

INCENTIVES FOR INCREASING RICE PRODUCTION; AN OUTLOOK

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Abstract

Successive governments of post independence era gave many incentives to rice production with the objective of achieving self sufficiency. Subsidies, credit schemes and guaranteed price or floor price for rice were maintained throughout. With the adoption of an open economic policy the magnitude and the scale of providing these incentives have changed and subsidies given for fertilizers were completely withdrawn for a period of five years, but were re-introduced with the change of government. In terms of money the subsidy paid for fertilizer which was a 1000 m rupee investment before complete withdrawal in 1989 rose to 1500 m rupees after 1994 and varied due to international price changes. All NPK fertilizers used in rice cultivation were subsidized in the early years, but since of *maha* 1997/98 the subsidy was limited only to the import of urea. Fertilizer consumption and actual requirement for the total sown extents have never matched in spite of the subsidies operating over the years, which may be due to many socioeconomic and other related factors. The subsidizing of urea have resulted in the imbalance use of fertilizer. The ratio by N: P: K used by farmers, which had been 11:1:7 in 1994 widened to 16:1:3 in 1999 and kept on changing with time mainly due to the changes in price ratio of a unit of urea, TSP and MOP. The price ratio of these commodities which had been at 1.02:1.05: 1.0 in 1994 have changed to 1.0:2.74:2.3 in 2000. This has resulted in many marginal growers of rice using only urea or NK mixtures for their crops. However, the unbalanced use of fertilizers have not reflected in the gross yield within a short period. The soil test programme shows that most rice growing soils are very low in both available phosphorus and potassium. This necessitates regular application of PK fertilizers to prevent soil mining and also to keep the soils at a reasonable level of fertility. Recent work carried out to obtain yields over 6 t ha⁻¹, shows that applications of higher rates of NPK fertilizers are necessary to achieve such yields. Sustainability of this level of production could be attractive if price differences of fertilizers are marginal. Combined use of organic and mineral fertilizer has been the key to obtaining high yields of 10 t ha⁻¹, which is achievable using higher rates of NPK fertilizers. Farmers who obtained yields at this rate have a lower cost of production for a unit of grain than those obtaining lower yields with conventional fertilizer applications. This phenomena leads to the proposition of providing incentives for collecting and *in situ* cultivating of organic materials for applying to rice soils. Farmers cultivating rice soils with adverse soil conditions such as acidity or alkalinity do not obtain the desired yields. Inherent soil characters of the wet zone and the increased use of drainage of one reservoir to feed another in the dry zone increase the chance of salt build up. Farmers who are affected could obtain higher yields if liming or gypsum applications are made as the case may be. An incentive programme to promote the use of these materials can enhance productivity. Credit for rice cultivation has been a monopoly of the state banks in the past due to the guarantee of the Central bank to cover up losses due to default. However, the scenario today is that only a small number of farmers are entitled to cultivation loans due to high rates of default. The Block Demonstrations introduced by the FAO fertilizer programme provided inputs to farmer groups on loan where the recovery rates were high. Small farmer groups, under the supervision of extension staff managed the loans. This concept is followed in providing fertilizer credit to farmer groups under the "yaya" programme for

fertilizers provided by the Ceylon Fertilizer Company. At present a few non government organizations like "Sanasa" and state banking institutions are providing loans to farmers to purchase the required fertilizers. Incentives as fertilizer subsidies and credit for inputs may not be necessary if the price of raw rice is kept at a higher level. Since the majority of the rice farmers are small operators, many may not have a marketable surplus to sell and cushion the high prices of inputs. But small farmer organizations could process their limited surplus and market them direct to consumer markets and narrow the profits earned by the middlemen. The capacity of the private sector seems to be adequate when production is lean but government intervention to purchase the total stock is necessary in bountiful years.

INTRODUCTION

Producing rice to meet the annual per capita consumption of around one hundred kilograms of rice and keeping production abreast of a growing population was the challenge faced by successive governments after independence. Investments in rehabilitation of ancient irrigation schemes, construction of new ones, land settlement to bring new land under the plough were high priorities of early years. Intensification of production per unit land was attempted from the early sixties where more emphasis was given to cultivate high yielding fertilizer responsive cultivars. Programmes to introduce new genetic materials and breeding to generate new high yielding varieties were intensified in the sixties. Fertilizer recommendations to suit different soil types were given from the early fifties and periodically revised to keep pace with the advances made in agronomy and rice sciences.

The policies followed by governments had a package of incentives to keep the farmers in rice cultivation, to solve their socioeconomic problems and also to provide the consumers with cereals at an affordable price. Incentives provided were many but the ones which spear headed were the fertilizer subsidy, the compre-

hensive credit and guaranteed price schemes. This paper attempts to examine a few issues arisen out of these intensive schemes.

FERTILIZER SUBSIDIES

A subsidy pertains to the financial assistance granted by a government for the purpose of promoting some production. Fertilizer subsidies stimulated farmers to use fertilizers and supported increased grain production and contributed to food security. It helped to keep the food grain prices low and also increased the labour force in agriculture. Cost of fertilizers vary from 9 – 18 % of the total cost of production (Table 1) but contributes to 55-70% of the increment in yield. If properly used could sustain soil productivity to keep crop production profitable. Fertilizer subsidies were introduced in the early sixties to help the farmers of the food crop sector, this resulted in the movement of a percentage of the subsidized fertilizers to the plantation sector. During the seventies the subsidy was extended to cover crops of both food and the plantation sectors. During the eighties a 65% subsidy was given to both urea and concentrated super phosphate. The fertilizer subsidy was withdrawn in the latter part of the

eighties and was continued up to 1994. The new government re-introduced a complete subsidy for urea, TSP and MOP at a sliding scale, during *maha* 97\98 the subsidy was limited only to urea. The reasons adduced have been that urea is the largest component recommended for rice farming and most rice farmers are small scale operators. An annual 1000 m rupee subsidy was maintained during the 1980s, the present subsidy rate is accommodated at around Rs 1500 m. Table 2 gives the cost of the fertilizer subsidy to the government during the past six years.

The subsidy scheme and the associated advances made by the other sectors have seen a rapid growth in the use of fertilizers by the rice industry.

The use of NPK has increased thousand fold due to both intensive use and expansion of the asweddumized extents. Table 3, indicates the increase in nutrient use as well as the ratio of NPK used. The ratio has widened as time progressed and farmers have used more N fertilizers over the other recommended fertilizers. The desired NPK ratio based on DOA recommendations (Table 4) are much narrower than what the farmers use.

The subsidy given for urea have resulted in the heavy use of urea over the recommended rates of TSP and MOP fertilizers during the past few years.

Table 1. Cost of Fertilizers as a % of total costs.

AEZ	Cost of Fertilizers (Rs. ha ⁻¹)			Fertilizer cost as a % of total cost		
	L ₁	L ₂	L ₃	L ₁	L ₂	L ₃
LCDZ	3349	4354	5359	11.6	15.0	18.5
LQWZ	2013	2165	-	12.8	13.3	-
MCWZ/IZ	2740	3745	-	9.3	12.7	-

AEZ - Agro-ecological zone

L - Yield level

Table 2. Cost of fertilizer subsidy.

Year	Amount (Rs. m)
1994	610.2
1995	1344.8
1996	1497.9
1997	1894.2
1998	2215.3
1999	1390.0

Source: NFS

Table 3. Quantities of Plant Nutrients used annually for Rice ('000 t).

Year	N	P	K	Ratio		
				N:	P:	K
1961	4.0	0.8	1.5	5 :	1 :	1.9
1970	18.6	3.2	5.0	5.8 :	1 :	1.6
1980	58.5	6.7	15.8	8.7 :	1 :	2.4
1989	65.8	8.7	20.1	7.6 :	1 :	2.3
1990	26.2	2.2	13.1	11.9 :	1 :	6.0
1993	68.0	9.0	20.8	7.5 :	1 :	2.3
1998	85.2	5.1	17.2	16.7 :	1 :	3.3
1999	110.6	6.9	19.2	16.0 :	1 :	2.8
2000	114.5	7.2	20.7	15.9 :	1 :	2.8

Source: NFS

Table 4. Nutrient ratio of general fertilizer recommendations.

AEZ	Nutrient Ratios		
	N :	P :	K
LCDZIZ	9.0	1	1.5
LCWZ	3.0	1	1.9
MCWZIZ UCWZIZ	5.5	1	1.5

The price ratio of the three commodities were kept artificially at a closer ratio during the 1980s and did not change much after the withdrawal of the subsidy.

After the introduction of a subsidy solely for urea the ratios did not differ immediately but at present, the price ratios of both TSP and MOP had increased (Table 5).

Table 5. Price Ratio of Urea, TSP and MOP over the Years.

Year	Price Ratio		
	N	P	K
1988	1	1	0.9
1990	1	1.2	1.02
1992	1	1	0.9
1994	1.02	1.05	1.0
1996	1	1.1	1.02
1998	1.0	2.45	1.8
2000	1.0	2.74	2.3

Source: CFC

The consumption of fertilizers during the past five years by the rice sector is given in Table 6 . The consumption of urea has increased by a 145.3% whereas use of TSP and MOP have reduced by 7.5% and 63.7 %, respectively. The overall N use have gone up by 136% .This pattern of fertilizer use had increased production of rice, the national average ha⁻¹ have increased from 3.3 t to 3.7 t between 1994 and 1999 which is an increase by a 12.1 % possibly at the expense of the soil reserves of P and K.

In Table 7, the current fertilizer recommendations are given for different types of farmer management capabilities. Evaluation of the current fertilizer consumption, based on the three levels of fertilizer recommendations are shown in Table 8. This points out to the necessity to arrive at a balanced use of nutrients to get more productivity in rice. The fertilizer requirement will increase if fertilizers are used at the higher rates of fertilizer recommendations. In the proposed granary area for intensification of rice production the fertilizer requirement per annum is high (Table 9).

Table 6. Fertilizers and nutrient usage 1994 – 2000 ('000 t).

Year	Urea	SA	TSP	MOP	N	P	K
1994	161.9	32.3	37.0	106.6	81.2	7.5	53.1
1995	161.1	14.2	33.0	39.4	77.1	6.7	19.6
1996	139.6	16.2	34.7	35.2	67.6	7.0	17.5
1997	177.0	11.4	26.7	34.4	84.1	5.4	17.1
1998	182.4	12.2	24.7	36.1	86.5	5.0	17.9
1999	235.3	11.1	34.2	38.7	110.6	6.9	19.2

Source: NFS

**Table 7. Fertilizer recommendations for rice (kg/ha⁻¹)
(Recommendations based on Expected Yield Level, t ha⁻¹).**

AEZ	L ₁ 4 - 5 t			L ₂ 5 - 6 t			L ₃ 6 - 7 t		
	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
	LCDZ	100	30	20	120	40	30	140	50
LCWZ	60	40	40	70	40	40	-	-	-
MCWZ/IZ	60	30	20	80	40	30	-	-	-
UCWZ/IZ									

L = Yield level

Table 8. Fertilizer Requirements based on gross sown Extent (ha) - 99/2000.

AEZ	Extent ('000 ha)	Requirment ('000 t)			Nutrient ('000 t)		
		Urea	TSP	MOP	N	P	K
LCDZ	644.8	141.8	41.9	22.5	65.2	8.4	11.2
LCWZ	143.1	143.1	18.6	12.1	8.5	2.4	4.6
MCWZ	18.8	2.4	1.2	0.6	1.1	0.3	0.3
MCIZ	47.9	6.2	3.1	1.6	2.9	0.6	0.8
UCWZ	39.9	5.1	2.5	1.3	2.4	0.5	0.6
Total	894.5	174.3	61.0	35.5	80.1	12.2	17.5

Extent = Rainfed + Major schemes + Minor schemes

Table 9. Annual Fertilizer requirement of the proposed granary (LCDZ/IZ) area.

Extent ('000 ha)	Production Level	Nutrient requirement ('000t)			Fertilizer requirement ('000t)		
		N	P	K	Urea	TSP	MOP
140	4 – 5 tha ⁻¹	14.0	1.5	2.3	31.5	7.7	4.9
	> 8 tha ⁻¹	19.6	2.7	5.2	42.6	13.7	10.5

Extent = Major schemes + Minor schemes

FERTILIZER RESPONSE STUDIES

Fertilizer demonstrations carried out in large numbers throughout the Country during the first five years of the 1990s were aimed at promoting the 1990 revision and the popularization of the use of straight fertilizers. Results obtained for the use of N, NPK and zero fertilizer plots are given in Table 10. It shows that the use of NPK have

given higher yields than a singular use of urea.

A comparison of the VCR based on the results of Table 10 at the changing prices of fertilizers under subsidized and free market prices gives a different set of values (Table 11). The use of combined NPK fertilizers gives a better VCR when the fertilizer prices are not subsidized.

Table 10. Rice demonstrations, Yield.

AEZ	Treatment and Yield (t/ha ¹)		
	000	N00	NPK
LCDZ	3.1	4.3	5.1
LCWZ	2.4	3.1	3.8
MCWZ/IZ	2.7	3.7	4.4

Source: DOA Fertilizer Unit

<i>Chemical</i>	<i>Fertilizers kg ha⁻¹</i>	<i>Organic Manure(OM) ha⁻¹</i>	
N	140	Cow dung (dry)	5t
P	25	Green manure	2.5t
K	60	Rice straw	4-6 t
SO ₄ - S	10	Charred rice husk	625 kg
Mg	2		
Zn	1		

The integrated plant nutrition system followed in the enhancement of rice production is efficient and sustainable as shown from the results. It also brings a high VCR and lowers the cost of production per unit of grain (Table 13).

Organic manure available are relatively wasted in areas where they are found abundant. In the proposed granary area the animal population already found could supply 50% of the requirement of cow dung to carry out at a production level of t ha⁻¹ (Table 14).

Table 13. Yield , VCR and cost per kilogram of rice at Telulla, Handapanagala Moneragala district.

<i>Treatment</i>	<i>Yield t ha⁻¹</i>	<i>VCR</i>	<i>Cost (Rs.)kg⁻¹</i>
000	2.8	-	11.07
NPK	4.0	3.6	8.81
NPK+ RS	5.8	7.8	6.16
NPK,S, Mg, Zn +OM	10.5	8.2	4.11

Table 14. Potential availability of Cow & Buffalo dung (t/y) for Rice production.

<i>Proposed Granary area (ha)</i>	<i>Materials available</i>				
	<i>Neat Cattle * No. Avail.</i>	<i>Buffalo* No. Avail.</i>	<i>Cowdung + Buff.dung avail. (t/y)</i>	<i>At 50% Collection (t/y)</i>	<i>Air dry basis (t/y)</i>
140000	1033700	552700	10677816	5338908	770904

* Source: Dept. of Census and Statistics

Assumptions :

Droppings: 18kg per day

Requirement for one ha: 5t x 2 = 10 t y⁻¹

This quantity is available for 55% of the available land

LIMING OF RICE SOILS OF THE - LCWZ

Results of Demonstrations trials carried out have shown that liming with dolomitic limestone followed by NPK fertilizers gave an increase of yield (Table 15).

CREDIT

Credit is an essential incentive to provide the farmer to produce more efficiently. The formal credit available through the state banks and other organized agencies have fallen far short of the actual requirement mainly due to defaulting by the clients. Report by the Central Bank shows that only around 7000 farmers have received loans under

the comprehensive loan scheme during 1998. A credit scheme to supply chemical fertilizers (Fertilizer Credit) was arranged by the Department of Agriculture (DOA) and the Ceylon Fertilizer Company (CFC) in yala 1996. This was initiated at the Siyambalangamuwa Irrigation scheme in the Moneragala district and was extended to cover many irrigation settlement schemes including the Mahaweli during the following years. Fertilizer given on credit for 4.5 months period at 16% interest by the CFC to farmer groups identified by the extension staff. Recoveries were made by the groups and settled to the CFC and the officers supervised the process. The progress of the credit scheme of the Inter Provincial areas are given in table 16.

Table 15. Rice yields with liming.

<i>Treatment</i>	<i>Mean yield (tha⁻¹)</i>	<i>% Increase</i>
000	3.3	
NPK	4.3	30.3
NPK+dol	4.6	39.3

Source : DOA Fertilizer unit

Table 16. Progress of Fertilizer Credit Scheme.

A) Issues (Rs.m)

<i>District/ Unit</i>	<i>Season</i>									
	<i>96Y</i>	<i>96/97M</i>	<i>97Y</i>	<i>97/98M</i>	<i>98Y</i>	<i>98/99M</i>	<i>99Y</i>	<i>99/00M</i>	<i>00Y</i>	<i>Total</i>
Anura'pura		0.89	0.25	3.04	3.35	5.52	1.95	4.29	2.16	21.45
Polonnaruwa		1.60	1.37	2.92	3.47	5.03	4.06	0.00	0.00	18.45
Hambantota		0.61	1.09	1.00	0.42	1.51	0.97	0.12	0.41	6.13
Ampara		0s.00	1.13	2.81	6.51	16.09	14.15	12.78	14.8	68.27
Hasalaka		0.13	0.28	0.73	0.15	0.24			0.00	1.53
Mahiyangana		0.14	0.03	0.20		0.83	0.98	1.55	0.21	3.94
Monaragala	0.6	0.89	0.10		0.18	0.12				0.55
Total	0.6	4.26	4.25	10.70	14.71	29.25	23.84	18.74	16.86	123.39

B) Recoveries (Rs. m)

<i>District/ Unit</i>	<i>Season</i>									<i>Total</i>
	<i>96Y</i>	<i>96/97M</i>	<i>97Y</i>	<i>97/98M</i>	<i>98Y</i>	<i>98/99M</i>	<i>99Y</i>	<i>99/00M</i>	<i>00Y</i>	
Anura'pura		0.89	0.25	3.04	3.35	5.51	1.67	3.26	1.84	19.6
Polonnaruwa		1.60	1.35	1.35	3.22	4.88	3.73		0.04	16.2
Hambantota		0.61	1.08	1.00	0.42	1.50	0.97	0.12	0.38	6.1
Ampara		0.00	1.13	2.81	6.51	16.09	14.15	12.23		52.9
Hasalaka		0.13	0.28	0.73	0.15	0.24				1.53
Mahiyangana		0.14	0.03	0.20		0.83	0.98	1.33	0.21	3.7
Monaragala	0.06	0.89	0.09	0.10		0.18	0.12			1.4
Total	0.06	3.47	4.18	9.23	13.65	29.20	21.62	16.94	2.47	99.9
%Recovery	100.0	100.0	98.12	86.26	96.90	99.5	90.64	90.39	14.05	83.1

Following this example other organizations of both government and non government have issued loans to purchase fertilizers by farmers (Table 17).

DISCUSSION

Fertilizers have played a big role in increasing rice productivity, subsidies have made more farmers to use fertilizers which has paved the way for increased

Table 17 . Fertilizer Credit operated by other agencies 99\00 maha and yala 00.

<i>Agency</i>	<i>District</i>	<i>Season</i>	<i>No. farmers</i>	<i>Amt. Issued (Rs m)</i>	<i>Amt. Recovered (Rs m)</i>
Bank of Ceylon	Polonnaruwa	2000Y	71	0.56	0.56
Peoples Bank	Polonnaruwa	2000Y	114	4.0	4.0
Sanasa	Moneragala	2000Y	870	1.22	1.12

MARKET PRICE OF RAW RICE

Productivity of rice depends on the market price of rice. The floor price decided by the government decides the open price determined by the millers. This is a case of supply and demand policy adopted by the millers. When prices are high loan recovery is high and the fertilizer use is also high.

production. Nitrogen is a major nutrient required by rice and increase of yields demands more N, but the over use and misuse can reduce yields and also make soil less productive. The fertilizer recommendations of the DOA are much narrower than the rates utilized by the rice sector. The price factor is the one which determines the demand and the subsequent use by farmers. Fertilizer use during the period of the withdrawal of the

subsidy have dropped but recovered gradually over time but most of the poorer farmers would have not used any fertilizers. The granting of a subsidy only for urea has increased the consumption at a very higher rate than the other fertilizers which have actually dropped by a fair margin. This could result in soil mining from soils which are already low in both phosphorus and potassium. It is shown that when subsidies operate using urea give a higher VCR because of the high prices of the other two fertilizers. This focus to a point where high fertilizer use efficiency (FUE) to be maintained in soils by following other management practices of IPNS, liming etc.

Organic manure use in combinations with recommended rates of fertilizers can increase yields many times over that of singular use. An incentive scheme to promote the use of these materials could increase the productivity and also sustain the soil fertility. A scheme for the farmers for collection, cultivate and assimilate these materials for the use in rice cultivation could boost yields particularly in areas where water is assured for two seasons. As there is a large stock of animals available in these areas the wastage of dung is a loss of soil productivity.

The wet zone soil are mostly acidic in nature and liming have increased yields. Liming materials are less expensive and it has to be applied once in two years. This practice could increase production from the low country soils and

could keep rice farming in the region compatible with the dry zone. A price incentive to farmers to lime can increase application.

Conventional credit available through banks does not serve a majority of farmers as they are not eligible for such loans due to default. Credit for fertilizer is popular with farmers due to the high return to investment. This type of credit needs close supervision and is tied up with the price the farmers get for produce after harvest. Non government organizations can lead the way to help the farmers.

CONCLUSIONS

Fertilizers have changed the face of the production scenario of rice in Sri Lanka. Subsidies are essential unless a more attractive price is offered to the farmer to encourage intensive production. Subsidizing of urea prices has increased the consumption of fertilizers but also have increased the national production average. Whether the soils could sustain the rate of removal may be answered with time. Paving a way for the farmers to utilize balanced fertilizer may not be possible with a policy of subsidizing fertilizers alone, but more productive methods may have to reach them to obtain high yields in all places where rice is grown. The IPNS package has made a definite contribution in this direction and more such practices to improve soil fertility by addition of organic materials and bringing soil amendments could be

the only way to increase rice production. Policies directed towards these could enhance and sustain the rice productivity in Sri Lanka.

Credit for rice production is used by a very small number of farmers perhaps due to their own reasons for not qualifying by repaying loans on time. This leads to the paradox of farmers using less inputs and less production. Small scale credit schemes have attempted to bring in solutions to the problem but to make it operational at a large scale requires a concerted effort by the officials.

Price of rice finally determines the rate of intensification of production. The cost of a kilogram of rice could be reduced by good agronomic practices but the surplus obtained also should reach the market.

RECOMMENDATIONS

- i. Subsidy prices may be best when overall production could be increased. and a more realistic approach could be arrived at deciding on the quantity and the nature of the subsidy.
- ii. Incentive schemes to utilize crop residues, green manure and animal waste could be given to farmers by way of rebates on chemical fertilizers or for the construction of collecting units.
- iii. Credit for fertilizers could be encouraged from more non traditional sources. NGO's , local millers and other banking sources could help out the farmers . The village level government servants could help the farmers and such organizations to bring confidence and trust between parties.
- iv. Incentive schemes to enhance the production of the LCWZ could be addressed and more research and extension are necessary to improve the production in the area. Monetary help to promote liming may be beneficial.

CHAPTER 5

RICE MARKETING AND TRADE