Vol XXIII
No. 3

ISSN 0019-5014

JULY -
SEPTEMBER
1968

INDIAN JOURNAL OF AGRICULTURAL ECONOMICS

INDIAN SOCIETY OF
AGRICULTURAL ECONOMICS,
BOMBAY

NOTE ON APPLICATION OF PROGRAMMING TECHNIQUES TO INDIAN FARMING CONDITIONS

This note seeks to explain a few issues raised by D. K. Desai in his review of our brochure* which was published in the January-March 1968 issue of this *Journal* (pp. 91—94).

Desai's main criticism of our brochure is in regard to our land use classification contained on pages 11 and 18. This classification is one of the major contributions made by the authors in solving linear programming problem in the context of Indian agriculture. Desai should have appreciated that his revised table proposed on land classification does not admit such activities as wheat-sown-after-fallow (Wr) and wheat-sown-after-*kharif* (Wk) beyond .90 acre, whereas the land use classification should permit such activities to the extent the land is suitable for them. This is so obvious. But to help Desai see it clearly we have solved the matrix using the classification he has suggested. The solution obtained (product mix) on this basis and the one obtained with our classification are reproduced here :

Original matrix			Revised Desai's matrix		
Activity		acres	Activity		acres
P_7	American cotton after fallow ..	2.50	P_7	American cotton after fallow	0.3555
P_1	Wheat after fallow ..	2.00	P_1	Wheat after fallow ..	0.5445
P_9	Sugarcane ..	0.68	P_9	Sugarcane ..	2.1710
P_{10}	Groundnut ..	1.87	P_{10}	Maize after fallow ..	1.9359
P_5	Maize after wheat ..	1.32	P_{10}	Groundnut ..	1.7555
P_2	Wheat after *kharif* ..	3.22	P_3	Gram irrigated ..	1.6000
	Net cash income (Rs.)	4,314.23		Net cash income (Rs.)	3,520.2854
	Decrease in income Rs. 793.94				

The answer is self-explanatory and those who are familiar with the sophistications of programming techniques would not find it difficult to locate the fallacies involved in Desai's revised table. The answer iteration based on Desai's classification yields very different product mix. It permits wheat-after-fallow activity only within the constraint of .90 acre (0.5445 acre) and has resulted into a reduction in farm income from Rs. 4,314.23 to Rs. 3,520.2854.

Again, Desai's comments on Table I.1 in the brochure (page 18) for gram irrigated do not hold good, so long as Cr. land category suitable for gram is also included in the category $(A+B+C)^r$. This point is of critical importance in programming techniques.

Desai has also commented that the authors have not cared to indicate which activities are denoted by P_1 to P_{10} or which restrictions are indicated by P_{11} to P_{23}. This criticism is misplaced because para 2 on page 12 under the head 'Solution of A Problem,' certainly provides an answer to this point.

* Application of Programming Techniques to Indian Farming Conditions, Department of Economics and Sociology, Punjab Agricultural University, Ludhiana, 1967.

Again, Desai has observed that the authors have not explained the notations P_{10} to P_{23} in Table II.3. A more careful examination of this table would show that against the notations P_{10} — P_{23} details of resource restraints are clearly stated in the resource column.

Desai's comments on explanation of the rotations R_1 to R_9 whether they are two-year or single year rotations are answered on page 32 of the brochure where the method of reducing the inputs and output of different rotations to one year basis has been clearly stated.

Again, Desai's comment on 'Mixed Farming Situation' that the supply of farmyard manure from dairy animals for crops should also be mentioned are not supported by facts. While working out returns to fixed resources, the returns from farmyard manure were included in the gross returns and we have spelt out on page 66 of the brochure the details of farmyard manure that would be available, *i.e.*, owned plus purchased less the quantity needed for growing of fodders as a fixed activity. This method certainly takes care of the objection raised by Desai.

Desai has also made a suggestion that Tables II. 24, II. 25 and II. 26 could be consolidated to make one table. One wonders how this could be done when these tables show the final iterations at different levels of dairy activity.

Desai has also raised the point that the existing plan and the optimum plan on pages 37 and 38 do not indicate whether the resource position of the farms was kept the same or was altered. Pages 38 (para 2) and 58 (para 3) clearly state that the borrowing activities were introduced in the optimum plans. Once this is stated, it should not be difficult to judge that after a particular resource was augmented, resource position could not remain the same.

Desai has also criticised our interpretation of the concept of linearity. We find no content in this comment. It is probably true that discussions could be limited to different levels of products obtained to explain the concept of linearity. But if these discussions were extended to elaborate this concept under different situations, *i.e.*, irrigated and unirrigated wheat as well as wheat-sown-after-fallow and wheat-sown-after-*kharif*, it does not in any way detract from the quality of this concept. If Desai blames us for making this concept much more practicable than he would like to do, we share this guilt fully.

Another issue raised by Desai is that we "have not explained as to what are the activities and what kind of data would be needed for relating these activities to resource constraints" while explaining the procedure of planning (page 8). Here all that is needed is to refer to item 2 under 'Procedure of Planning' on page 8 and find these activities having been carefully defined there. While explaining the kind of data needed, we have also referred to the items contained in the schedule which could be used for this purpose. In fact, through applications on various farm situations throughout the brochure, we have adequately demonstrated what sort of data were required for this analysis.

Related to this issue is another question raised by Desai : "How inputs of fixed resource can be worked out from Table IIIA and IIIB" ? A careful examination of these tables would show that we had split up the labour inputs

into permanent and hired labour and such items as irrigation, farmyard manure, capital, etc., which constituted resource restrictions were contained in these tables. A particular resource may be a variable input for an activity, yet it could be and often is a fixed resource for the total farm organization. Examples are capital, irrigation, labour, etc.

Desai also raises a question on irrigation capacity which we have confined to the period April to early July. His objection is that in other parts of the country irrigation might be a restriction in other seasons also. We do not deny this. But since we were working with the conditions obtaining in the Punjab, it would be a natural thing to do to spell out only such irrigation constraints which were applicable to this situation.

Again, to the objection that the figures under the irrigated-unirrigated categories of land do not tally with the total land fit for growing of crops, it is important to appreciate that the total land may not be fit for growing of crops. Some areas might be low lying or might not be cropped due to some other reasons. When a situation is averaged over a large number of holdings, this difference in the total cultivated land and the land available for growing of different crops could occur. There is, however, a typographical error on page 31, *i.e.*, (7.70—1.14= 6.56 acres and not 6.29 acres). Such typographical errors are regretted.

We agree with Desai's comments that uniform notations could be used on the cost minimization problem. But this does not alter the solution of the problem. Moreover, wherever different notations were used, they were explained in the immediately following paragraph and no confusion could possibly arise on this account to the reader.

A. S. KAHLON†
AND
S. S. JOHL

QUANTITATIVE DELIMITATION OF AGRICULTURAL REGIONS IN INDIA*

In an article on "A Regional Approach to Agricultural Development in India—Some Preliminary Results,"[1] an attempt had been made to delineate agricultural regions by grouping districts in various States on the basis of composite land resource indices, worked out by giving decile rankings and some weightage to selected indicators, *viz.*, (*i*) gross area irrigated as per cent of gross area sown, (*ii*) average annual rainfall, (*iii*) extent of cultivated area, (*iv*) intensity of cropping, (*v*) soil characteristics like topography, texture, etc., (*vi*) gross area sown per capita. The indices for district by district composite decile ratings were worked out by taking the lowest composite decile ratings for 10 districts located in Gujarat, Kerala, Madhya Pradesh, Maharashtra and Rajasthan equal to 100. These land resource indices were also compared with composite productivity of rice and wheat district by district.

† Dean, College of Basic Sciences and Humanities and Professor of Economics and Sociology, Department of Economics and Sociology respectively, Punjab Agricultural University, Ludhiana.

* The author is grateful to Shri J. S. Sarma, Joint Commissioner in the Ministry of Food and Agriculture, Government of India for suggesting various improvements in the original draft. Personal views alone are expressed here.

1. *Indian Journal of Agricultural Economics*, Vol. XIX, No. 1, January-March, 1964, pp. 176-192.