
# Rice Mountain

## Assessment of the Thai rice pledging program

**Risti Permani and David Vanzetti**

The University of Adelaide and Australian National University

Contributed paper prepared for presentation at the 58th AARES Annual Conference, Port Macquarie, New South Wales, 4-7 February 2014.

# Rice mountain:
## Assessment of the Thai rice pledging program

**Risti Permani and David Vanzetti**

*The University of Adelaide and Australian National University*

## Abstract

In 2011 the Thai Government pledged to pay rice producers 50 per cent more than the going market price. The surplus has gone into Government stocks. While supporting local farmers, the Government also hoped to drive up world prices by withholding supplies from the world market and make a speculative profit by selling the stocks at a higher price. It is now clear that the policy has in fact depressed world prices and the Government has a mountain of rice to dispose of. Furthermore, the stocks are starting to spoil, and there has been an upsurge in smuggling to take advantage of inflated prices. Competing exporters have increased supplies to the international market. This study analyses the welfare effects of various Thai rice policy options using a dynamic, stochastic, ten-region, partial equilibrium model of world rice trade. While the Thai policy was effective in supporting the incomes of rice producers in the short run, the burden imposed on taxpayers and consumers seems difficult to justify.

## Keywords

Thailand, rice, stocks, trade

# 1. Introduction

The recent rice policies of the Thai Government have sparked debate over strategies to achieve food security programs particularly in the Asian region. A standard buffer stock scheme involves governments purchasing and stockpiling a commodity when prices are low and selling it when prices are high. By this means, the Government not only stabilises prices but also makes a speculative profit if the price difference is sufficient to cover the cost of storage. However, the Thai policies seemed to have been aimed at raising world prices by temporarily removing supply from the world market. Prime Minister Yingluck Shinawatra has been accused of attempting "to manipulate the world's rice market by buying up supplies" (Murdoch 2013).

The Government's rice pledging scheme is to pay as much as 50 per cent above the market price without limit on the amount of stocks. This makes the Government the largest buyer of rice. When the program was first launched in 2011, the top price at which the government buys rice from the country's farmers was 15,000 Baht (for white rice; and up to 20,000 Baht for fragrant paddy rice) or $486 a tonne – about 50 per cent higher than the global market price at the time. With Thai rice stocks around 30 million tonnes, the Government was outlaying an additional $7.8 billion over the world price with the hope that it could recoup this expenditure by selling the grain at an inflated price. The Pledging Program for 2011/2012 involved 1.3 million rice farming households, out of a total of 3.6 million in the country. Most of these household participants are small to medium-size farming households. The World Bank estimated that the program is projected to cost the government around 1 per cent of GDP each year.

In the past two decades, Thailand's share of the global rice market has been generally declining and relatively volatile (Figure 1). In contrast, the contribution of other major rice exporters such as Vietnam and India has been gradually increasing since late 1980s. In 2010, just one year before the rice pledging scheme was first launched, Thailand contributed one-third of the global rice exports, whilst Vietnam and India contributed 20 per cent and 8 per cent, respectively (USDA 2013). These relatively small differences between Thailand's and other major competitors' world export shares would suggest that Thailand would not be able to increase world prices by a significant amount. However, if traded rice is seen as a different product than domestically consumed rice, then Thailand would have much greater market power, and the plan to raise prices by restricting exports would have a much greater chance of success. Furthermore, buyers seemed to panic in 2008, when several countries imposed restrictions on exports. There was a chance that they may do so once again.

Nonetheless, many argue that the main reason why the rice pledging scheme was implemented in the first place was more politically motivated rather than aimed at enhancing food security. According to Russell (2013), the policy was Prime Minister Shinawatra's 'vote winner'. She won power in July 2011 with a promise of generous subsidies to rice farmers.

Regardless the rationale behind the design of the policy, the controversial policy seems to bring back an already heated debate on the role of governments in grain storage and potential volatility in the world grain market resulted from speculative actions of major producers such

as Thailand. Governments' interventions in stockholding are normally justified, as in other areas, by the existence of market failure for example when the private sector has inadequate resources to handle risk, is poorly informed or subject to inappropriate regulatory or political constraints. That is not obviously the case in this instance.

Trade is often seen as a means of stabilising domestic prices. However, when exporters impose restrictions on trade, as happened in 2008, importers are naturally reluctant to rely on international markets and may seek to ensure supplies by holding their own stocks. This is especially so in a thin market such as rice where trade is a small proportion of global production. Related issues to the debate include whether a regional or national approach or the provision of credit or other costs subsidies are more effective in ensuring stable food prices and supply. In eight of the last 13 years, global grain consumption has exceeded production leading to a significant drop in reserves (Larson 2013). In 2012, according to FAO statistics, global rice production is only slightly above total consumption whilst the available stocks would only cover 81 days of consumption. Given the importance of food security, governments' role in grain storage is understandable but holding excessive stocks may not be the most efficient policy option.

Thailand's decision to restrict its rice exports has not significantly affected the world price (Figure 2). The current (February 2014) price is US$438 per tonne, the lowest since January 2008. Whilst this could mean that the global rice market is quite competitive where even a major exporter is not a price maker, the insignificant impact of the policy on the global price may be due to other factors. The timing of Thailand being edged out of its top exporter position for the first time in three decades was simultaneous with India needing to unload stocks accumulated during a four-year ban on non-Basmati exports (Larson 2013). Indonesia also buys less rice from Thailand due to higher domestic output (Russell 2013). Furthermore, the Philippines' commitment to import at least 367 kt tonnes of rice, which could help Thailand solve its issues, is constrained by the passing of the importation burden onto the private sector. The private sector in Philippines has preferred to import rice from Vietnam due to its lower price (Manila Bulletin 2013).

The Thai rice pledging scheme would have driven up world prices if exports from other countries were not increasing. In addition, the inclusion of wealthy farmers in the rice pledging program means that there is room to improve the efficiency of the program delivery if the targeted population is poor farmers. From the Thai government's perspective, this should highlight the importance of exploring other policy options rather than accumulating rice stocks.

Despite exhaustive media coverage, to the authors' knowledge, there has not been any empirical study demonstrating the welfare impacts of the Thai rice pledging scheme. This study, therefore, aims at investigating the welfare effects of various Thai rice policy options. In particular, it uses a dynamic, stochastic, ten-region, partial equilibrium model of world rice trade to identify the separate impacts of the domestic price rise and the build-up of stocks, and then to examine options to draw down the stocks and to support farmers using a direct support mechanism not liked to production.

## 2. Rice policies in Thailand

The rice economies in Asia were traditionally characterised by a high degree of government intervention in production, export and internal distribution (Wong 1978). Many Asian countries have been concerned about food security and improving productivity to reduce import dependence. Some would then translate the policy to a self-sufficiency program. For Thailand, the concerns have been more about stabilising food prices for consumers rather than supporting producers (Warr 2008).

A review of rice policies until 1973 suggests that most policies being used were trade policies and "unlike most importing countries, the government of Thailand never tried to influence prices by influencing production" (Siamwalla 1975). In the past, the impacts of various government rice policies varied considerably. However, as suggested by Siamwalla (1975), "the government generally was more successful in decreasing rice prices than in increasing them" and benefiting urban consumers more when prices were high compared to their effects on the farmers who "were completely unprotected when prices were low" (page 246). As an illustration, the export premium, a fee to be paid as a price for obtaining an export license and in effect an export tax, became the major instrument of government intervention since the abolishment of government's monopoly in rice export (Wong 1978). Since the removal of the export tax in 1986, however, Thailand's rice exports have been neither protected nor subsidised to any significant extent (Warr 2008).

Despite being a major rice exporter, Thailand still experiences fluctuations in its production although the general trend in rice production has been positive (Figure 3). Natural disasters, especially floods, have impacted rice production quite significantly in the past. In October 2011 for example, the Commerce Ministry predicted that floods affected 1.6 million hectares of cultivated areas of which 1.3 million are paddy (Bangkok Post 2011), but these events had not impacted the total production and its export contribution significantly.

Whilst there have been fluctuations in the growth rate of domestic production, the ability of domestic production to meet domestic demand for rice has been increasing quite consistently as indicated by a widening gap between the two variables (Figure 3). This could be due to dietary transformation in Thailand which, as in many other Asian countries, reflects higher demand for animal-based sources of protein such as beef, fish and dairy (Beghin 2006). In contrast, demand for rice per capita may not have experienced a significant increase. Another reason could be due to the price elasticity of supply of most agricultural commodities which has been historically very low, at least in the short run (Warr 2008). However, as demonstrated by Figure 1, increased global population and, therefore, increased total demand for rice, as well as increased exports from newer exporting countries such as India and Vietnam, mean that increased Thai rice export volume does not necessarily imply an increase in its global export share.

Prior to the implementation of the rice pledging scheme, what's unusual about Thailand was that government interventions were seldom intervening in agricultural commodity markets (Warr 2008). Instead, cash transfers to village organisations and subsidised loan schemes not linked to agricultural production and rural infrastructure development have been the main

intervention instruments (Warr 2008). Unfortunately, these transfers and loans have not been able to raise the productivity of rural people or helped them diversify their economic activities into non-agriculture. This condition might have been seen by Prime Minister Shinawatra as a rationale for designing a policy to improve rice smallholders' welfare.

The Paddy Pledging Program was estimated to create a loss of around 1 per cent of GP from the 2011/2012 Program and around 1.2 per cent of GDP for the 2012/2013 Program. The costs of pledging, storage, milling, operating costs and interests are paid by the government. Under the program, registered farmers could deliver paddy to designated millers, approximately 2,000 of them across the country, and receive a receipt, which they would then take to the Bank for Agriculture and Agricultural Cooperatives (BAAC) to claim a payment (The World Bank 2012). The payment would depend on the grade and moisture of the paddy as determined by the millers. Millers are hired by the government to mill the pledged paddy and deliver the milled rice to the government within 7 days. Due to limited capacity of the Government's public storage, they are also hired to store the milled rice.

Looking at the farm-gate price, there seems to be some rationale for the government to increase the ceiling price. The average cost of rice farming is between 5,000 and 6,000 baht per tonne, according to the Thai Agriculturist Association. Additional costs of more than 3,000 baht are required to cover interest payments, labour and land rental. According to FAO data the average farm gate price was 11,600 baht per tonne in 2010, but in the rainy seasons price can decrease to 9,000 baht per tonne due to humidity (Jikkham and Bunyamanee 2013). These price effects of quality issues have been reported to create a tension between rice millers, buyers and producers.

One objective of the rice pledging scheme was to improve the productivity and welfare of smallholders. These universally applied subsidies mean that farmers who are in a position not requiring financial support also receive government assistance. A recent study indicates that about 500,000 rice farmers are regarded as wealthy, while 1.3 million farming households are poor (Wangkiat 2013). Moreover, the study reported that most wealthy farmers earn their income mainly from growing rice, while only 16 per cent of poor paddy farmers earn their living solely from the land implying the scheme tends to benefit the rich more than the poor (Wangkiat 2013). Recent policy discussion has been centred at whether the government should lower the pledging price from 15,000 to 12,000 baht.

## 3. An analytic framework

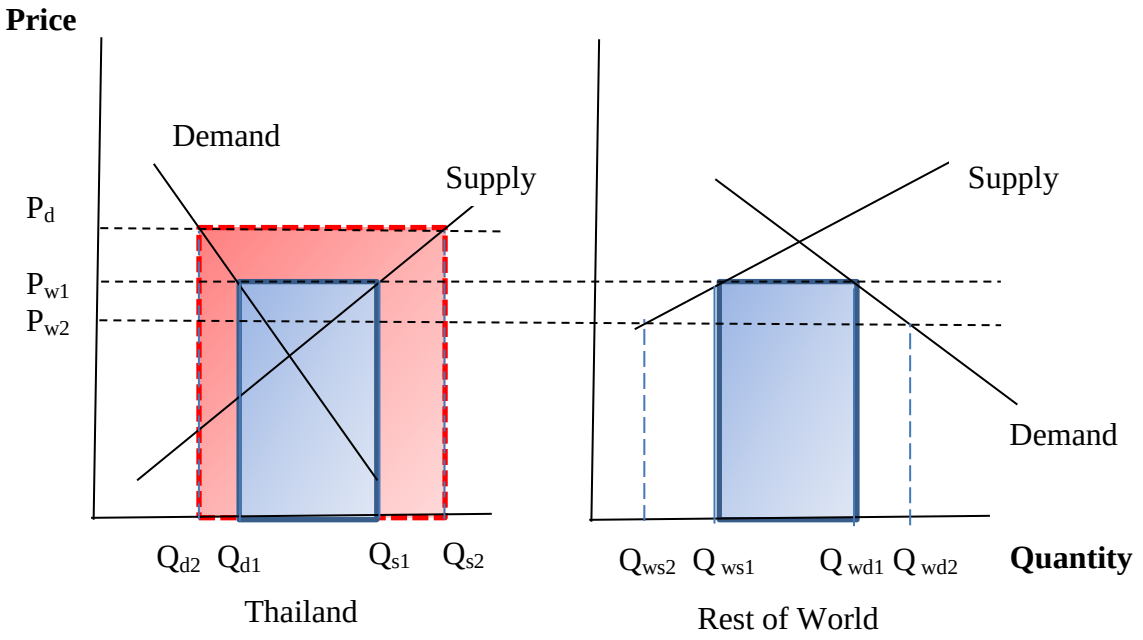
To analyse the impact of government stockholding we use a dynamic, stochastic, ten-region, partial equilibrium model of world rice trade. The model includes historical stochastic production shocks and was used elsewhere (Vanzetti 1998) to examine the effectiveness of government stockholding versus trade liberalisation as a means of stabilising prices. In this application a static, deterministic version of the model provides useful insights. The key variable is the elasticity of foreign supply. Unless the build-up of stocks in Thailand led to a decrease in global supply, or there was simultaneously a significant production shortfall, the policy was unlikely to succeed.

The analytics of a floor price scheme are shown in Box 1.

**Box 1 Simple analytics of floor price scheme**

The main effects of a floor price for rice are shown in the diagram. The left hand side panel shows quantity of output ($Q_{s1}$), of which $Q_{d1}$ is consumed domestically and $Q_{s1}$-$Q_{d1}$ is exported at world price $P_{w1}$. Thailand's exports, the blue box, equal Rest of World imports, $Q_{wd1}$-$Q_{ws1,}$ shown in the right hand side panel.

If Thailand raises its domestic prices to $P_d$, the exportable surplus, red box, rises to $Q_{s2}$-$Q_{d2}$. In the absence of a change in stocks, the world price needs to fall to $P_{w2}$ for the market to clear. To avoid the world price falling, Thailand needs to store the additional supplies. In fact, the Thai policy seems to have been to store more than the additional surplus to raise world prices. This is unlikely to work unless the Rest of World supply curve is unresponsive to price (inelastic). Since agents know that Thai stocks are overhanging the market, the policy is likely to have the opposite effect to that intended. World prices are more likely to fall than rise.




## 3.1 The model

The model used in the analysis in this paper is based on Vanzetti (1998) but with some notable differences, for example with focuses on rice rather than wheat, and on Thailand/South East Asia rather than the world as a whole. See the appendix for a more detailed description.

The features of the model are the following.

1. ***Stochastic:*** The model incorporates stochastic supply-side shocks that are based on observed annual variations in production from a linear trend since 1961. The

randomly generated shocks are assumed to have a logistic distribution around the observed mean deviation from the trend. The logistic distribution has longer tails than a normal distribution and allows for more extreme shocks. The covariance between regions is taken into account when generating the shocks. Shocks which have their origin in the demand side are ignored, although from the perspective of a single country, changes in demand in other countries are transmitted to the domestic market.

2. ***Dynamic:*** The model is dynamic in the sense that periods are linked by the formation of price expectations and carry-over of stocks between periods. However, it is not dynamic in the sense used in estimated econometric models based on time series data where specified variables such as production and consumption change over specific period of time (e.g. annually). In this more qualitative model, constructed with parameters estimated outside of the basic data in the model, the equilibrium conditions of specified variables will remain constant if there are no stochastic shocks or policy changes.
3. ***Non-linearity:*** Demand and supply curves are assumed to be non-linear so as to capture observed responses such as to large shocks on prices where consumption does not fall proportionally as much as it does for smaller price shocks.
4. ***Public and private stock functions:*** These stock functions are modelled separately as it is assumed that they are based on different objectives, for example price stabilisation (buy and sell bands) and commercial incentives (expected price gains outweigh storage costs) respectively.
5. ***Domestic and international price linkages:*** Trade constraints such as high tariffs or quantitative restrictions prevent domestic prices reflecting world market prices. Estimates of the relationship between movements in these prices are used to link them in the model for analysing the stability impact of specific policies.
6. ***Welfare measures:*** The model calculates consumer, producer and taxpayers' gains and losses (e.g. costs of subsidies to storage) as well as a risk premium which incorporates the proportion of expenditure spent on rice, the responsiveness of consumer spending to changes in income, and the (assumed) degree of aversion to risk (unstable prices).
7. ***Ten regions:*** The model has ten regions (see table 1), chosen to reflect the degree of similarity between countries in each region while limiting the number to manageable proportions. Of particular interest are the policies of Thailand and other ASEAN countries and the three non-ASEAN countries, Japan, China and Korea, who are discussing coordinating rice reserves. The Rest of World is a residual, meaning that the model covers global trade.

## 3.2 The data

Base period quantity and price data for the ten regions are shown in Table 1. The year 2010 was selected as the base year, the most recent for which price, quantity and policy data are available and reasonably representative of important recent developments like bio-fuels. In particular, this choice avoids the turmoil of 2008.

**Table 1. Milled rice baseline data (2012)**

| | Production | Imports | Exports | Consump-tion | Ending stocks | Prices |
|---|---|---|---|---|---|---|
| | kt | kt | kt | kt | kt | $/t |
| China | 137,000 | 540 | 500 | 135,000 | 42,574 | 775 |
| India | 95,980 | - | 2,774 | 90,206 | 23,500 | 936 |
| Japan | 7,720 | 676 | 200 | 8,200 | 2,689 | 3,063 |
| Korea, South | 4,295 | 436 | 3 | 4,900 | 1,281 | 546 |
| Indonesia | 35,500 | 3,098 | - | 39,000 | 6,175 | 546 |
| Philippines | 10,539 | 1,300 | - | 12,900 | 2,459 | 650 |
| Thailand | 20,262 | 200 | 10,647 | 10,300 | 5,615 | 567 |
| Vietnam | 26,371 | 500 | 7,000 | 19,400 | 1,941 | 598 |
| Rest of ASEAN | 19,344 | 1,145 | 1,779 | 18,725 | 987 | 546 |
| Rest of World | 93,091 | 26,984 | 11,976 | 111,471 | 11,137 | 520 |

Source: USDA (2012). Prices derived from world price ($520) plus tariff.

Global production is dominated by China producing one third of the global supply, which more than maintains a policy of self-sufficiency (defined by the government as production in excess of 95 per cent of consumption), with production similar to consumption at 135 million tonnes. The level of stocks is quite significant, 43 mmt, but prices are also high.

*Prices*

The model is calibrated around a world indicator milled rice price (Thai 5 per cent broken) of US$520 per tonne. Domestic prices are based on world prices plus the applied import tariffs. These tend to be well above the paddy prices received by producers because rice is milled before it is traded.

Producer prices in countries in the South East Asia region, for example Indonesia and Philippines, seem to have followed Thai prices for much of the past three decades, according to historical data reported by the FAO (Figure 4). However, in recent years Indonesian prices have departed from Thai levels as policies became more closed. This implies that price

transmission is relatively high, at least on an annual basis. This implies that Thai prices will have a direct impact on world prices.

*Base period parameters and policy data*

The model parameters are shown in Table 2. A key parameter is the Thailand elasticity of demand, as this determines the response of consumers to price shocks. A high elasticity, such as -0.4 in India, means consumers respond to higher prices by reducing consumption, and there is less change in domestic prices than would be the case with a lower elasticity. If there is no response, all the adjustment to the production shock occurs in prices rather than quantities.

**Table 2 Rice baseline parameters**

| | **Elasticity of demand** | **Elasticity of supply** | **Transmission elasticity** | **Storage costs** |
|---|---|---|---|---|
| | | | | % |
| China | -0.12 | 0.62 | 0.62 | 0.17 |
| India | -0.40 | 0.77 | 0.77 | 0.17 |
| Japan | -0.10 | 1.70 | 1.70 | 0.15 |
| Korea, South | -0.20 | 1.77 | 1.77 | 0.15 |
| Indonesia | -0.14 | 0.75 | 0.75 | 0.17 |
| Philippines | -0.25 | 0.76 | 0.76 | 0.17 |
| Thailand | -0.25 | 0.91 | 1.00 | 0.17 |
| Vietnam | -0.10 | 0.58 | 0.58 | 0.17 |
| Rest of ASEAN | -0.20 | 0.80 | 0.80 | 0.17 |
| Rest of World | -0.20 | 0.80 | 0.80 | 0.17 |

Source: ATPSM database (UNCTAD), FAPRI, Vanzetti (1998), Dissanayake (2012).

A second important parameter is the elasticity of supply of competing producers, particularly exporters. In fact these are not particularly high for India (0.77) and Vietnam (0.58), in contrast to the observation that these countries responded to Thailand's stock build-up by increasing exports to the world market. Also important is the transmission elasticity. If this is low, producers and consumers have only a limited opportunity to respond to a change in world prices. The Thai elasticity is assumed to be one, as it sets the world indicator price.

*Storage costs*

The costs of storage include interest on the value of the stocks, the interest and depreciation of the physical storage facilities, the variable costs required to keep the rice at appropriate moisture content and an allowance for possible spoilage and, perhaps, theft. Annual storage costs in developed countries are assumed to be 5 per cent of current price, to reflect real interest charges, plus 10 per cent of baseline prices to represent physical storage costs. Costs in developing countries tend to be higher (at 17 per cent) than in the developed countries because of the lack of good quality storage facilities, the lower quality training received by storage personnel and the higher temperatures in tropical countries that encourage insect pests.

According to the World Bank which uses information from the National Rice Policy Committee, in the 2011/2012 Paddy Pledging Program the total costs of operating, storage, milling and interest are 33 billion Baht for approximately 21 million tonne produced in the main and second crop (page 19). This implies around 157 Baht per tonne is spent on operating, storage, milling and interests or about 10 per cent of the pledged price (i.e. 15,000 Baht) or 15 per cent of the domestic market rice which is between 9,000 and 10,000 Baht. Therefore, we assume here that total storage costs in Thailand are 17 per cent which includes about 5 per cent interest rates and 12 per cent physical storage costs. Additional information is that the average warehouse rent stand around 160-190 Baht (or about $6) per square meter per month.

The average cost of storage at about 17 per cent of domestic market price is quite similar to the costs of storage in other developing countries. Government storage costs are assumed to be similar to private costs. Governments might have lower costs because of economies of scale, lower borrowing costs, or lower insurance costs, but on the other hand costs may be higher, given that governments are holding stocks for reasons other than speculative profits, such as producer income support. In addition, spoilage is likely to increase the longer the grain is held. After two years the cost of storage may increase significantly for this reason. This is not taken into account here. In the model used here, government storage levels are not dependent on the costs of its storage.

*Government stockholding*

Governments hold stocks when they believe the private sector is not performing the social or political economy role they envisage adequately. Since the private sector responds to expected prices, governments typically buy stock when there is insufficient profit to encourage private storage.

The Thai rice pledging program offers a unique case of public-private relationships in the rice sector. By design, there seems to be a deliberate goal to offer a higher price in order to crowd out the private rice dealers. Under the Program, the Government hires around 800 millers across Thailand to mill and store the milled rice. The total domestic rice storage capacity is reported to be around 23 million tonnes (Samudro 2012).

As the Thai government does not restrict the amount of rice allowed to be pledged, the government would have to increasingly rely on private warehouses. In October 2012, it is reported that 95 per cent of government warehouses were full and several rice millers refused to buy rice from farmers because of insufficient storage, whilst earlier the commerce Minister said that the government can store up to 20 million tonnes of rice (Oryza 2012). This represents nearly 90 per cent of total production. However, if the government continues to build its rice stocks up, increasing reliance on private warehouses is expected to increase the rents by up to 15 per cent.

*Expectations*

In most cases producers must make their planting decisions before they know the season's price. The price they expect to receive is assumed here to be a combination of past prices, weighted to place prominence on the more recent values. In general, the faster producers respond to a shock, the more stable prices become. On the other hand, lagged effects reduce the magnitude and increase the duration of a one-off shock by spreading its impact. In this analysis, the weights are assumed the same for all countries and all periods at 0.6, 0.3 and 0.1 for one, two and three period lags respectively. This assumption is somewhat at odds with the Government announcing a fixed price, say 15,000 Baht. At issue is whether producers believe the Government at planting time. There has been some debate, for example, about reducing the price to 12,000 Baht.

*The scenarios*

Four scenarios of the international rice market are presented.

1. *Baseline*: This represents the base simulation in which all regions apply the protectionist trade policies current in 2010.
2. *The pledging scheme:* The price received by Thai farmers increases by 50 per cent compared to the market price.
3. *Stock purchase:* Government buys 10 mmt over each of three years.
4. *Stock sell-off:* Government sells 18 per cent of current stock per year over five years.
5. *Farmer income support:* The government to provide cash transfers to poor farmers.

Scenario 2 provides estimates of the effects of the current rice pledging program in the absence of stockholding. Scenario 3 shows the effect of the high domestic price plus the build-up of stocks to maintain world prices. Scenario 4 shows what may happen when the Government releases stocks back onto the market. Scenario 5 examines an alternative policy to support low income farmers through a decoupled payment. This takes into account recommendations from several development agencies including the World Bank. The World Bank (2012) suggests that although only a little more than 10,000 households out of 1.3 million household participants are large households, the very poor farmers in Thailand are subsistence farmers who do not have excess rice to sell and, therefore, do not benefit from the pledging program. On the other hand, the pledging scheme has motivated farmers to increase the number of crops each year through the use of lower quality paddy which has a shorter

harvest time. It is suggested that a better program to help raise income and productivity of poor farmers would be through better targeted social assistance such as cash transfers.

The model solves by finding a market clearing world price, at which global imports equal global exports. This is found by numerical iteration and domestic prices, quantities and welfare are calculated. In this application, where we are not concerned about price stability, the model is run in a deterministic mode, without stochastic shocks. Results are presented in the following section.

## 4. Simulation results

Assume the Thai Government increases domestic prices by 50 per cent without any other policy changes. Specifically, assume no change in Government stocks. The results that could be expected are shown in column 2 of table 3. After the changes have worked through – there is a three year lag in the formation of producer expectations of domestic prices – production increases 12 per cent and consumption decreases 8 per cent, reflecting the respective elasticities. As a result, the exportable surplus increases 33 per cent and world price is reduced by 3 per cent from the base of $520 to $505 per tonne.

The annual welfare effects show the change from the base in consumer surplus, producer surplus and Government expenditure. Rice producers gain, $5.1 billion, at the expense of consumers, $2.3 billion, and taxpayers $3.8 billion. Private stockholders make a speculative gain from selling stocks at high prices. While the main effect is transfers from one group to another, the net effect is a welfare loss for Thailand of $759 million. This is not totally wasted, however, as world prices fall and foreign consumers gain. In fact, global consumer gains, at $2.1 billion, are similar to the Thai consumer losses.

This result sees world prices falling because global supply has increased. This is partly due to the increase in production, but also because Thai stockholders have drawn down their stocks in the belief that prices must inevitably fall. This adds to the problem.

The second scenario reflects reality more closely. The Government builds up stocks to remove supply from the world market. In addition to the price increase, the Government buys 10,000 kt a year for three years. In the third year it holds 30,000 kt.[1] The results are shown in the third column of table 3. Output and consumption are hardly affected, but exports are reduced by close to the amount of the annual stock purchase. The effect on world price is to raise it to $555 per tonne, compared with $520 in the baseline. To this extent the policy is effective in raising prices, but the magnitude is not great. This is because world price depends on total production, not only on exports.

[1] The Government is reported to have purchased 36,000 kt over three years, but sold off 15-20 per cent of this (Murdoch 2013).

**Table 3 Simulation results for Thailand**

| | | Baseline | Pledging scheme | Stock purchase | Stock sell-off | Decoupled producer support |
|---|---|---|---|---|---|---|
| **Output** | kt | 20,262 | 22,666 | 22,985 | 22,483 | 20,262 |
| **Consumption** | kt | 10,300 | 9,436 | 9,253 | 9,473 | 10,300 |
| **Exports** | kt | 9,962 | 13,229 | 3,732 | 18,524 | 9,962 |
| **Closing stocks - private** | kt | 2,808 | 17 | - | 1,145 | 2,808 |
| **Closing stocks - Govt** | kt | 2,808 | 2,808 | 30,000 | 2,800 | 2,808 |
| **Domestic price** | $/t | 567 | 805 | 870 | 792 | 567 |
| **World price** | $/t | 520 | 505 | 555 | 497 | 520 |
| **Change in consumer surplus** | $m | - | -2,351 | -2,953 | -2,222 | - |
| **Change in producer surplus** | $m | - | 5,143 | 6,624 | 4,836 | 3,120 |
| **Change in Govt revenue** | $m | - | -3,822 | -5,171 | -5,380 | -3,120 |
| **Private speculative profits** | $m | - | 271 | 2,874 | 192 | |
| **Welfare** | $m | - | -759 | -9,933 | 1,735 | |

Source: Model simulations.

In this simulation domestic prices rise because they are linked to the world price. There is the expected effect on producer and consumer surplus. However, the main cost for the government is the expenditure in acquiring and storing the stocks. This rises to $5.2 billion. Welfare losses are $9.9 billion. Some of this accrues to private stockholders who make speculative gains by selling stocks to the Government.

While the stock purchase plan seems moderately successful in raising world prices, the question arises as to how to dispose of the stocks. Prices are expected to fall when the Government sells off the stocks. This is illustrated in scenario 4. Here the Government sells down 18 per cent of its stocks over five years to bring stocks back to the initial levels, 2,808 kt. The simulated effects are shown in the final column. The world price falls to $497, reflecting the large increase in Thai exports onto the world market. Because we assume

domestic prices are maintained at 50 per cent above world levels, the impact on producers and consumers are relatively unchanged from the previous scenario. One difference is the Government enhances it revenue by selling the stocks, so the welfare effect is positive. However, this is not a speculative profit. The selling price is below the purchase price and the Government has incurred storage costs of 17 per cent for several years. Finally, we can see that private stockholders move back into the market when the Government exits.

If the objective is to help small farmers, a better approach would be to make a decoupled lump sum payment, targeted to low income families irrespective of production. The Government could have given the poorest 1.3 million farmers $2,400 each and the total would be no more than the costs of storing 30 million tonnes.[2] The final scenario illustrates that this is merely a transfer from taxpayers to producers, with no impact on quantities or prices. Of course, this assumes producers don't grow more, or less, rice to qualify for the payment.

The build-up in Thailand's stocks has favoured competing producers such as Vietnam. Simulations suggest an increase in Vietnam exports of 4 per cent. This good fortune is only temporary. Exports are likely to fall when Thailand releases its stocks. Nonetheless, some importers may develop a preference for Vietnamese rice, which is generally been considered to be of inferior quality.

## 5. Concluding remarks

The results raise the question of what the Thai Government should do now that it has built up a mountain of rice. In contrast to minerals and some agricultural products such as wool, the storage of rice not only incurs physical storage and interest costs, but the commodity deteriorates over time, and the rate of spoilage increases exponentially with time. The options are: (i) sell it quickly; (ii) sell it slowly; (iii) give it away; or (iv) destroy it. All of these options have been used previously in different countries for different commodities.

Our analysis suggests option (i) is the best approach, resulting in minimum welfare losses, because of the storage costs. Selling off Government stocks over one, three and five years results in estimated welfare losses of $16.9 billion, $18.2 billion and $22.2 billion respectively over a five period. Over the longer period the price is not depressed so much but the storage costs are greater.[3]

Options (iii) and (iv) have merit. Rice could be given away as aid, although this tends to depress world markets unless the donations can be kept separate from the commercial market. Japan gives away as aid much of the rice it is obliged to import under the 1995 WTO Agreement. The fourth option saves on storage costs and gets the market back to equilibrium sooner rather than later. The European Union has provisions to denature dairy products to make them unsuitable for human consumption. At the moment the Thai rice stocks are

[2] This calculation assumes 20 per cent annual storage costs and a price of $520 per tonne.
[3] Our estimate does not take account of spoilage over time.

overhanging the market and keeping prices low. Nonetheless, this would be an expensive option, especially if high domestic prices are maintained.

A further consideration is that a production shortfall in Thailand or elsewhere in the world may lead prices to rise dramatically, as they did in 2008, and allow the stocks to be sold at a profit. Analysis using a model with stochastic production shocks based on 50 years of data suggests that that there is 4 per cent chance of the world price rising to $750 per tonne in any given year. The probability of it rising to $650 is 14 per cent. However, it is equally likely to fall.

Limitations to the analysis should be noted. We have assumed producer prices are based on past prices. This would not be the case if prices were administratively set. This implies farmers would respond more quickly to announced price changes. A further assumption is the share of stocks held by private stockholders. In fact, data about private stocks is incomplete. There is no data, for example, about stocks on farms. We also have no data about the possible losses from spoilage.

There may be some merit in supporting low income producers or stabilising prices. However, a floor price scheme is not the optimal approach. It is poorly targeted, with most of the benefits going to larger farmers. It will not benefit subsistence producers who are not selling their grain. It imposes a burden on consumers, many of whom are poor themselves. Governments must also fund the expenditure at the expense of more worthy projects. In the Thai case the rice pledging scheme has encouraged smuggling, as the porous borders allow foreigners to take advantage of the higher prices paid to producers. Initially private stockholders make substantial gains from the higher prices, but end up with no role if prices are fixed. The Government crowds out the private sector, or pays the private sector to store grain on its behalf.

The Government should remove the domestic price premium and sell off the rice stockpile as soon as possible.

## References


Bangkok Post (2011). Floods reduce rice supply, 2013 (Available from URL: http://www.bangkokpost.com/learning/learning-from-news/261757/floods-reduce-rice-supply.

Beghin, J.C. (2006). Evolving dairy markets in Asia: Recent findings and implications, *Food Policy* 31, 195-200.

Dissanayake, J. (2012), "Transmission of price fluctuations in International markets to domestic markets", unpublished (draft) paper, Crawford School of Public Policy, Australian National University, Canberra.

FAO (2013). FAOSTAT, Food Agricultural Statistics (FAO). Available from URL: http://faostat3.fao.org/home/index.html.

FAPRI elasticities database, Iowa State University's Center for Agricultural and Rural Development, (http://www.fapri.iastate.edu/tools/elasticity.aspx).

IFPRI (2009/2010), http://www.ifpri.org/node/8436.

IMF (2014) Primary commodity prices, http://www.imf.org/external/np/res/commod/External_Data.xls.

Jikkham, P. and Bunyamanee, S. (2013). Pledging scheme 'aids rich', Bangkok Post, 2013 (Available from URL: http://www.bangkokpost.com/news/local/363001/rice-pledging-helps-rich-as-well-as-farmers.

Larson, J. (2013). Global Grain Stocks Drop Dangerously Low as 2012 Consumption Exceeded Production, 2013 (Available from URL: http://yubanet.com/world/Global-Grain-Stocks-Drop-Dangerously-Low-as-2012-Consumption-Exceeded-Production.php .

Manila Bulletin (2013). Thailand urges Philippines to comply with earlier rice import commitment, 2013 (Available from URL: http://ph.news.yahoo.com/thailand-urges-philippines-comply-earlier-rice-import-commitment-183924888.html.

Murdoch, L. (2013). Thailand's failed rice scheme creates moulding mountains of grain, The Age, 2013 (Available from URL: http://www.theage.com.au/world/thailands-failed-rice-scheme-creates-moulding---mountains-of-grain-20130724-2qjdy.html.

Oryza (2012). Thailand Private Storage Companies Eye Windfall as Rice Storage Problem Mounts Oryza.com, 2013 (Available from URL: http://oryza.com/content/thailand-private-storage-companies-eye-windfall-rice-storage-problem-mounts.

Russell, C. (2013). Thai rice prices to drop at least 20 pct if stockpile is sold, Reuters, 2013(Available from URL: http://www.reuters.com/article/2013/08/23/column-russell-rice-idUSL4N0GO0OY20130823.

Samudro, A. (2012). Analysis: 2013 inflation: subdued on lower rice and oil prices, The Jakarta Post, 2013 (Available from URL: http://www.thejakartapost.com/news/2012/10/11/analysis-2013-inflation-subdued-lower-rice-and-oil-prices.html.

Siamwalla, A. (1975). A history of rice policies in Thailand, Food Research Institute Studies, Standford University, 2013 (Available from URL: http://ideas.repec.org/a/ags/frisst/135510.html.

Tweeten, L. (1989) *Farm Policy Analysis*, Westview Press, Boulder.

UNCTAD (ATPSM database) www.unctad.org/tab.

USDA (2013). USDA FAS Production, Supply and Distribution, USDA 2013 (Available from URL: http://www.fas.usda.gov/psdonline/psdHome.aspx.

Vanzetti, D. (1998). Global stocks, price stability and food security. Danish Institute of Agricultural and Fisheries Economics, Copenhagen.

Wangkiat, P. (2013). Researchers call for an end to pledging, Thailand Development Research Institute, 2013 (Available from URL: http://tdri.or.th/en/tdri-insight/researchers-call-for-an-end-to-pledging/.

Warr, P. (2008). Trade Policy and the Structure of Incentives in Thai Agriculture, *ASEAN Economic Bulletin* 25, 249-270.

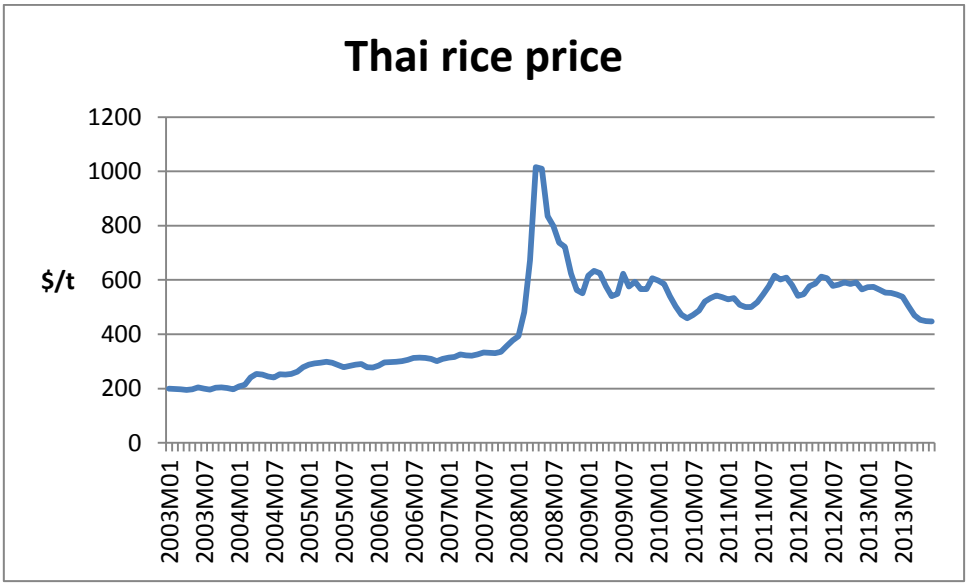
Wong, C.M. (1978). A model for evaluating the effects of Thai government taxation of rice exports on trade and welfare, *American Journal of Agricultural Economics*65-73.

World Bank (2012). Thailand Economic Monitor: December 2012, The World Bank, 2013(Available from URL: http://www.worldbank.org/content/dam/Worldbank/document/TEM_Dec_2012.pdf

**Figure 1. Rice export share (1960-2012)**

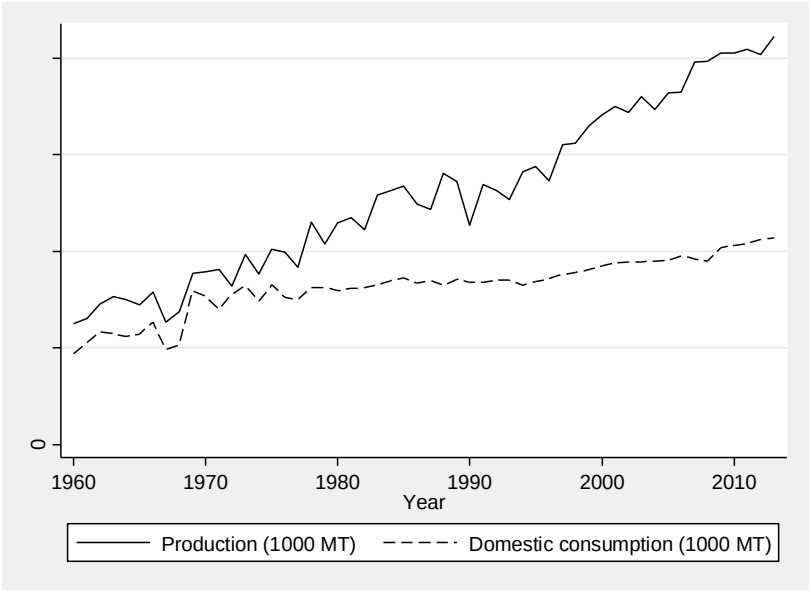

Source: USDA (2013)

**Figure 2. Thai rice price (2003-2013)**



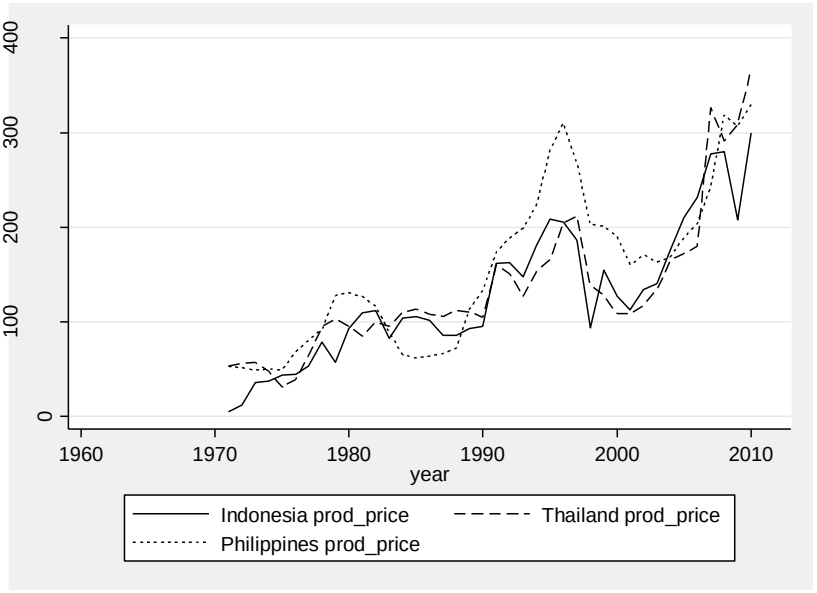

Source: IMF (2014)

**Figure 3. Thai rice production and domestic consumption (1960-2012)**




Source: USDA (2013)

**Figure 4 Price transmissions: Producer prices in Thailand, Indonesia and Philippines (1971-2012)**




Source: (FAO 2013)

## Appendix World rice model description[4]

The world rice model is a multiregion, single, commodity, dynamic, stochastic, non-linear partial equilibrium model.

Demand and supply equations in each region *i* are specified as follows:

(1) $D_i = \alpha_i P_i^{d\ \beta i}$

(2) $S_i = \gamma_i E(P_i^d)^{\delta i} + \mu_i$

Time subscripts are dispensed with except where it is necessary to avoid confusion. $D_i$ is annual consumption in region *i*, $S_i$ is annual production, $P_i^d$ is the domestic price, E is the expectations operator, $\alpha_i$, $\beta_i$, $\gamma_i$, $\delta_i$ are constant parameters and $\mu_i$ a stochastic parameter reflecting uncertainty in annual production.

Equation (1) specifies a non-linear, non-stochastic domestic demand function. The supply function specification (equation 2) provides for additive stochastic shocks $\mu_i$ which are assumed to be independent and normally distributed[5]. Expected prices are assumed to be based on prices in the three previous periods, with greater weight being given to the more recent period.

(3) $E(P_i^d) = \omega_1 P_{i(t-1)}^d + \omega_2 P_{i(t-2)}^d + \omega_3 P_{i(t-3)}^d$

where $\omega_1 + \omega_2 + \omega_3 = 1$.

The price linkage equation is:

(4) $P_i^d = \phi_i + \theta_i P_w$

Domestic prices are linked to world prices, $P_w$, (equation 4) through two components. $\phi_i$ represents a shift component unrelated to the world price, such as a specific tariff, a variable levy, transport costs and so on. The term $\theta_i$ represents the direct relationship between domestic and world prices, and can be interpreted as a transmission elasticity. For $\theta_i < 1$, domestic prices are insulated from and fluctuate less than world prices. A negative value would imply that domestic prices move opposite to world prices. Under free trade, $\phi_i$ equals 0 (excluding transport costs and other margins) and $\theta_i$ equals 1. These parameters should be seen as capturing the effects of a range of policies, although this is an admittedly crude (linear) specification. Where consumers are taxed or subsidised, it is possible to specify different consumer price linkages.

Commercial stocks can be determined by using the arbitrage relationship requiring the expected increase in buying and subsequent selling prices equate to the cost of storage at the margin. Agents carryover stocks if they expect their profits on resale to more than covers the storage costs, including interest, spoilage and the cost of operating the physical facilities. For

[4] This section is an abridged version taken from Vanzetti (1998).

[5] A normal distribution has no theoretical minimum or maximum, yet production cannot be negative. An alternative specification would be to assume a log-normal or a triangular distribution.

simplicity, an approximation suggested by Tweeten (1989, p. 151) is used here. The change in the quantity of private stocks is some proportion of the difference between current and expected prices, where the proportion is equivalent to 1 minus the ratio of storage costs to equilibrium price. This term is multiplied by the slope of the supply equation to convert prices into quantities. Private stockholders are assumed to base their expectation of future prices in a similar fashion to producers, on a weighted average of prices in the current and previous two years. Private stocks cannot become negative.

Private ending stocks $EPS_i$ depend on opening stocks $OPS_i$ and prices and quantities as follows:

(5) $$EPS_i = \rho_i (E(P_i) - P_i^d) + OPS_i$$

where

(6) $$\rho_i = (1 - f_i - g_i)\, \delta_i\, S_i / P_i^d$$

$f_i$ is the real rate of interest and $g_i$ is the physical costs of storage including depreciation. This function implies that as prices rise or supply falls, the demand for stocks falls. In years of poor production, prices will rise and stocks will be run down.

Government stocks are modelled as a price band. The change in government stocks at the end of each period is:

(7) $$EGS_i - OGS_i = \lambda_i (P_i^{dmin} - P_i^d) \text{ if } P_i^d < P_i^{dmin}$$

$$\lambda_i (P_i^{dmax} - P_i^d) \text{ if } P_i^d > P_i^{dmax}$$

$$0 \text{ if } P_i^{dmin} < P_i^d < P_i^{dmax}$$

where $P_i^{dmin}$ and $P_i^{dmax}$ are the lower and upper limits of the band and $\lambda_i$ is the responsiveness of the government agency when the limits are breached. A capacity constraint limits the carryover of government stocks in each country to a user specified percentage above the historic maximum.

The market clearing equation (8) requires that each period global supply plus the change in private and government stocks equates with global demand, and that global imports equal global exports.

(8) $$\Sigma D_i - \Sigma S_i + \Sigma OPS_i + \Sigma OGS_i - \Sigma EPS_i - \Sigma EGS_i = 0.$$

The non-linearities in the model require that it is solved numerically. Initially, a world reference price is postulated. The world price plus region-specific transport costs and policy wedges determine domestic prices, which in turn generate levels of domestic production, consumption and changes in private and public stocks. Trade flows are then calculated. If global exports do not equal global imports, the world price is adjusted until an equilibrium is reached.

Various welfare measures are then derived from these results. The values for a baseline and alternative simulations are compared to assess the impact of a specific policy change.

The non-linear specification requires that consumer and producer surplus measures be calculated by integration. Consumer surplus is the area above the price line bounded by the demand curve and the vertical axis in a standard demand and supply diagram such as figure 1. For a constant elasticity function, $\alpha_i P_i^{d\ \beta i}$, as used here, the demand curve does not reach the vertical axis, and thus the level of consumer surplus is not defined. The approach taken here is to calculate the change in consumer surplus from the baseline. A similar line of reasoning applies to producer surplus. The change in surplus is thus:

(9) $$CS_i = \int_{P0}^{P'} D_i(t)\, dt$$

(10) $$PS_i = \int_{P0}^{P'} S_i(t)\, dt$$

where P0 and P' refer to the baseline and new domestic prices in each region.

Government revenue is the difference in prices times the level of imports, the excess of demand over supply. Domestic governments may not capture all of the rent accruing from policies that drive a wedge between domestic and world prices, as assumed here. They may incur losses through subsidies on exports. Governments also make a net storage gain from buying stocks at a low price and selling at a higher price. Storage costs must be deducted from this.

(12) $$GR_i = (P_i^d - P_w)(D_i - S_i) + EGS_it\,(P_i(t) - P_ii(t-1)) - c_iEGS_it.$$

where c is the marginal cost of storage.

Competitive private stockholders in each region are also assumed to make normal profits which just offset the cost of storage.

Welfare in each region *i* in each period is the sum of the four components:

(13) $$CS_i + PS_i + GR_i + NSGi.$$