

Implications of the Green Revolution for Land Use Patterns and Relative Crop Profitability Under Domestic and International Prices

by

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INTRODUCTION

The 'Green Revolution' of the late sixties was caused by the development of high responsive seeds (HRS) and the increased availability of irrigation water. New dwarf varieties of rice and wheat developed for tropical and sub-tropical regions have a higher grain-nutrient response than traditional varieties. Potential increase in yields per acre with the introduction of HRS are of the order of 50 to 200 per cent, given sufficient doses of chemical fertilizers and proper cultural practices [2, p. 58].

Since the introduction of HRS is confined to wheat and rice, the relative productivity of competing crops has changed substantially. In addition to government policies of input subsidies (water and fertilizers), price support (wheat and rice), protection (sugar-cane), and an overvalued exchange rate have affected the profitability of crops unevenly. This has provided an incentive to the farmers to change their land use patterns. This paper analysis the impact of the 'Green Revolution' and Government policies to assess the resulting efficiency of land use.

A number of studies (those by W.P. Falcon, and S.M. Hussain [4, 12] are quite well known) has shown that farmers respond to price incentives rather than being led by tradition in allocating land among competing crops. Their studies concentrated on measuring acreage response to price. Cost and yield variations were ignored on the ground that they were not substantial in determining profitability for technologically stagnant agriculture.

With the introduction and spread of Green Revolution, the costs of production and normal yields of affected crops have changed substantially. We have adopted the approach of acreage response to profitability per acre instead of acreage response to price of the product because of the recent technological

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developments. In estimating the profitability of cultivating alternative crops, we have taken into account not only prices, but also costs, yields, and revenues. We want to see if a change in profitability causes changes in the cropping patterns. We analyse two alternative trade possibilities under international prices in discussing optimal cropping patterns: (i) that cultivation of all crops leads to exportable surplus under international prices; (ii) that imposition of export duties on cotton and rice may change the relative profitability of major crops and consequently may affect the land used patterns. Since the paper was written before Pakistan's 1972 devaluation; it has become necessary to revise the analysis of optimal cropping patterns at the new exchange rate.

Without any export duty or import restrictions, the prices of agricultural exports will increase by the full extent of devaluation. The cost of production after devaluation did not change significantly. This is because the foreign exchange component of the inputs is negligible. The main input affected by change in the exchange rate is chemical fertilizer which is used almost in same proportion for cotton, wheat and rice, relatively more for sugar-cane, decreasing its relative profitability. Since our main interest lies in relative profitability, and not absolute profitability, for determining optimal cropping patterns, our conclusions are not affected by devaluation.¹

We relax the assumption of no intervention, *i.e.*, no export duty and import restriction, in favour of 40 per-cent export duty on cotton and Rs. 34 and Rs. 7 per KWT on basmati rice and coarse rice respectively imposed by the Government.

II. A METHODOLOGICAL DISCUSSION

The impact of the 'Green Revolution' and government policies have provided incentives to the farmers to change their land use patterns. This part discusses the problem of cropping patterns in the light of the relative profitabilities of major crops for selected regions of West Pakistan.

There are four major crops, namely sugarcane, rice, wheat and cotton, which account for 71 per cent of the cultivated area in West Pakistan [23]. The remaining crops are minor and occupy a very small proportion of the total area. Although all crops are grown in almost all the regions of West Pakistan, the distribution of acreage under each crop in each region depends on the soil, climatic and other conditions suited to it. Thus we have divided West Pakistan into three zones *i.e.*, Northern zone, Central zone and Southern zone. Each zone is relatively homogenous with respect to soil, climatic and other agronomic conditions. Peshawar division has been selected to represent the Northern zone, Sargodha division the Central zone, and Hyderabad division for the Southern zone. Each division is considered separately to observe changes in the land use pattern and to investigate the causes of these changes. For example, most sugar-cane fields are found in irrigated areas. Sugar-cane requires considerable water and good soil. Drought and frost are both harmful. In West Pakistan, the Sargodha and Peshawar divisions have a fairly large acreage under this crop.

¹ Our analysis has shown that the sugarcane is the least profitable production alternative under international prices. Therefore, the increases in costs, if any, will just reinforce our conclusions.

Rice is an important *kharif* crop. It requires a warm climate and standing water in the early stages of growth. In West Pakistan, the cultivation of rice is mainly confined to the low lying parts of the central zone and the river flooded and canal inundated areas of the Southern zone. It is also grown on limited scale, in the submountain districts and the canal irrigated areas of the Northern zone.

Wheat is a principal *rabi* crop. More than two third of the crop is grown on irrigated land. The distribution of wheat in West Pakistan clearly corresponds to the extent of irrigated land in the dry areas and the regions affected by autumn and late summer rains. On the Potwar plateau and in the Peshawar division there are large areas under wheat which depend entirely on rainfall.

Cotton is the chief cash and *kharif* crop in West Pakistan and is grown mainly in the canal irrigated areas of Indus Plain. Cotton requires medium to heavy loams that retain moisture. The weather at the time of harvest should be warm and dry. Sargodha and Hyderabad divisions are most suitable for the cultivation of this crop.

Divisional data are used since (i) tehsil or district data for the relevant time period are not available in published form, and (ii) no survey was conducted for this purpose. However, some information has been collected from various research organizations on the basis of personal interviews.

The major crops have been classified into competing groups in accordance with systems of crop rotation determined by the prevailing agronomic conditions. The period of crop rotation is considered to be one year on the assumption that the farmer does not keep land fallow due to the development of (HRS), and the availability of water and chemical fertilizers. Sugar-cane is considered to be a one year crop. On the other hand, either a combination of wheat and cotton or a combination of wheat and rice can be grown in a one year period. The analysis, therefore, is confined to sugar cane and competing crop combinations i.e., wheat and rice, and wheat and cotton.

In order to observe the changes in the land use patterns brought about by the 'Green Revolution' we have taken averages for the years 1964-65 to 1966-67 and 1967-68 to 1968-69 to reflect the pre - and post - Green Revolution periods, respectively.

Profitability was computed on the basis of estimates of gross revenue and short-run variable costs. In estimating gross revenue, farm gate prices were used. Farm gate prices in turn were derived from the domestic wholesale prices at important market centres by deducting the estimated distributive and marketing costs.*

In estimating costs of production, we have assumed constant permanent costs in the form of rent, drought animals, permanent labour and depreciation of building, equipment and other fixtures, regardless of the crops grown. Therefore a combination of crops that maximize net return after meeting the variable costs will also maximize the farm income. Variable costs generally consist of land revenue, water rates, seeds, fertilizers, casual labour and pest control.

* Data on marketing costs and distributive margins were obtained from [3,16,17,21,22 and24].

After deducting variable costs, as estimated by an IBRD study [11], from revenue for the pre-Green Revolution period, we have estimated the profits per acre for all the competing crops.

The costs for the post-Green Revolution period have gone up due to the increase in the quantity and prices of inputs used for cultivating different crops, especially wheat and rice. The quantity of inputs like water, fertilizers and casual labour used in the cultivation of new varieties of wheat and rice have changed substantially. A survey was conducted in 1968 by Dr. S.M. Hussain for Mexican wheat, to gather data about the additional quantities of inputs per acre being used by the farmers [22]. The survey included Lyallpur and Hyderabad districts which are considered to be the representative districts of Sargodha and Hyderabad divisions respectively. We have used this survey as the basis for computing changes in the input-mix for wheat in the post-Green Revolution period.

In addition, prices of various physical inputs have also changed. We adjusted the pre-Green Revolution cost estimates by the changes in the input-mix and prices of inputs in order to arrive at proper cost estimates for the post-Green Revolution period. The increase in quantities of inputs to be used for wheat in the Peshawar Division is of the same magnitude as in the Hyderabad Division.³ It has been observed, on the basis of available information, that the increase in quantities of inputs for rice is almost of the same order as in the case of wheat in their respective divisions.⁴ No significant increases in the quantities of inputs (with the exception of fertilizers) for sugar cane and cotton have been noted during the Green Revolution period.

III. AREA STUDIES

Sargodha Division: Appendix—A shows that in the Sargodha division the area under the four crops was 3.43 million acres in the pre-Green Revolution period. The relative acreage under the three crop alternatives was 10.09 per cent (sugarcane), 69.93 per cent (wheat and rice) and 85.36 per cent (wheat and cotton). In the post-Green Revolution period, whereas the area under the competing crops increased from 3.43 million acres to 3.93 million acres, the relative acreage under sugarcane declined from 10.9 per cent to 8.85 per cent.⁵ The distribution of land, however, moved in favour of wheat-rice from 69.93 per cent to 73.00 per cent and wheat-cotton from 85.36 per cent to 86.72 per cent.

The changes in the land use can be attributed to changes in profitability of various crops. Appendix-A shows the profitability of crops under discussion for the pre-and post-Green Revolution period. It shows that per acre profits from sugarcane were Rs. 492.86, while the per acre profits from combinations of wheat-rice and wheat-cotton were Rs. 402.23 and Rs. 371.66 respectively in the pre-Green Revolution period. With the Green

³Office of the Director of Agriculture, Hyderabad Region, Hyderabad.

⁴Interviews with Extra Assistant Director of Agriculture, Hyderabad Region, Hyderabad; Agronomist, Wheat Botanist, Sugarcane Specialist, Tando Jam Agricultural College; Head Department of Farm Management and Chief Agronomist, Agricultural University, Lyallpur.

⁵The relative acreage of the crop combinations has been computed from the total area under four crops.

Revolution, the profitability of wheat-rice went up by 37.0 per cent, the profitability in the cases of wheat-cotton and sugarcane increased by 13.44 per cent and 12.81 per cent respectively. This shows that the combination of wheat-rice in terms of percentage change in profitability tops the ranking of major crops, followed by the combination of wheat-cotton.

Although the combination of wheat-rice tops the ranking of competing crops in terms of percentage change in profitability, sugarcane remains the most profitable in absolute terms in the post-Green Revolution period. The declining trend in the cultivated area under sugarcane, however, is attributed to the following factors:

- (1) The seed-fertilizer revolution has led to better production alternatives for farmers specially to those who fall outside the sugarcane purchase area for the sugar mills. The Government of Pakistan declared that all the sugarcane cultivated within a radius of 10 miles of sugar mills must be purchased by the mills at specified prices. The farmers within this area concentrated on sugarcane production while those lying outside the radius of 10 miles preferred to grow Mexi-Pak wheat or irri rice. Thus acreage under sugarcane has been continuously falling for a few years, despite the fact that profitability from sugarcane production is the greatest in absolute terms at prevailing domestic prices.
- (2) The uncertain selling price of sugar and gur as against a guaranteed support price for wheat and rice is another factor for the declining acreage under sugarcane production and the increasing cultivation of wheat and rice for the last several years. Apparently farmers preferred lower profits to the risk in sugarcane production.

Peshawar Division: The pattern of changes in land use and the relative profitability of different crops in the Peshawar division is essentially the same as in the Sargodha division. The table shows that the relative distribution of acreage under sugarcane has decreased in the post-Green Revolution period, while the relative acreage under the combination of wheat-rice and that of wheat-cotton has increased. The combination of wheat-rice has the greatest percentage change in profitability in the post-Green Revolution followed by the combination of wheat-cotton.

Hyderabad Division: Appendix-A shows that in the Hyderabad division the area under the four crops was 2.38 million acres in the pre-Green Revolution period. The relative acreage under the three crop alternatives was 4.5 per cent (sugarcane), 66.24 per cent (wheat-rice) and 67.33 per cent (wheat-cotton). In the post-Green Revolution era though the area under the competing crops increased from 2.38 million acres to 3.2 million acres, the relative acreage under sugarcane declined from 4.5 per cent to 4.00 per cent. The distribution of land, however, moved in favour of wheat-rice from 66.24 per cent to 66.64 per cent and wheat-cotton from 67.33 per cent to 69.27 per cent. The profitability from sugarcane was higher than any combination of competing crops in the pre-Green Revolution period similar to that in other divisions. However, the post-Green Revolution period has resulted in decreasing relative profitability of sugarcane compared to combinations of competing crops. The

factors for the change in relative profitability are the same as mentioned earlier for the Sargodha division. The combination of wheat-rice was most profitable followed by wheat-cotton.

The discussion has shown that changes in land use have been in line with changes in profitability. This testifies to the fact that farmers have been rational in response to the economic incentives provided by the changes in crop yields and prices.

The question arises whether the impact of the Green Revolution has led to the increase in profitability through an increase in prices. In the Sargodha division, the average yield per acre of wheat in the pre-Green Revolution period was 10.55 maunds. In the post-Green Revolution period, the yield per acre increased to 14.55 maunds [23]. The increase is 37.91 per cent, while the increase in costs is about 12 per cent [22]. This significant increase in yields relative to costs has resulted in increasing profitability. The average market price per maund of wheat in the pre-Green Revolution period was Rs. 18.96 per maund. In the post-Green Revolution period the price per maund had increased to Rs. 19.39. The increase in price per maund was 2.26 per cent only. The yield per acre of rice in the pre-Green Revolution period was 11.25 maunds, while in the post-Green Revolution period, it increased to 13.16 maunds per acre. The weighted average price per maund in the pre-Green Revolution was Rs. 30.60 per maund, while in the post Green Revolution period, it increased to Rs. 31 per maund. The increase in price per maund is insignificant.

Therefore the changes in land use are mainly due to the increase in yields. No doubt, the increase in prices have played a part in increasing the profitability of wheat and rice, but the prominent factor in the increase in profitability remains the increase in yields due to technological developments.

IV. THE OPTIMALITY OF CROPPING PATTERNS

So far we have described the changes in land use subsequent to the Green Revolution. The next problem to be examined is the optimality of present cropping pattern. We require data for social costs and benefits for all competing crops. The real costs of production have been calculated by taking the physical inputs at the appropriate shadow price, reflecting the opportunity cost of resources used. The essential agricultural inputs have been shadow priced in the following fashion:

Labour: The shadow price of agricultural labour in West Pakistan is commonly taken as half its observed wage rate [15].

Fertilizer: The appropriate price of fertilizer has been taken as the c.i.f. import price.

Water: Water has been valued at the real cost of producing water. The cost of tubewell water is taken as the appropriate price to measure the cost of obtaining additional water.

In order to evaluate social return, crop yields and the social value of the produce are needed. For yields, it has been observed that the land is relatively homogeneous in Hyderabad division. In Sargodha division most of the irrigated land is homogeneous except for small patches of saline and waterlogged

areas. In Peshawar division the land is more or less homogeneous. Therefore, the average yield will not change significantly in each of these divisions when one crop is substituted with another crop. For social value we have used international prices adjusted for freight when necessary.

In discussing optimal cropping pattern we have tested two alternative trade possibilities; (i) that cultivation of all crops leads to exportable surplus under international prices and (ii) that imposition of export duties on cotton and rice may change the relative profitability of the major crops, and consequently affect land use patterns.

In order to discuss the first possibility, the appropriate prices are competitive export prices. In order to estimate these, actual export prices of the important exporting countries during the year 1970-71 were used. For example, in the case of wheat and sugar the export prices of Australia and Cuba were used respectively. In the case of cotton, as Pakistan is one of the major exporting countries, we have taken Pakistan export prices. The case of rice is complicated by three distinct varieties that are produced and traded. The three varieties are fine, medium and coarse, and as Pakistan exports all of them, export prices are easily available. The production mix in each division is different from the export trade mix. Therefore we have made necessary adjustments in evaluating the produce. On the basis of export prices, the per acre gross revenue was estimated, and by deducting the variable cost from it the profitability of competing crops is obtained.

It can be seen from Table I (Section-A) that if one acre of land were allocated to the cultivation of sugarcane in Sargodha division, the profitability is Rs. 540 compared to Rs. 966 for wheat-cotton and Rs. 1232 for wheat-rice. It is clear that with the assumed trade possibilities, the production of wheat-rice ranks highest of all, followed by wheat-cotton. The same pattern is observed in the case of Peshawar division. Hyderabad division presents a different picture. Table I (Section-A) shows that if one acre of land is allocated to the cultivation of sugarcane in the Hyderabad division, the profitability is Rs. 324 compared to Rs. 900 for wheat-cotton and Rs. 674 for wheat-rice. The combination of wheat-cotton ranks best of all. This is due to the fact that the quality of rice produced in Hyderabad division is poor and therefore is exported at very low prices. About 90 per cent of the rice acreage is under coarse rice.

The profitability criterion showed that the cultivation of sugarcane for export purposes is the most unprofitable production alternative. In order to discuss the second trade possibility, export duties imposed by the government on May 15, 1972 are taken into account in estimating relative profitabilities. Table 1 (Section-B) shows the profitability per acre for all competing crops after adjusting the export duties imposed on cotton and rice.

TABLE I
PROFITABILITY UNDER INTERNATIONAL PRICES

Crops	Sargodha division	Peshawar division	Hyderabad division
<i>Section-A (Trade Possibilities-I)</i>			
Sugar-cane	540	436	324
Wheat-rice	1232	734	674
Wheat-cotton	966	604	900
<i>Section-B (Trade Possibilities-II—Adjusted for Export Duty)</i>			
Sugarcane	540	436	324
Wheat-rice	968	556	603
Wheat-cotton	712	466	640

Sources: [5, 6, 7, 8, 13 and 15].

On the basis of profitability per acre, sugar cane still remains an inferior production alternative compared to wheat-rice or wheat-cotton in all the three divisions. One acre of land, if allocated to sugarcane, fetches a profit of Rs. 540, compared to Rs. 968 for wheat-rice and Rs. 712 for wheat-cotton. The same pattern is found in Peshawar division although the per acre yields of rice and cotton are lower due to the peculiar climatic and soil characteristics. Hyderabad division, however, presents a different picture in the sense that the combination of wheat-cotton continues to show greatest profitability per acre due to relative yields and quality differences in rice. However, exports are affected by export duty. Export duty reduces prices and thus profitability which, in turn, reduces exports. This is explained as follows:

$$X = f(S, \bar{P}) \quad \frac{\partial X}{\partial S} > 0$$

where X = exports

S = supply

\bar{P} = world price

on small country assumption, we can safely assume \bar{P} to be given. Thus the crucial variable left is S.

$$S = g(P) \quad \text{where} \quad \frac{\partial S}{\partial P} > 0;$$

and P = Price in domestic market.

Price is affected by export duty and thus

$$P = H(E) \quad \text{where} \quad \frac{\partial P}{\partial E} < 0$$

where E = export duty

$$\therefore \frac{\partial X}{\partial E} = \frac{\partial X}{\partial S} \cdot \frac{\partial S}{\partial P} \cdot \frac{\partial P}{\partial E}$$

On the right hand side first and second terms are positive and the third term is negative.

Thus $\frac{\partial X}{\partial E}$ is negative.

This shows that introduction of export duty will lower the exports.

The following tables show the sensitivity of crop rankings with respect to changes in the international prices of competing products with and without the imposition of export duties.

TABLE II-A
SENSITIVITY OF CROP RANKINGS TO CHANGES IN INTERNATIONAL PRICES

Competing crops	Divisions	Best combination at current prices	Relative price changes in order to reverse the rankings
1. Wheat-rice vs. wheat-cotton (a)	Sargodha and Peshawar.	wheat-rice	21.5% fall in the price of rice in Sargodha division and 7.6% in Peshawar division.
2. Wheat-cotton vs. wheat-rice	Hyderabad	wheat-cotton	25% fall in the price of cotton.
3. Wheat-rice vs. sugarcane (b)	Sargodha, Peshawar & Hyderabad	wheat-rice	56.1%, 40.5%, 51.8% fall in the price of wheat-rice in Sargodha, Peshawar and Hyderabad divisions respectively.
4. Wheat-cotton vs. sugarcane	Sargodha, Peshawar & Hyderabad	wheat-cotton	44.6%, 33.2%, 63.9% fall in the price of wheat-cotton in Sargodha, Peshawar and Hyderabad divisions respectively

(a) (i) Weighted average exports price of rice has been calculated as Rs. 71.00 per maund, (ii) export price of wheat is Rs. 27 per maund and (iii) export price of cotton is Rs. 231.00 per maund.

(b) Export price of sugar is Rs 36.96 per maund.

TABLE II-B

**SENSITIVITY OF CROP RANKINGS TO CHANGES IN INTERNATIONAL
PRICES ADJUSTED FOR EXPORT DUTIES**

Competing crops	Divisions	Best combination at current prices	Relative price changes in order to reverse the rankings
Weat-rice vs. wheat-cotton	Sargodha Peshawar	wheat-rice	26.4% and 1.2% fall in the price of rice in Sargodha and Peshawar divisions respectively.
Wheat-cotton vs. wheat-rice	Hyderabad	wheat-cotton	5.9% fall in the price of cotton.
Wheat-rice vs. sugarcane	Sargodha, Peshawar & Hyderabad	wheat-rice	41.1%, 21.5%, 46% fall in the price of wheat-rice in Sargodha, Peshawar and Hyderabad divisions respectively.
Wheat-cotton vs. sugarcane	Sargodha, Peshawar & Hyderabad	wheat-cotton	24.1%, 6.3%, 49.3% fall in the price of wheat-cotton in Sargodha, Peshawar and Hyderabad divisions respectively.

The tables indicate that the ranking of wheat-rice and wheat-cotton combinations are fairly susceptible to changes in the international prices of these products. Thus agricultural policies should be formulated with the correlation between production of commodities and their relative world prices in mind.

V. CONCLUSIONS AND POLICY SUGGESTIONS

The analysis in part IV has shown that the wheat-rice combination is the most profitable in Sargodha and Peshawar divisions as against the combination of wheat-cotton for the Hyderabad division under prevailing international prices. The wheat-cotton and wheat-rice combinations come next in Sargodha-Peshawar divisions and Hyderabad division respectively. Sugarcane is the least profitable in all divisions.

It is suggested that protection policy in case of the sugar industry, the subsidies given on various agricultural inputs and price support programmes should be abolished. Steps should be taken to increase the cultivated area under wheat-rice in the Peshawar-Sargodha divisions and wheat-cotton in the Hyderabad division by switching the cultivated area from sugarcane to these crops. The increased acreage under these crops will result in greater production and a fall in domestic prices. This will enable the domestic producers to compete in the world market successfully.

As the analysis shows, the export duty on cotton and rice has reduced the profitability of wheat-cotton and wheat-rice combinations under international prices. This may have an overall unfavourable effect on the production of these two crop combinations and consequently may discourage the exports of cotton and rice. The imposition of export duties may be justified on the basis of increase in international prices of these commodities and devaluation in Pakistan rupee. However, the fact remains that the balance of payments effect of devaluation is nullified to a great extent by such relatively high rates; consequently may reduce the real receipts of the exporters and may lead to distortions in the economy.

Changes in trade policies or any other measures taken by the Government of Pakistan in the direction of bringing domestic prices in line with international prices will be in the best interest of Pakistan. Our conclusions are relative to the facts used and are based on the assumption that the various assumed trade possibilities will not lead to substantial changes in the world prices used for evaluation.

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APPENDIX A

GREEN REVOLUTION AND THE CHANGES IN THE LAND USE
Pre-Green Revolution (a) Post-Green Revolution

Divisions	Crops	Area '000' acres	Relative acreage (b)	Area '000' acres	Relative acreage	Pre-Green Revolution profitability (Rs.)	Post-Green Revolution profitability (Rs.)	Percentage change in profitability (Rs.)
	1	2	3	4	5	6	7	8
Sargodha	1. Sugarcane	375	10.09	343	8.85	492.86	556.00	12.81
	2. Wheat-rice	2406	69.93	2872	73.00	402.23	554.29	37.00
	3. Wheat cotton	2964	85.36	3411	86.72	371.66	421.62	13.44
	4. Total (four crops)	3432	100.00	3934	100.00	—	—	—
Peshawar	1. Sugarcane	190	15.20	167	12.79	648.98	678.62	4.50
	2. Wheat-rice	1055	84.44	1131	86.82	252.82	426.16	68.50
	3. Wheat-cotton	982	78.61	1032	79.30	269.06	284.55	5.70
	4. Total (four crops)	1249	100.00	1302	100.00	—	—	—
Hyderabad	1. Sugarcane	107	4.5	104	4.00	602.83	608.27	0.90
	2. Wheat-rice	1579	66.24	1732	66.64	245.10	402.99	46.40
	3. Wheat-cotton.	1605	67.33	1800	69.27	463.01	472.38	2.00
	4. Total (four crops)	2383	100.00	3199	100.00	—	—	—

Notes: (a) The period before 1967/68 is considered to be a pre-Green Revolution period in our analysis, since 1967/68 was the first year in which the availability of seed was not a binding constraint and 2.5 to 3 million acres were planted to dwarf varieties of wheat.

(b) The relative acreage has been computed from the total area under four crops. The total of the relative acreage exceeds 100 since wheat is counted twice.

Sources Column No. 2 and 4 from [23]; Column No. 6 and 7 from [3, 9, 10, 11, 14, 16, 17, 18, 19, 20, 21, 23 and 24].