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Sustainability and Trends in Profitability of Indian Agriculture

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Abstract

The pattern of development and trends in productivity and profitability have been analysed to find whether Indian agriculture meets the requirements of sustainable development. The study is based on the secondary data culled from the publications of the Department of Agriculture and Department of Statistics, Govt. of India. A tremendous development and spectacular growth have been observed in agriculture during the past five decades, 1949-50 to 1999-2000. However, there has not been any spectacular modification in the technology since 1980s, leading to a continuous deceleration in the rates of growth of both production and productivity of most crops in recent years. Because of decline in yield, the economic condition of farmers has deteriorated. On the other side, non-agricultural sector has shown a growth of 6 per cent. This increasing disparity between per capita income of agricultural and non-agricultural sectors is likely to raise social disorder in the farming class.

Introduction

Sustainable development has become inevitable in all the spheres, including agriculture. The World Commission on Environment and Development (WCED) has defined sustainable development as the development that meets the needs of present generation without compromising the ability of future generations to meet their own needs. The brief circulated by the AERA stated that sustainable agriculture development is environmentally non-degrading, technologically appropriate, economically viable and socially acceptable. It further stated that sustainability ought to be viewed in the context of need for enhancement of productivity, production and profitability of agriculture and above all, for improvement in the economic conditions of farmers.

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Of late, serious concerns have been raised about the deteriorating economic conditions of the farmers in view of the rising cases of suicides by the farmers linked with their indebtedness. The Situation Assessment Survey of the Farmers of the NSSO-2003 has reported that 40 per cent of farmer households were of the view that given the choice, they would take up some other career, while 27 per cent of the households (67.5 per cent of disliked households) did not find farming a profitable venture.

Taking into consideration the situation as outlined above, the sustainability of agriculture has to be seen in the context of emerging economic condition of farmers and profitability of agriculture. The present paper is aimed at critically analysing the pattern of development and trends in productivity and profitability and examining whether Indian agriculture meets the requirements of sustainable development.

Data and Approach

Secondary data as available from the government publications of the Department of Agriculture and Department of Statistics were used. The trends in growth in production and yield are based on statistics culled from DES Ag, whereas trends in profitability are based on the data culled from the comprehensive scheme for studying cost of cultivation / production of principal crops in India and published by the CACP in their reports on price policy. The gross domestic product from agriculture and value of output over time were taken from the Central Statistical Organisation (CSO) of the Department of Statistics. The simple analytical approach has been used to infer the results rather than using sophisticated statistical tools.

Agricultural Growth

Agriculture in India has observed a spectacular growth during the past five decades (1949-50 to 1999-2000). An idea about the increase in production of principal crops and related developments during this period can be obtained from Table 1. A perusal of Table 1 reveals that during the past five decades, the production of most of the agricultural commodities had a higher increase than the rise in population in the country; wheat production in the country had increased by almost 12-times, from 6.46 million tonnes (Mt) in 1950-51 to 76.37 Mt in 1999-2000. Rice production increased by almost four-times, from 22.58 Mt to 89.68 Mt, during this period. The total food grains production showed an increase of 312.83 per cent against the increase in population of 180.3 per cent during this period. Similarly, production of edible oils, sugarcane, cotton, etc. showed an increase significantly higher than the rate of increase in population during the period

Table 1. Level of production and related agricultural development

Period	(Production: million tonnes)									
	Rice	Wheat	Food grains	Oilseeds	Sugarcane	Cotton (million bales)	Irrigated area (million hectares)	Fertilizer (lakh tonnes)	Population (millions)	
1950-51	22.58	6.46	50.82	5.16	57.05	3.04	22.56	0.65	361.1	
1960-61	34.58	11.00	82.02	6.98	110.00	5.60	27.98	2.92	439.2	
1970-71	42.22	23.83	108.42	9.63	126.37	4.76	38.19	21.77	548.2	
1980-81	53.63	36.31	129.59	9.37	154.25	7.01	49.78	55.15	683.3	
1990-91	74.29	55.14	176.39	18.61	241.05	9.84	62.47	125.46	846.4	
1999-00	89.68	76.37	209.80	20.72	299.32	11.53	77.99	180.69	1012.2	
Percentage increase										
1970-71/1950-51	86.97	268.88	113.34	86.6	121.5	56.57	69.28	3249.23	51.18	
1999-2000/1970-71	112.41	220.47	93.50	115.16	136.68	142.22	104.21	729.99	84.60	
1999-2000/1950-51	397.16	1082.22	312.83	301.55	424.66	279.27	245.7	Infimite	180.03	

1951-2000. The increase in production of agricultural commodities during this period had been possible due to significant development in the sector associated with vast expansion in the irrigated area, to the extent of 246 per cent and large-scale use of chemical fertilizers. Since, the production of most of the commodities was considered sufficient enough to meet the society's demand, the agricultural growth and development during this period was, thus, socially sustainable.

Growth and Sustainability

The introduction of new technology during the mid-1960s significantly improved the productivity of crops in which HYVs as well as other modern inputs were used for quite a long time. There has been a continuous improvement in the yield and growth of crops, and the technology at that stage was considered quite sustainable. However, there has not been any spectacular improvement in the technology since 1980s and it would be worth while to have a re-look at the pattern of growth of production and productivity of various crops in the recent period vis-à-vis earlier periods. The rates of growth of production and productivity of principal crops in India during different segments of time periods between 1949-50 to 2004-05 are shown in Table 2.

A perusal of Table 2 reveals a continuous deceleration in the rates of growth of both production and productivity of most of the crops in recent years. The principal cereal crops of rice and wheat, which showed sustained growth in production and productivity till 1989-90, depicted deceleration after 1990-91. The rate of growth in production of rice which was slightly lower than the rate of growth in population during 1990-91 to 2000-01, showed a negative growth of -0.49 per cent per annum during the past five years, 2000-01 to 2004-05. Not only the rate of growth in productivity of wheat decelerated to about 2 per cent per annum during 1990-91 to 2000-01 from over 3 per cent per annum during 1967-68 to 1989-90, its yield also declined to -0.11 per cent per annum during 2000-01 to 2004-05. The production growth has been observed as 0.57 per cent per annum during the past five years. These rates of growth in production of rice and wheat would not be able to meet the demand of the society and hence their present technology cannot be deemed as socially sustainable.

The production of pulses has been fluctuating in the range of 11-14 Mt during the past four decades, depending upon the weather. Though there has been some improvement in the rate of growth in production and yield of pulses in the recent period of 2001-05, there has been hardly any spectacular improvement in the technology which could result in a sustained growth in production and yield of these crops.

Table 2. All-India rates of growth of production and productivity of crops
(Production/ annum)

Crop	1959-60 to 1964-65		1967-68 to 1980-81		1981-82 to 1989-90		1990-91 to 2000-01		2000-01 to 2004-05	
	P*	Y*	P	Y	P	Y	P	Y	P	Y
	Rice	3.50	2.25	2.94	2.20	3.55	3.47	1.34	0.92	-0.49
Wheat	3.98	1.27	6.50	3.26	3.57	3.10	3.27	2.21	0.57	-0.11
Coarse cereals	2.25	1.23	0.45	1.20	0.40	1.62	-0.54	1.18	-4.40	1.52
Cereals	3.21	1.77	3.30	2.10	3.03	2.90	1.86	1.36	0.33	1.11
Pulses	1.41	-0.18	0.56	-0.07	1.52	1.61	-0.04	0.55	3.35	2.79
Groundnut	4.26	0.31	0.87	1.00	3.76	2.06	-1.45	0.89	3.42	3.42
Rapeseed & mustard	3.35	0.37	1.95	0.28	7.28	5.22	0.66	0.09	4.50	3.20
Oilseeds	3.20	0.30	1.60	0.61	5.20	2.43	1.62	1.04	8.40	4.86
Sugarcane	4.26	0.95	0.40	0.55	2.70	1.24	2.70	0.82	-6.80	-2.70
Cotton	4.55	2.04	2.40	2.42	2.80	4.10	1.37	-0.94		
Jute	3.50	0.49	2.50	0.72	0.91	3.37	2.37	0.59	0.41	1.97
Potato	4.28	-0.11	6.45	3.45	5.17	2.20	4.33	0.98	0.26	-2.53
All crops	3.15	1.21	2.10	1.20	3.19	2.56	1.96	1.09	1.64	1.96

*P = Production; Y = Yield

Groundnut, which is the most important oilseed crop, has shown large fluctuations in its rates of growth in production and productivity during different decades. However, in recent years, it has shown some improvement in growth rates of both production and productivity but how far these are sustainable, is yet to be observed. Rapeseed and mustard has shown some sustained growth in the long-term, though some fluctuations were observed during the 1990s. The productivity of sugarcane has depicted a continued deceleration in its rate of growth after 1989-90. Not only the rate of growth in its yield declined to below one per cent per annum during 1990-91 to 2000-01, it showed a declining trend with the rate of growth as -2.70 per cent per annum during the period 2000-01 to 2004-05. This definitely raises some doubts about the sustainability of its technology. Cotton, jute and potato have though shown sustained growth in the long-term in the past, these have, of late, shown some fluctuations and decelerations. However, it would not be rational to raise any doubt about the sustainability of technology of these crops at this stage.

Recent Concern about Rice and Wheat Technology

Much of the achievements of India's food grain production and green revolution are attributed to the development of rice and wheat technology.

Table 3. All-India production and productivity of rice and wheat during 1998-99 to 2005-06

Year	Rice		Wheat	
	Production, Mt	Yield, kg/ha	Production, Mt	Yield, kg/ha
1998-99	86.1	1921	71.3	2590
1999-2000	89.7	1980	76.4	2778
2000-01	85.0	1901	69.3	2708
2001-02	93.3	2079	72.8	2762
2002-03	71.8	1744	65.8	2610
2003-04	88.2	2077	72.1	2713
2004-05	85.3	2026	69.5	2673
2005-06(P)	89.0	2070	69.0	2653

P = Provisional

Of late, however, concerns are being raised about the sustainability of technology of these crops in view of deceleration in the rates of their growth. This aspect was further examined by studying their production and productivity in a more recent period of 1998-99 to 2005-06, shown in Table 3. It could be seen from Table 3 that production and productivity of both rice and wheat have shown either stagnation or some fluctuations towards downward, but did not show any significant improvement since 1999-2000. Yield of rice and wheat has been hovering around 2000 kg/ha and 2700 kg/ha, respectively during the period 1999-2000 to 2005-06. The stagnation in yield has also resulted practically insignificant growth in production of these crops. The basic issue is that if such a growth in production and yield cannot meet the domestic demand of the society, the sustainability of the existing technology of rice and wheat also needs a fresh scrutiny.

Profitability of Wheat and Rice

Rice and wheat are said to be the most productive and economically profitable crops in the Indian farming system. However, the farmers have, of late, started raising concern about the economic sustainability of these crops. The genuineness of the concerns could be examined by studying the trends in profitability of these crops in the major producing states. In view of shortage of space, two major producing states of Punjab and Uttar Pradesh for wheat and Andhra Pradesh and West Bengal for paddy were examined for the period 1996-97 to 2003-04, and the data have been shown in Table 4 and Table 5, respectively.

The study of Table 4 shows that profitability of wheat, as measured in terms of farm business income (return over cost A_2) increased up to 1999-2000 but showed a decline thereafter, even at the current prices for both the major producing states of Punjab and Uttar Pradesh. The farm business

income per hectare, when deflated with consumer price index numbers for agricultural labour, which also holds good for farm families, showed a significant fall in wheat. In fact, the FBI per hectare in Punjab during 2003-04 at Rs 11150 was about 30 per cent lower than that of Rs 16040 in 1999-2000. The decline in FBI in Uttar Pradesh was about 20 per cent till 2002-03, though there was some recovery in 2003-04. However, it is evident that profitability of wheat in most technologically-advanced states of Punjab and Uttar Pradesh has also deteriorated during the past five years and concern shown by the farmers in this regard is quite genuine.

A perusal of Table 5 reveals that farm business income per hectare in the production of paddy at current prices did show some increases during the period 1996-97 to 2002-03 in Andhra Pradesh, but it has a decline in West Bengal, except some upward fluctuations in between 1998-99 or so. Farm business income per hectare at the current prices declined from Rs 10788 in 1996-97 to Rs 5737 in 2003-04 in West Bengal. The decline in farm business income, when deflated by the CPIAL, was more (57.31%) when FBI declined from Rs 9861 in 1996-97 to Rs 4209 in 2002-03, against 47 per cent decline at the current prices in West Bengal. It was, however, obvious that profitability in the cultivation / production of paddy in both the major producing states of Andhra Pradesh and West Bengal had declined in recent years.

State of Cotton Economy

Rice and wheat economy was examined in terms of trends in farm business income which considered only paid out cost of cultivation. However,

Table 4. Trend in profitability of cultivation of wheat: 1996-97 to 2003-04

(Rs/ha)

Year	Punjab				Uttar Pradesh			
	Cost A ₂	Gross value of output	Return over Cost A ₂ (FBI)	FBI deflated by CPIAL	Cost A ₂	Gross value of output	Return over Cost A ₂ (FBI)	FBI deflated by CPIAL
1996-97	8753	23663	14909	13628	7272	19674	12402	11336
1997-98	9512	21452	11940	10585	7016	18489	11472	10170
1998-99	9944	26861	16916	13511	7451	20501	13049	10423
1999-2000	10281	31246	20965	16040	8375	22097	13721	10498
2000-01	11854	31803	19949	15310	8597	20199	11602	8904
2001-02	12368	31171	18803	14245	8620	19821	11201	8486
2002-03	12484	29199	16714	12263	10033	21527	11494	8433
2003-04	12826	28032	15206	11156	10476	23089	12613	9253

Note : CPIAL converted with 1995-96 as base = 100

Table 5. Trend in profitability of cultivation of paddy: 1995-96 to 2002-03

(Rs/ha)

Year	Andhra Pradesh				West Bengal			
	Cost A ₂	Gross value of output	Return over Cost A ₂ (FBI)	FBI deflated by CPIAL	Cost A ₂	Gross value of output	Return over Cost A ₂ (FBI)	FBI deflated by CPIAL
1995-96	10105	19247	9141	8356	5770	14169	8398	8398
1996-97	11317	22101	10783	9857	8301	19089	10788	9861
1997-98	11861	20753	8891	7882	9440	19806	10365	9189
1998-99	12121	25938	13817	11036	10509	23836	13327	10645
1999-2000	13781	26770	12989	9038	9938	20763	10824	8281
2000-01	14348	26796	12447	9552	9582	16256	6674	5123
2001-02	15342	27184	11841	9001	11305	18501	7195	5451
2003-04	15790	32743	16953	12438	13027	18764	5736	4209

Note : CPIAL converted with 1995-96 as base = 100

if one considers the economic cost, which includes both paid out as well as imputed costs, then situation may be slightly different with reduced margin of profit. This aspect was studied in the case of cotton, as more complaints are received about the economy of this crop. A comparison of cost of production as represented by cost C₂ and MSP would depict the state of economy of crops, as shown in Table 6.

A study of Table 6 reveals that the MSP fixed by the government on the recommendations of the CACP, covered the economic cost, viz. cost C₂ of production in the major producing states in the case of paddy and wheat but in the case of cotton, the MSP covered only 75-85 per cent of cost C₂ in Maharashtra and 60-85 per cent in Punjab in different years during the period 1996-97 to 2002-03. It could also be observed that even the paid out cost of production of cotton in these two states was not covered by the MSP in most of these years. This clearly reflects the poor state of economy of cotton-farmers in these states where producers have often resorted to agitations, resentments, and even suicides in recent years.

State of Agricultural Economy

The economics of some principal crops in a few major producing states may not show the overall picture of agricultural economy, as there are large variations in the cost structure and production pattern in different states. The overall trends in agricultural economy could best be reflected with changes in GDP and value of output per hectare. The value of GDP from agriculture and allied activities and value of output from agriculture (crop

Table 6. MSP and cost of production of cotton, rice and wheat in selected states

Year	MSP (Rs/q)			Cost of production, Rs/q					
	Rice	Wheat	Cotton	Paddy		Wheat		Cotton	
				Andhra Pradesh	West Bengal	Punjab	Uttar Pradesh	Maha-rashtra	Punjab
1996-97	380	475	1180	406	379	363	363	—	1703
1997-98	415	510	1330	437	429	412	363	1549	2845
1998-99	440	550	1440	432	491	398	389	—	3171
1999-00	490	580	1575	540	490	396	427	—	2375
2000-01	510	610	1625	496	497	432	446	1904	1915
2001-02	530	620	1675	538	500	456	455	2268	2622
2002-03	550	630	1695	544	549	494	507	2205	2448
2003-04	550	630	1725	—	N.A.	504	483	—	2621

Table 7. Over all profitability in agriculture in India: 1995-96 to 2002-03
(at constant prices of 1993-94)

Year	GDP from agriculture (Rs crore)	Value of output of agriculture (Rs crore)	Cropped area million hectares	Per hectare (Rs)		FBI* per hectare (Rs)
				GDP	Value of output	
1995-96	230469	212243	187.47	12294	11321	6482
1996-97	253750	232832	189.59	13390	122891	7032
1997-98	246599	225744	189.41	13019	11918	6824
1998-99	263540	243151	191.37	13771	12705	7275
1999-00	263258	241970	187.43	14046	12910	7392
2000-01	262196	235469	183.67	14275	12820	7341
2001-02	279129	248287	185.81	15022	13362	7651
2002-03	256836	219125	171.15	15006	12803	7331

Note: The ratio of FBI to GVO has been taken as 0.5726 as average estimated, based on all crops / states during 1988-2000 by Sen and Bhatia (2004).

production) as available from CSO from 1995-96 to 2002-03 at constant prices of 1993-94 and their per hectare values have been shown in Table 7.

A perusal of Table 7 shows that GDP from agriculture, which also included allied sub-sectors like animal husbandry, increased from Rs 13390 in 1996-97 to Rs 15006 in 2002-03 per hectare, an increase of about 12 per cent in a period of six years. If increase in the agricultural population during this period is taken into consideration, the increase in GDP per capita agricultural population would be only nominal or negligible. As regards crop production, the value of output per hectare at constant prices of 1993-94 was in the range of Rs 12000-13300, showing a marginal increase of about 4 per cent in a per period of six years. The farm business income per hectare has also shown only a marginal increase. Even if a modest increase

of agricultural population of 1.5 per cent per annum is assumed, the increase in population would result about 3 per cent decline in value of output and farm income per capita agricultural population during the period 1996-97 to 2002-03. The stagnation in per hectare farm income or decline in per capita income does not depict a sound health of agricultural economy in the country.

Price Policy and Agricultural Economy

Level of technology and price policy are important determinants of the state of farm economy. The price policy of the government is to provide minimum support price to the farmers for all the principal crops. In order to justify the prices fixed, the government brings out an index of terms of trade between agricultural and non-agricultural sectors, as shown in Table 8. A perusal of this table reveals that the terms of trade indices (shown in Column 7) have not deteriorated since 1990-91. However, if one reconstructs the series with 1994-95 as the base, then it would be seen that terms of trade in recent years, particularly after 1999-2000, have definitely moved against the farmers. During the past four years, viz. 2000-01 to 2003-04, the prices received by the farmers were 3-4 per cent lower than the prices paid by them with respect to 1994-95, as indicated by the indices of terms of trade. It could also be observed that if parity in indices of terms of trade was maintained, it only indicated that the margin of profit in production of crops was maintained and given technology and no change in yield, it reflected that the farmers' income at constant prices was not reduced. However, if there was relatively higher increase in input prices with given technology, the level of input-use might shift to the left and downward, resulting a decline in yield. This is what has happened during the past four years, as could be seen from Table 9.

It could be seen from Table 9 that the real minimum support prices, as measured by deflating the actual MSP by the indices of wholesale prices for all commodities with 1993-94 as base equal to 100, declined in real prices of most of the principal commodities as compared to that of 1999-2000 except for gram, rapeseed, mustard and groundnut. Since the performance of yield has already been discussed in the earlier section of sustainability of technology, it may only be added that small increases in yield in certain crops have not been able to compensate the losses arising out of the decline in real prices during the past five years and thus there has been a deterioration in the economic condition of the farmers. Producers of crops like wheat, tur, soyabean, jute and copra have suffered more where decline has been recorded in both yield and real minimum support prices during this period.

Table 8. Index of terms of trade between agricultural and non-agricultural sectors: 1994-95 to 2003-04

Year	Index of prices received (IPR)	Index of prices paid (IPP) for				Index of terms of trade
		Final consumption	Intermediate consumption	Capital formation	Combined index	
1994-95	171.1 (100.0)	159.0	166.1 (100.01)	158.4	160.5 (100.0)	106.6 (100.0)
1995-96	182.9 (106.9)	173.4	174.2 (104.8)	176.1	173.7 (108.2)	105.3 (98.7)
1996-97	190.6 (111.4)	185.6	181.5 (109.3)	188.8	184.8 (115.1)	103.1 (96.7)
1997-98	205.9 (120.3)	195.7	192.0 (115.6)	196.7	194.9 (121.4)	105.6 (99.0)
1998-99	220.8 (129.0)	213.8	197.1 (118.6)	206.8	209.9 (130.8)	105.2 (98.7)
1999-00	219.8 (128.5)	217.1	203.9 (122.7)	212.6	214.0 (133.3)	102.7 (96.3)
2000-01	225.0 (131.5)	220.5	230.4 (138.7)	227.0	222.9 (138.8)	100.9 (94.6)
2001-02	235.5 (137.4)	226.4	236.4 (142.3)	240.4	229.2 (142.8)	102.6 (96.2)
2002-03	247.5 (144.6)	234.9	253.2 (152.4)	245.7	239.4 (149.2)	103.6 (97.2)
2003-04	254.9 (148.9)	245.2	259.1 (155.9)	255.7	248.7 (154.9)	102.5 (96.1)

Note: Figures within the brackets are indices converted with 1994-95 as base = 100

Summing Up

The analysis of trends in production, productivity and profitability of different crops has raised serious concerns about sustainability of the present production system and technology in agriculture. Because of decline in the real minimum support prices during the past five years with stagnant or marginal change in yield, the economic condition of farmers of most of the crops has deteriorated. The overall per capita income of agricultural population at constant prices has shown only a marginal change during 1999-2000 to 2004-05. The non-agricultural sector during this period has shown a growth rate of about 6 per cent. Given not much change in the proportion of population dependent on the agricultural and non-agricultural sectors and the share of agriculture in the total income being reduced from about 22 to 20 per cent during this period, the disparity in per capita income of non-agriculture to agriculture sector is likely to have increased from about 3.8:1

Table 9. Real minimum support prices of principal crops (Marketing Season)

Commodity	Real minimum support prices, Rs/q							Per cent increase in 2004-05 over 1999-2000
	1990-1991	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	
Paddy common	261	327	319	324	310	311	296	-10.50
Paddy A	286	347	338	343	327	328	312	-10.1
Wheat	274	367	363	373	362	350	333	-10.3
Coarse cereals	229	277	279	297	383	285	272	-1.8
Gram	536	597	636	673	701	671	740	23.9
Tur	611	737	751	808	771	748	735	-0.2
Rapeseed & mustard	732	667	689	734	759	752	846	26.8
Groundnut	738	731	764	820	791	791	793	2.8
Sunflower	763	771	733	725	698	688	709	-8.1
Soyabean (Y)	509	564	542	542	517	515	529	-6.2
Cotton H ₄	954	1184	1143	1147	1096	1059	1036	-12.5
Jute	407	500	492	496	496	473	471	-5.87
Copra milling	2036	2068	2036	2020	1928	1827	1851	-10.5

*Source: CACP Report for Crop Season 2005-06

to 4.8:1. This increasing disparity / gap between per capita income of non-agriculture and agriculture sectors is likely to raise social disorder in farming class. The situation Assessment Survey of NSSO in 2003 has already observed that 40 per cent of farmers are dissatisfied with the profession. Any technology and production system that increases discontentment amongst its users, cannot be deemed as socially sustainable.

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