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It can be seen from Table III that consumption of total nutrient was only 58.8 per cent and 44.4 per cent (59.2 per cent) of the target in the Second and the Third Five-Year Plan respectively. Trend estimates for the consumption of total nutrient in the Fourth Five-Year Plan which represent 68.1 per cent of the target, can only be surpassed if efforts without any precedent are made and the same come out to be successful.

Conclusion

It seems that the trend model developed above provides reasonably good estimate of the consumption of plant nutrients at the national level. Further statewise disaggregation would be desirable and shall probably give better results as area covered for estimation will be more homogeneous.

Even if the supply position is improved adequately, it will be difficult to market the quantity anticipated by targets because a lot of development work is to be undertaken which will take a long time. Moreover the factors like prices of agricultural products, irrigated and total acreage and prices of fertilizers which affect fertilizer demand are not expected to improve considerably in favour of fertilizer demand. Already prices of agricultural commodities have reached a saturated point and further rise, which would have increased fertilizer demand, is not expected to be significant. Moreover, now shift of area from cash crops to foodgrains is expected and is being emphasized because of severe shortage of foodgrains and this point will certainly go against the interest of fertilizer demand.

However, there is a wide gap between targets and trend estimates for the Fourth Plan and some sincere and strong efforts are necessary to overcome this gap.

R. C. DAHIYA*

A NOTE ON THE ELASTICITY OF THE MARKETABLE SURPLUS OF A SUBSISTENCE CROP—A COMMENT

Raj Krishna in his note on the elasticity of the marketable surplus of a subsistence crop[1] comes to the conclusion that "the likelihood of a perverse market supply behaviour is extremely small." The purpose of this note is to show that this conclusion is too optimistic and we may have backward bending supply curve.

I shall use Raj Krishna's notation to make comparison easy. Let

Q = the quantity of wheat produced.

C = the quantity of wheat consumed.

M = the quantity of wheat marketed.

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1. Raj Krishna, "A Note on the Elasticity of the Marketable Surplus of a Subsistence Crop," *Indian Journal of Agricultural Economics*, Vol. XVII, No. 3, July-September, 1962, pp. 79-84.

$c = \frac{C}{Q}$ = the consumption ratio.

$m = \frac{M}{Q}$ = the sales ratio.

$r = \frac{Q}{M} = \frac{1}{m}$ = the reciprocal of the sales ratio.

P = the relative price of wheat.
Y = the total income of the peasants.
e = the elasticity of the market supply with respect to P.
d = the total elasticity of home consumption with respect to P.
b = the elasticity of output with respect to P.

Abstracting from changes in inventories, we have

$$M = Q - C$$

$$\therefore \frac{dM}{dP} = \frac{dQ}{dP} - \frac{dC}{dP}.$$

In terms of elasticities, this reduces to

$$e = rb - (r-1)\, d.$$

Given that $r > 1$ and $b \geqslant 0$, e will certainly be positive if $d < 0$. Raj Krishna then goes on to derive an expression for d and hence find likely values of e given estimated values of other elasticities.

Raj Krishna specifies the home consumption function in terms of elasticities.

$$\frac{dC}{C} = g\frac{dP}{P} + h\frac{dY}{Y}. \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

where g is the elasticity of the substitution effect and h is the elasticity of the income effect.[2] It is not quite clear what he means by the substitution effect; is it $\frac{\partial C}{\partial P}$ with income kept constant or is it $\frac{\partial C}{\partial P}$ with utility kept constant ?

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2. I suppose this is derived from a consumption function $C = F(P, Y)$. Differentiating both sides

$$dC = \frac{\partial C}{\partial p}\, dP + \frac{\partial C}{\partial Y}\, dY.$$

Dividing by C

$$\frac{dC}{C} = \frac{\partial C}{\partial p}\frac{dP}{C} + \frac{\partial C}{\partial Y}\frac{dY}{C}$$

$$\therefore \frac{dC}{C} = g\frac{dp}{p} + h\frac{dY}{Y}.$$

Let us assume by substitution effect he means $\left.\frac{\partial C}{\partial P}\right|_{\overline{y}}$. Then given that

$$Y = \text{some constant} + QP$$

by differentiating both sides we get

$$dY = QdP + P\frac{dQ}{dP}dP.$$

Raj Krishna asserts that $dY = QdP - CdP$, *i.e.*, he omits the term $P\frac{dQ}{dP}dP$ and further substracts CdP. Obviously, farmers' monetary income, as defined here, does not depend upon their own consumption. Substituting for dY in (1) we get

$$\frac{dC}{C} = g\frac{dP}{P} + h\frac{Q + P\frac{dQ}{dP}}{Y}dP.$$

It can be easily shown that

$$\frac{dC}{C} = g\frac{dP}{P} + h\,k\frac{dP}{P} + h\,k\,b\frac{dP}{P}$$

where $k = \frac{QP}{Y}$. It follows that

$$d = g + h\,k + h\,k\,b.$$

Compare this with Raj Krishna's result, which is

$$d = g + m\,h\,k.$$

Given that $g < 0$, $0 < m < 1$, $h > 0$, $k > 0$, $b > 0$, it is clear that Raj Krishna's result has a downward bias. As it is shown below, for some values of our parameters, this bias makes d negative and, therefore, e positive when in fact d is positive and e negative (*i.e.*, backward bending supply).

If we assume that he is dealing with the pure substitution effect $\left(i.e., \left.\frac{\partial C}{\partial P}\right|_{\overline{U}}\right)$ then our refutation of his conclusion is based on a different argument. We have

$$C = \Psi(P, Y)$$

$$\therefore \quad dC = \left.\frac{\partial C}{\partial P}\right|_{\overline{Y}} dp + \left.\frac{\partial C}{\partial Y}\right|_{\overline{P}} dY.$$

But substituting for $\left.\frac{\partial C}{\partial p}\right|_{\bar{Y}}$,

$$\left.\frac{\partial C}{\partial p}\right|_{\bar{Y}} = \left.\frac{\partial C}{\partial p}\right|_{\bar{U}} - C \left.\frac{\partial C}{\partial Y}\right|_{\bar{P}}$$

$$\therefore dC = \left.\frac{C}{\partial p}\right|_{\bar{U}} dp - C \left.\frac{\partial C}{\partial Y}\right|_{\bar{p}} dp + \left.\frac{\partial C}{\partial Y}\right|_{\bar{p}} dY$$

$$= \left.\frac{\partial C}{\partial p}\right|_{\bar{U}} dp + \frac{\partial C}{\partial Y}\left[\, dY - cdp \,\right]$$

$$\therefore \quad \frac{dC}{C} = g' \frac{dp}{P} + h \frac{dY - Cdp}{Y}.$$

where g′ is the elasticity of the pure substitution effect and h is the income elasticity. What Raj Krishna calculates as dY is this dY — Cdp. (Still, his error about omitting $P \frac{dQ}{dP}$ dp remains). It is easy to show that

$$\frac{dC}{C} = g' \frac{dP}{P} + m\,h\,k \frac{dp}{P} + h\,k\,b \frac{dp}{P}$$

$$\therefore \quad d = g' + m\,h\,k + h\,k\,b.$$

Again, compare this with Raj Krishna's result, which is

$$d = g' + m\,h\,k.$$

Omitting h k b is not so serious because it is small compared to the other terms. However, his error remains because he uses the wrong value for g′ which he takes as estimates of price elasticity obtained from demand studies. It is well known that such estimates are not the pure substitution elasticities but simple price elasticities, *i.e.*, $\left.\frac{\partial C}{\partial P}\right|_{\bar{Y}} \cdot \frac{P}{C}$. It can be shown that

$$g' = g + \frac{\partial C}{\partial Y} P.$$

Of course when we allow for this fact and substitute for g′ we get our original equation, which is

$$d = g + h\,k + h\,k\,b.$$

In order to compare the two results I shall reproduce Raj Krishna's table and present the corresponding results, using the corrected formulation.

CALCULATION OF PLAUSIBLE LIMITS OF e

RAJ KRISHNA'S

Plausible Ranges of Parameters	Values Relevant for Min. e	Values Relevant for Max. e
b = .1 to .2	.1	.2
g = —.2 to —.4	—.2	—.4
h = .5 to .8	.8	.5
k = .1 to .7	.7	.1

	m = .1	m = .5	m = .9
Min. e	2.30	.12	.08
Max. e	5.56	.78	.26
Min. e (g = 0)	.50	—.08	.06

Plausible Limits of e (This Note's Results)

	m = .1	m = .5	m = .9
Min. e	—2.74	—.216	.07
Max. e	5.56	.74	.56
Min. e (g = 0)	—4.744	—.416	.04

The results need no further comments, and it is clear that we can have backward bending supply curve.

In the above discussion, I have not questioned Raj Krishna's behavioural assumptions. Of course we can have different assumptions which would make the situation better or worse, but that is a question to be decided empirically.

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