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AGRICULTURAL DEVELOPMENT IN FIVE DEVELOPING COUNTRIES —A COMPARATIVE STUDY*

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India accounts for 56 per cent of arable land, 66 per cent of area under all cereals, 52 per cent of cereal output and 44 per cent of rice output of the total developing ECAFE region. The rate of growth of agriculture in this region, therefore, depends heavily on the rate of growth of the agricultural economy of India. Her annual rate of growth of agricultural output during the 'fifties was only 2.6 per cent and this rate of growth has been accompanied by an average rate of growth of about 2 per cent in arable land. But there are marked variations in the progress of the agricultural sector of the developing countries and India's performance in the agricultural sector will be better appreciated if viewed against the performances of those countries that have done much better in recent years. In this paper we have made a comparative study of the development of agriculture in five developing countries—four in the ECAFE region and one in Latin America. The countries are : Taiwan, South Korea, Mexico, Pakistan and India.

TABLE I—PERCENTAGE CHANGE BETWEEN 1952-53 AND 1964-65

Country	Agricultural production		Food production		Population (1951-64)
	Total	Per capita	Total	Per capita	
(1)	(2)	(3)	(4)	(5)	(6)
Taiwan	77	18	77	17	57
South Korea	113	50	124	61	35
Mexico	118	51	124	56	51
Pakistan	29	0	34	4	33
India	46	12	45	12	31

Table I shows some broad indicators of agricultural development. The first three countries, *viz.*, Taiwan, South Korea and Mexico, have registered considerable improvement on both total and per capita basis in spite of larger population increase. South Korea and Mexico have more than doubled their total agricultural as well as food production. India's performance in this background appears very poor although it is higher than what Pakistan has achieved.

* Data used in this paper have been taken from (i) *FAO Production Yearbook* for different years, and (ii) *Economic Bulletin for Asia and the Far East*, Vol. XVI, No. 1, June, 1965.

The achievements of the different countries as shown in Table I do not reveal the full potentialities for India because the 77 and 124 per cent increase in the production of food in Taiwan and South Korea respectively was achieved on a much higher yield rate than that of India in the base period. Table II shows the average yield of three major cereals and all cereals during 1948-49—1952-53.

TABLE II—YIELD PER HECTARE—AVERAGE OF 1948-49—1952-53

<i>(100 kgs./hectare)</i>				
Country	Rice	Wheat	Maize	All cereals
(1)	(2)	(3)	(4)	(5)
Taiwan	22.1	9.6	14.1	21.8
South Korea ..	27.5	8.9	5.7	18.0
Mexico	18.0	8.8	7.5	—
Pakistan	13.8	8.7	9.8	11.7
India	11.1	6.6	6.5	7.1

It is clearly observed that India started from a very low level of yield rate in her planned effort at agricultural development. In this background the performance of different countries in respect of different crops during the last one and a half decade are presented in Table III.

TABLE III—PERCENTAGE CHANGE IN YIELD PER HECTARE OF DIFFERENT CROPS BETWEEN 1948-49—1952-53 AND 1964-65

Country	Rice	Wheat	Maize	All cereals* (1948-49— 1952-53 to 1961-62— 1962-63)
(1)	(2)	(3)	(4)	(5)
Taiwan	65	119	49	47
South Korea ..	21	6	42	11
Mexico	15	190	45	—
Pakistan	22	—5	10	11
India	45	11	52	27

* All cereals include wheat, rye, barley, oats, maize, sorghum and rice.

Data for all cereals in respect of Mexico were not available.

An analysis of the data given in Tables II and III convincingly show the superiority of Taiwan's agriculture. Her yield rate of all the three crops under study was very high even in the base period—highest in the case of wheat and maize and second only to South Korea in the case of rice. Nevertheless she attained the highest percentage increase and overtook South Korea in average yield of rice, maintained her highest position in average yield of maize and yielded the first position in the rate of wheat yield to Mexico which nearly trebled her yield rate of wheat. The performance of South Korea does not appear to be much impressive from the figures of percentage increase during the period. But it should be remembered that an increase of 21 per cent on an average yield as high as 27.5 quintals per hectare requires considerable effort.

Mexico almost trebled her yield rate of wheat and made a 45 per cent increase in the average yield of maize. India achieved the highest percentage increase in average maize yield but the absolute yield per hectare still remained very low (99 quintals per hectare) in 1964-65. Compared to Pakistan, India's performance appears to be better but the absolute levels of yield of all the three crops under study in Pakistan still remained higher than India as they were in the base period despite a 5 per cent decrease in average wheat yield. Moreover, as has already been stated above, India started from a very low rate of yield and it should have been possible for her to achieve considerably higher percentage increase for comparable increase in inputs.

We now turn our attention to an analysis of some major agricultural inputs for an explanation of the differential growth rates of yield. Detailed data on input structure of the countries under study are not available. It has been possible to collect data only on (a) irrigation, (b) consumption of chemical fertilizer and (c) insecticides used in agriculture.

TABLE IV—CHANGE IN PERCENTAGE OF ARABLE LAND IRRIGATED

Country	Period	Per cent of arable land irrigated		Percentage change in irrigated area cols. (4)—(3)	Per cent increase in arable land
		First year of col. (2)	Last year of col. (2)		
(1)	(2)	(3)	(4)	(5)	(6)
Taiwan	1950-1964	56	58	2	0.8
South Korea	1952-1964	29	44	15	10.2
Mexico	1950-1960	12	15	3	19.5
Pakistan	1953-1961	37	42	5	6.0
India	1950-1963	15	16	1	24.0

It appears from Table IV that except in the case of South Korea, changes in the percentage of irrigated land in all other countries are negligible. Even in South Korea the increase was registered during the last two years of the period under study. The percentage of irrigated land in 1962 was only 31, *i.e.*, 2 per cent higher than the figure for 1952. To get a clearer picture we should examine these percentage increases vis-a-vis the percentage increase in arable land.

Taiwan and South Korea already had comparatively higher proportion of irrigated land and in both the countries irrigation facilities increased at a higher rate than the increase in arable land. India and Mexico substantially increased their arable land but the proportion of irrigated land remained almost the same.

Irrigation facilities pave the way for the use of chemical fertilizers. The variation in fertilizer use amongst the five countries is very high. The data on fertilizer use is presented in Table V.

TABLE V—CHANGE IN FERTILIZER CONSUMPTION

Country	Consumption of chemical fertilizer (kg./hectare)					
	1948-49— 1952-53	1955-56	1960-61	1962-63	1963-64	1964-65
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Taiwan ..	87.89	139.23	200.79	194.10	214.06	237.07
South Korea ..	53.63	91.98	139.78	146.82	160.61	167.53
Mexico ..	1.08	6.58	7.42	9.52	—	—
Pakistan ..	.21	.42	3.65	3.49	3.46	3.65
India ..	.59	1.07	2.33	2.81	3.74	4.43

Between 1948-49—1952-53 and 1964-65 all the five countries under study increased their consumption of fertilizer. Mexico, Pakistan and India, starting from very low levels, registered very high percentage increase. But as regards the absolute level of use, Taiwan and South Korea are not at all comparable with the other three countries.

After fertilizer, insecticides is the next important agricultural input and in Table VI, we have shown the amount of insecticides used in agriculture. Upto the mid-'fifties there was virtually no use of insecticides except very little in South Korea. From early 'sixties, considerable use is noticed in Taiwan and a steady increase is also noticed in South Korea. Pakistan reached the level of one kilo-gramme per hectare in 1961-62 but India's consumption of insecticides was only 27 grammes per hectare in 1962-63.

TABLE VI—CHANGE IN THE CONSUMPTION OF INSECTICIDES IN AGRICULTURE*

Country	Consumption of insecticides in agriculture (kg./hectare)					
	1953-54	1955-56	1960-61	1961-62	1962-63	1963-64
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Taiwan .. .. .	.08	.10	19.25	19.48	—	—
South Korea .. .. .	.39	2.15	2.70	3.24	7.93	10.41
Pakistan .. .. .	.02	.04	.06	1.01	.95	—
India .. .. .	.06	.07	.19	.29	.27	—

* Information regarding insecticides used in Mexican agriculture was not available.

Analysing Tables IV, V and VI we can see that at the beginning of the period under study, Pakistan had a larger proportion of area under irrigation than was the case with South Korea and at the end of the period the proportion was almost equal for both the countries. But the average yield of the most important crop in South Korea, *viz.*, rice, was more than double the Pakistani level in early 'fifties and it remained more than double in the last year of our study. Again, the proportion of irrigated land in Mexico was lower than India and Pakistan throughout the period but the average yield of wheat increased by 190 per cent and that of Maize by 45 per cent during the period. Apparently, irrigation by itself did not have any differential effect on the yield rate. But the consumption of chemical fertilizer per hectare in South Korea is over forty times the present consumption level of both India and Pakistan. Mexico's consumption of fertilizer in 1962-63 (last year for which data are available) was much lower compared to the consumption of Taiwan and South Korea, but it was 3 to 4 times higher than the Indian or Pakistani level.

The response of yield rate of cereals to changes in irrigation and fertilizer use can also be analysed by rank correlation methods. Eleven countries of the developing ECAFE region have been arranged in descending order of yields of cereals per hectare in Table VII below. These countries have also been ranked in the descending order of (a) proportion of irrigated arable land and (b) net chemical fertilizer use per hectare.

TABLE VII—RANKING OF COUNTRIES ACCORDING TO YIELDS PER HECTARE, AREA UNDER IRRIGATION AND FERTILIZER INPUT

Country	Rank in descending order of		
	Cereal yield per hectare 1961-62—1962-63	Irrigated area as per cent of arable land in 1962	Net chemical fertilizer input per hectare in 1962-63
(1)	(2)	(3)	(4)
Taiwan	1	1	1
Federation of Malaya	2	8	3
South Korea	3	4	2
Rep. of Viet-Nam	4	5	5
Indonesia	5	3	4
Burma	6	9	9
Thailand	7	6	8
Pakistan	8	2	7
Cambodia	9	11	11
Philippines	10	10	10
India	11	7	6

As a measure of correlation between the ranks Kendall's T was calculated between the ranks in cols (2) and (3) and again between cols. (2) and (4). The value of T in the first case is 0.34 and in the second case, the value is 0.60. Test of significance on the two values of T was made. The critical ratio in the first case was 1.29 which is not significant at the 5 per cent level and the critical ratio in the second case was found to be 2.27 which is significant at the one-sided 5 per cent level.

It can, perhaps, be concluded that the higher yield in Taiwan and South Korea in the 'fifties and earlier was achieved by increasing the use of fertilizer and from early 'sixties this process was further helped by the increasing use of insecticides.

In all the five countries that we have studied, land ownership is private and in these countries the rapid growth of agricultural output requires that peasants (actual cultivators, not peasants by definition alone) can legitimately expect a fair share in the fruits of their labour. Recent land reform measures in some countries of the ECAFE region reflect this realization but their achievement varies widely. In this respect also, Taiwan and South Korea have made greater progress than what has been achieved by India or Pakistan. In Taiwan about 70 to 80 per cent of the tenant-operated land has already been transferred to the cultivators, while 20-30 per cent of the tenant cultivators have achieved secure tenure and an appreciable reduction in rent.

According to the findings of a recent survey undertaken by the National Agricultural Co-operative Federation, tenant farm households in South Korea accounted for 17 per cent of the total, as of March 1963. The problem of small holdings and their fragmentation still remains to be solved in this country. But in Taiwan a long term programme for consolidating 300,000 hectares in 10 years has been launched and it is reported that the proportion of farm plots accessible by farm roads have risen from 19 per cent to 41 per cent of total plots, and the proportion of irrigable farm plots from 42 per cent to 72 per cent. The problem of tenancy reform and consolidation of small holdings has been touched only at the fringe in both India and Pakistan.

We have tried to show in our analysis above that the differential rate of use of fertilizer and insecticides explains the differences in the rate of growth of average yield in recent years in the five countries under study. But this analysis does not seem to have any immediate policy implications because nobody would think that we can raise our fertilizer use to about 200 kgs. and use of insecticides to about 20 kgs. per hectare in the near future. Again, if it has been possible for us to achieve a level of average rice yield which is about half the yield rate of Taiwan with an irrigation intensity which is about one-fourth, fertilizer use which is about one-sixtieth and insecticides use which is one-twenty-fifth of the latter, it is worth pondering whether it is necessary for us to go the Taiwan's way. Our suspicion is further strengthened when we look at the yield rates of cereals of some other ECAFE countries. The Federation of Malaya, Burma, Cambodia, Philippines have lower proportion of irrigated land than India. Again, Burma, Thailand, Pakistan, Cambodia and Philippines use less fertilizer per hectare than India does. But the average yield of cereals in all these countries are higher than that of India. It may, therefore, be instructive if we closely study the method of cultivation of these countries.