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RAPPORTEUR'S REPORT

ON

PROBLEMS OF DRY FARMING

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In all 27 papers were submitted for discussion on the problems of dry farming covering in one way or the other, economic aspects of converting dry areas into irrigated areas, the twin problems of instability and growth including measures and incidence of uncertainty, diversification of cropping pattern, crop insurance, and relative profitability of farm enterprises at micro level.

To avoid repetition in discussion and to facilitate critical scrutiny, all the papers have been categorised as under:

I. Papers pertaining to cost-benefit analysis of converting dry areas into irrigated areas.

II. Enterprise diversification in the context of instability and growth; and development strategy for arid agriculture.

III. Crop insurance.

IV. Financial aspects of adoption of dry farming technology.

V. Problems of yield and income variability.

VI. Relative profitability of crop enterprises under dry and irrigated conditions.

VII. Papers dealing with miscellaneous problems not directly concerned within the agreed scope of the subject-matter.

The topics mentioned above received varied attention. Most of the papers dealt with the relative profitability of crops or crop rotations at micro level. Macro aspects have remained untouched. Even at the micro level, policy issues have gone generally unnoticed. Discussion on other topics tends to be rather general and here again important policy implications have not received proper attention. Further, no papers were received on the flexibility of product and resource use, forward contracts, institutional and financial implications of resource conservation and green revolution in the context of the dry farming areas.

The review of the various papers that follows is in accordance with the categories as listed above.

I

Three papers attempt to estimate economic returns from converting dry areas into irrigated areas. A. Sachidanandam estimates costs and returns from the canal irrigation system of the Hirakud project. On the basis of official data, he concludes that in the Hirakud area, irrigation of crops resulted in a loss to the farmers. This is, however, not supported by the official figures which he cites. In fact, the economic returns to the farmers in the project area increased over the years, though, marginally. The loss in initial years of the project could be due to heavy initial investment together with the farmers' unresponsiveness to the immediate adoption of the changed agronomic practices and cropping pattern. H. K. Das Gupta, Prafulla Kumar Das and B. Mohanty, and J. P. Bhati, G. R. Singh and K. K. Verma try to estimate the cost of and returns from converting dry areas into irrigated areas. Das Gupta and his co-workers find that per hectare irrigation cost can be substantially reduced by full utilization of irrigation potential. A comparison of per acre fixed and operating cost for the three lift irrigation centres under the existing and full utilization of capacity would have been worthwhile. Bhati, Singh and Verma use the extension demonstration data of Budaun district (Uttar Pradesh) and experimental data on fertilizers only, to show that per acre net returns from irrigated fertilized wheat came to be as high as Rs. 694 as compared to just Rs. 20 from unirrigated unfertilized wheat. A thrilling difference indeed. Instead of mixing up the results from the demonstration plots and the experiment station, Bhati and his colleagues could have resorted to only one source to make any valid comparison.

II

Only two papers concentrate attention on the two-fold problems of instability and growth in dry farming areas and one paper on the development of arid agriculture.

N. S. Jodha and S. D. Purohit properly set forth the problem of crop yield instability and survey the effects of weather variability on some major crops in the dry (arid) region of Rajasthan. The coefficient of variation is taken as a measure of crop yield instability. After having mentioned the 'time-honoured' devices like diversification, etc., as adjustment devices to crop yield instability, the authors come forward to suggest remedial measures such as increased irrigation facilities, bunding, shelter-belts and windbreaks, and perennial grass farming. But none of these remedial measures is considered to be feasible by the authors because of operational limitations and thus, ultimately the paper hangs in the air without being conclusive. M. K. Shingarey treats dry area as one which depends on rainfall and uses only yield and price data for a period of five years (1951-56). He rightly points out that high correlation between prices of different crops makes price stability difficult. Then, he switches over to crop yield and gross income correlations, without

stating any meaningful relevance to the problem of crop yield/income instability.

N. S. Jodha in his largely descriptive paper emphasizes the need for a 'new approach' for the development of arid agriculture and argues that unscientific use of arid lands through over-grazing and ploughing for a long time in Rajasthan has disturbed the ecological equilibrium of nature resulting into the operation of the Law of Diminishing Returns. But because of the basic assumptions, this law is bound to operate not only under dry conditions as Jodha seems to think but also under irrigated conditions. It is, further, not clear as to how the resource conservation (judicious use of land and inclusion of perennial grasses in crop rotation) and efficient use of available soil moisture termed as a 'new approach' for developing arid agriculture are really different from the 'remedial measures' earlier discarded by Jodha and Purohit on the grounds of operational limitations.

III

Only one paper by S. G. Borude and N. M. Joglekar is concerned with crop insurance programme as a safeguard against crop yield instability. Premium rates as worked out by the authors are based on the U.S. and Japanese experiences. One might question the validity of the 75 per cent coverage in the Indian context particularly for dry farming areas. For a complete crop insurance programme the authors could have also worked out the indemnity which is necessary to indicate the pay off to the farmer from insurance against the premium paid, especially under the conditions of credit constraints and relaxation therein. The size of the paper could have been easily concised and made pointed by avoiding repetition. The premium rate for *kharif* jowar in Sholapur (Table III) works out to be 1.66 pounds per acre and not 1.82.

IV

M.S. Krishnaswamy and K.V. Patel identify the variability of the known dry farming technology and estimate the magnitude of finance for its wider adoption. The authors contend that the available dry farming technology meets the viability criteria of simplicity, acceptability and feasibility in terms of input availability and profitability. To meet the financial requirements necessary for stepping up the technological levels of lower adopters, the nationalised banking sector is suggested as a lending source since the performance of co-operative credit institutions, according to the authors, have not been impressive in the past. M. M. Bhalerao, Kali Charan and H. C. Pandey in their too descriptive a paper, though initially intending to discuss the role of commercialised banks in financing dry land agricultural development, hardly provide any discussion. Instead, they have described in rather repetitive way, what was stated in the Fourth Plan and in other deliberations of

some of the study groups with a number of tables reproduced from the *Reserve Bank of India Bulletins.*

V

Five papers discuss the nature and extent of yield and income variability. M. V. Nadkarni calculates the coefficients of variation for different crops in Maharashtra to measure their yield uncertainty. At the district level, irrigation is not found to affect the cotton yield though at the State level it does; and accordingly he concludes that irrigation is not expected to be a major factor in inter-district variations in yield rates. However, it should be logical to expect that to the extent crop yield variability is due to variation in rainfall, irrigation would not only increase the average yields but also would reduce the year-to-year variations.

R. C. Agrawal and S. L. Shah use official statistics to determine the extent of crop yield variability of a few important crops in the dry farming districts of Uttar Pradesh. Curiously enough, the coefficient of variation which is estimated as a measure of crop yield variability on the basis of 20 years (1950-70) data, is said to match well with only one year (1969-70) crop pattern, and, further the authors jump to conclude that this indicates farmers' rationality ! Measures such as crop insurance, improved breeds of milch animals, etc., are suggested to reduce income instability. These measures are, unfortunately, not discussed analytically in sufficient detail to warrant any worthwhile discussion. B. B. Singh and S. P. Singh find that in Agra district (Uttar Pradesh), drought resistant crops (bajra, gram, *arhar* and oilseeds) command more area on dry than on irrigated farms. Net income is calculated as the difference between the total value of output and total input cost. They also compute 'farm business income' without stating the basis of its calculation as well as its relevance.

J. S. Sisodia and V. L. Agarkar find a high degree of instability in the economy of Indore district (Madhya Pradesh) caused by fluctuating crop yields. Resource productivity is measured by a 'more refined approach'—the Cobb-Douglas production function. The authors seem to have committed serious errors while calculating the regression coefficients, their standard errors and t-values as indicated in Table I. If one goes by the corrected estimates, the entire discussion of the authors based on their calculations would be placed in suspense.

The title and objectives of the paper by J. S. Garg and G. N. Singh run into two different directions : title speaking of income disparity and the objective, of cost and returns, etc., on dry and irrigated farms. The 't' test is often used to see the obvious difference between cropping intensity, capital investment and net income on dry and irrigated farms. In their attempt to raise farm incomes under the 'synthetic' farm situations, the authors use budgeting technique and come out with a conclusion that the alternative plan

TABLE I—COEFFICIENTS OF FARM PRODUCTION FUNCTIONS (60 DRY AND 60 IRRIGATED FARMS)

Independent variables	Category of farms	Regression coefficient	Standard errors	Statistical significance of the regression coefficients		
				Authors' estimates	Corrected estimates	
					t-value	Significance
Land (acres) ..	Dry	0·9315	0·1013	Significanct	9·1954	Significant
	Irrigated	0·6526	0·0294	,,	22·1973	,,
Human labour (days)	Dry	2·4483	0·1967	,,	12·4468	,,
	Irrigated	1·1032	0·0075	,,	147·0933	,,
Bullock labour (days)	Dry	—1·7630	0·2071	,,	8·5127	,,
	Irrigated	—0·0353	0·0192	Not significant	1·8697*	,,
Farm manure and fertilizers (Rs.)	Dry	0·2474	0·0209	,,	11·8373	,,
	Irrigated	0·1178	0·0001	,,	1,178·0000	,,
Irrigation and pesticides (Rs.)	Dry	—	—	—	—	—
	Irrigated	0·1304	0·0432	Not significant	3·0175	Significant

* Significant at 10 per cent probability level. Other corrected estimates are significant at 1 per cent probability level.

would yield a net income of Rs. 1,367.76 per farm—but which farm (?), probably a 'synthetic' one which may not exist in the real world.

VI

As much as eleven papers discuss the relative profitability of different crops and crop rotations. L. R. Singh and U. K. Pandey study the cropping pattern and the resource use efficiency in a dry farming district of Banda (Uttar Pradesh). The authors find that farmers are rational in the use of 'only' bullock labour since its per hour MVP (Re. 0.79) is close to the per hour acquisition cost (Re. 0.75); expenditure on manure and other inputs including irrigation (perhaps canal water) is below optimum. Human labour use is found to be excessive and accordingly a one-fourth reduction in its use is suggested to increase farm incomes by 10.2 per cent. However, a good case for probing the alternative employment opportunities for the surplus human labour is left aside. Parmatma Singh and D. D. Gupta find farmers in the dry farming areas of Haryana State fully aquainted with the new crop technology (use of fertilizers and improved seeds) and any lag in its adoption is ascribed to the lack of assured irrigation facilities. Fallow-*sarson* (mustard) rotation (Table II) is found to give maximum net profit of Rs. 563.73 per acre.

M. V. George, A. C. Gangwar and Vijay Kumar examine net returns under the existing and improved practices in some villages of Hissar district (Haryana State). Despite the authors' suggested farm plan with improved technology yielding about three times higher net returns than the existing ones (with existing technology), they find 'very little scope for drastic changes in the existing plan to arrive at the most profitable plan.' It is further stated that 'the objective of the present study was not to develop optimal plans but to develop acceptable and more remunerative plans over the existing ones.'

But how could one develop a 'more remunerative farm plan' without developing 'optimal plan' ?

V. P. Shukla also works out the optimum crop combination for a few rain-fed farms in Jabalpur district (Madhya Pradesh) under the traditional (category 1) and advanced (category 2) technology. The programmed crop plan shows full use of *rabi* land on both the categories of farms (Table III). In regard to *kharif* land a surplus of as much as 12.66 acres out of 18.14 acres and 19.76 acres out of 24.35 acres is left on farms in category 1 and 2, respectively. Even though the operating capital (cash expenses) was not a restriction on farms in category 1, one fails to understand as to how as high as 70 per cent *kharif* land could be left unused ? At least commonsense economics would not provide any rationale to this kind of situation. However, Shukla derives some comfort because his results are similar to those of Raj Krishna and J. W. Mellor as farmers in both the categories were close to optimal resource allocation.

R. I. Singh, M. S. Bhatia and M. P. Azad report that an increase of 46.2 per cent in inputs like fertilizers, human and bullock labour on irrigated farms of Unnao district (Uttar Pradesh) resulted in an increase of crop output by 63.2 per cent and net income by 80.5 per cent over dry farms. Ram Murti and V. Prasad, on the other hand, find that under dry farming conditions in Banda district (Uttar Pradesh) bajra + *arhar* + *urid*, and jowar + *arhar* + *urid*, etc., could increase per hactare net income by 74.07 per cent and 55 per cent respectively. Over which crop rotations does this increase take place is not clearly spelt out. V. P. Shukla in another paper finds that the use of fertilizers and improved seeds increases farm incomes by 32 per cent and 48 per cent on unirrigated and irrigated farms respectively.

A. S. Kahlon, S. S. Miglani and Harwant Singh study the cropping pattern and the related profitability under irrigated and unirrigated conditions in the Ferozepur district (Punjab). *Guara*, *desi* bajra and gram are found to give higher returns on unirrigated than irrigated farms, whereas, gram mixed with wheat, and also with barley, is found to be more profitable on the latter. S. S. Kahlon and H. S. Sandhu identify dry farming zones in Punjab and make an interesting study of the zonal characteristics, moisture conservation methods and pattern of input use and net profits from crops grown in these zones. Groundnut is found to be giving maximum net returns in the northern and central zones while *sarson* (mustard) in southern zone. The cultivation of wheat in the southern zone resulted in a loss of Rs. 124 per acre.

M. D. Maral and R. E. Waghmare find a high correlation (0.8262) between farm size and the value of crop production on small dry farms and conclude increasing returns to scale on small farms ! This absurdity is, perhaps, conceptual. All kinds of generalizations with respect to family and bullock labour, investment on farm lands and buildings, livestock, implements, expenditure and income are made and the discussion is carried away from the central theme. Saroj Kanti Chaudhuri attempts to study the state of agri-

culture in the Burdwan district (West Bengal). The semi-arid region is taken to mean as rain-fed region. The cultivators' performance is favourably compared with that of irrigated zone both with respect to size and tenurial systems though production of paddy in the semi-arid zone is less than half of that of the irrigated zone.

VII

H. S. Chauhan and C. S. Jaiswal use data from the U. P. Agricultural University, Pantnagar Farm to show that the cost of operating a shallow tube-well (60 to 70 feet deep) with 5 H. P. electric motor is Rs. 2.04 per hour. The per hour cost of using tractor power for pumping irrigation water varies from Rs. 8.32 to Rs. 16.32. The paper deals primarily with the 'engineering aspects' of cost of operating different pumping units and sources of water, ignoring altogether the economic aspects, particularly, that of returns obtained, from different sources of irrigation. Mercier J. R. and Ribiere G. try to discuss 'the economics of dry farming areas in Andhra Pradesh through rainfall simulation.' Although, the title appears attractive, a cut-and-paste job has been done in the paper with hardly any discussion on economics. The authors think that the 'Regional Rainfall Simulation Model' (RRSM) is a tool which could solve almost all problems in economics. One could have, however, desired to know the 'optimal decision rules' clearly spelt out in the model with its applicability under dry farming conditions.

VIII

On the basis of the papers presented and in the light of the foregoing review, we would like to suggest the following issues for the group discussion at the Conference :

1. As a new package of dry farming technology, the country's Fourth Plan (1969-74) invisages, *inter alia,* soil and water management, evolving new crop varieties and agronomic practices. In this regard, a number of questions can be raised and discussed.

   (*a*) What has been the progress in the soil management, water harvest, evolving drought resistant, high-yielding, short duration, and photo-insensitive crop varieties for the dry farming areas ?

   (*b*) What are the factors responsible for the slow (or even lack of) progress in developing the new package of dry farming technology ?

   (*c*) What are the financial requirements and what institutional and administrative measures are necessary for the effective implementation of the new package of dry land technology ?

2. A large number of papers has come out with the conclusion that the new crop technology particularly improved seeds and chemical fertilizers

could increase crop productivity and thereby farm incomes, with or without irrigation facilities. Implicit in this conclusion is that now farmers have acquainted themselves with the new crop technology. At the prevailing prices of quality seeds, chemical fertilizers and output, the demand for quality seeds and fertilizers is likely to increase. In this context, could we re-examine the price policies for the quality seeds, chemical fertilizers and output so as to see if farmers in the dry farming areas would have a sustained incentive to make investments in such inputs.

3. Empirical evidence in some papers suggests that provision of irrigation facilities in the dry farming areas is likely to increase farm incomes and farm labour employment through increased cropping intensity. If this is true, then one may expect an increase in the wage rates of farm labourers at least in the peak season, and also a reduction in the income disparities between dry and irrigated areas. If the latter holds true, what other measures besides providing irrigation facilities would be needed to narrow down income inequalities over a long period of time?

4. The economic aspects of converting dry areas into irrigated areas need to be concerned only with 'productive' irrigation projects, such as Nagarjunasagar project of Andhra Pradesh, Hirakud project of Orissa, Cauvery-Mettur irrigation system of Tamil Nadu and Tungabhadra project of Mysore State. It would be worthwhile discussing the benefits—increase in crop productivity and incomes, increase in labour employment due to changed cropping pattern, and increased cropping intensity;—and problems—farmers' response to desired agronomic practices, cropping pattern, pests and disease control measures.

5. If the production of high-yielding and quick maturing crop varieties in irrigated areas alone has the potential of meeting the country's entire food requirements, what crops and crop rotations could or should be suggested for dry lands? Shall they continue to grow coarse grains having limited markets for exports or they should concentrate on the production of pulses, cotton, oilseeds and unconventional crops like soybeans and sunflower? Or the concentration should be on raising milch animals along with high-yielding, nutritious and palatable fodder crops?

6. Farmers in dry as well as arid areas have been making adjustments with yield and income instability through diversification of farm enterprises, maintenance of grain and fodder reserves and migration of both human and animal population. Now given liberal provision of credit by the nationalised banks, is it desirable to advocate specialization in cattle, sheep or goat raising thriving well in dry farming areas?

7. Can the results on foliar application of nitrogen obtained from agronomic trials conducted at the experiment stations serve as a basis for large scale application and projections of its economic benefits?

8. Crop insurance would involve a number of economic, legal and administrative problems. We might discuss its economic feasibility, its legal implications and, the burden it may throw on the administration.

9. In view of the recent thinking on the size of ownership holding, one would like to discuss the economic rationale for determining a viable size of holding, especially, in dry farming areas.

10. The discussion of the various issues raised above may ultimately lead to working out important guidelines for developing a long-term strategy for the development of dry farming areas. Also could such a strategy be adopted in arid and/or rain-fed areas ?