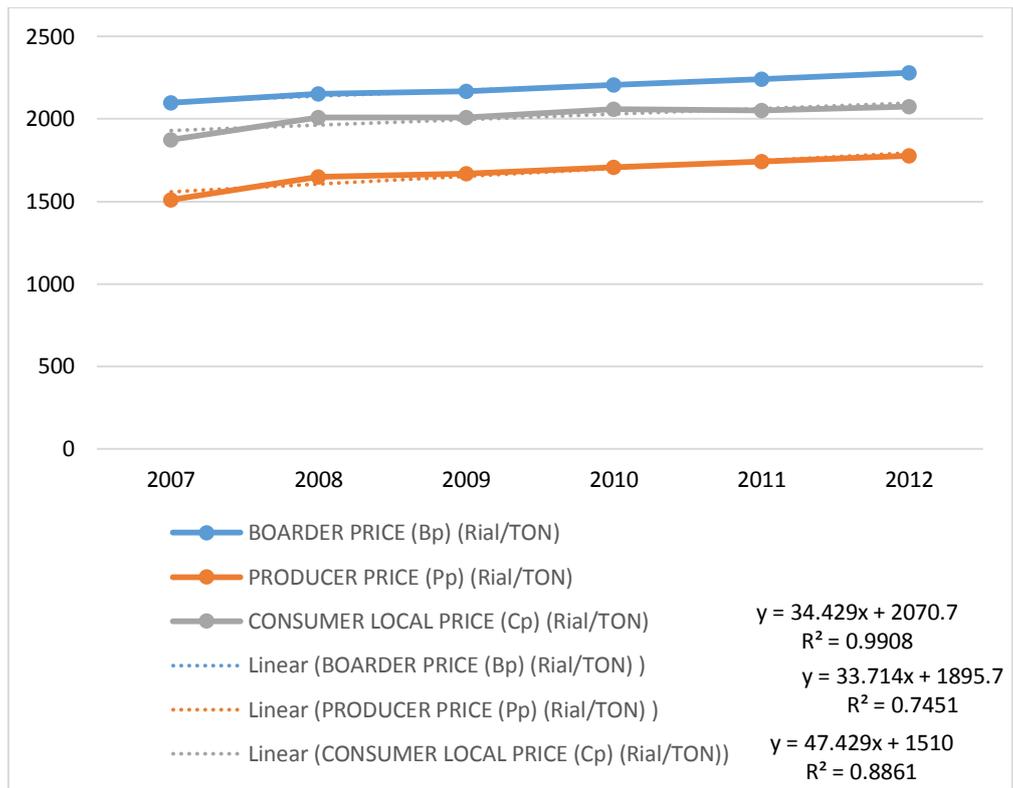


Figure 4. Boarder Prices, Producers' Prices an consumers' Pries forSaudi Arabia dates during 2007-2012

Table 3 summarizes the partial equilibrium model results, the level of supply during the selected period had dropped due to elimination of the producer subsidies, moreover, this elimination caused an increase in consumer prices which causes a decrease in the quantity demanded.

The net social efficiency losses in production and consumption and total efficiency loss were positive. From the efficiency point of view the benefit for the produpes was higher than for the consumers.

On the other hand, the producers' loss was higher for the producers than the consumers. While the dead weight gain reached about 571 million Rial Saudi as an average of the period 2007-2012, and total gain of the government (budget gain) was 514 million Saudi Rial during the same period.

Recommendations

It is recommended to phase out the producers' subsidies within the next five years to decrease the depletion of the scarce groundwater and to save some money from the government spending.

To decrease the effect of the increase in consumer prices of Dates locally, it is recommended to carry out a consumption campaign for dates, especially between the youth in the Mingdom.

Moreover, the KSA should follow the WTO rules related to lifting all types of market interference in the Date Palm sector.

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