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Special volume published March 2016 containing selected papers from the IAAE-ISAE Inter-Conference Symposium on Re-visiting Agricultural Policies in the Light of Globalisation Experience: The Indian Context. The symposium was held in Hyderabad, India, October 12-14, 2014.

**RE-VISITING AGRICULTURAL POLICIES IN THE LIGHT OF
GLOBALISATION EXPERIENCE: THE INDIAN CONTEXT**

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INDIAN SOCIETY OF AGRICULTURAL ECONOMICS
in collaboration with
National Institute of Agricultural Extension Management (MANAGE)
Professor Jayashankar Telangana State Agricultural University (PJTSAU)
Acharya N.G. Ranga Agricultural University (ANGRAU)

Supported by
International Association of Agricultural Economists (IAAE)

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Agriculture Diversification in India: Pattern and Determinants

I

INTRODUCTION

The Indian economy has undergone wide structural changes over time with the anticipated decline in the share of agriculture in its GDP. Despite a fall in its share from 56.53 per cent in 1950-51 to 14.0 per cent in 2012-13, agriculture still continues to be the main sector of Indian economy as it provides livelihood to majority of the people. Average number of Indians still spends almost half of their total income on food, while roughly half of India's work force is still engaged in agriculture for their livelihood. The global experience of growth and poverty reduction shows that GDP growth originating in agriculture is at least twice as effective in reducing poverty as GDP growth originating outside agriculture. Agriculture is and will continue to be the engine of the national growth and development.

Agricultural policies in the past have witnessed a series of interactive changes following the economic reforms during 1990s that marked significant departure from the past. Though many of the reform process were not initiated to directly affect the agriculture sector, it was affected indirectly (Chand, 2004). A sustained economic growth, rising per capita income and growing urbanization are apparently causing a shift in the consumption patterns in favour of high value food commodities like fruits, vegetables, dairy, poultry, meat and fish products from staple food such as rice, wheat and coarse cereals (Haque *et al.*, 2010). Further it has also been suggested that India should diversify its agriculture and get a foothold in the world market (Radhakrishna and Reddy, 2004). The diversified and accelerated agricultural growth would enhance the food security by improving the purchasing power of the poor in the perplexing situation of shrinkage in agricultural holdings, declining new investments in agriculture and increasing degradation of natural resources (Joshi *et al.*, 2004). This study basically aims at analysing the trends and patterns of agricultural diversification and its determinants in India.

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II

METHODOLOGY

Data base: The study is entirely based on both secondary collected from different departments/agencies/publications relating to different variables/parameters. The data were collected for the 1950-51 to 2012-13.

Analytical tools: Agricultural diversification was gauged from share of various sub-sectors in GDP as well as total value of output from agriculture & allied activities and cropping pattern. Further, the Simpson Index (SID) was also calculated to find the extent of diversification.

Several factors can induce a shift in the crops grown. On the supply side, diversification is influenced by improvement in infrastructure: (roads and markets) and technology (Joshi *et al.*, 2007). These factors and the speed with which the changes occur vary under different situations (Vyas, 1996). In the innumerable studies on crop-acreage response; infrastructure, technology and institutions are important non-price factors that influence acreage under a crop. Though there are numerous infrastructures, that affect acreage under a crop, network of road is one of the most important factors. Technology has different dimensions among which intensive agricultural practices is the most important while assured irrigation is important for the adoption of intensive agricultural practices.

Since, the results of Simpson Index indicated that there is no variability in the index, the percentage of area under non foodgrain crops in gross cropped area (NON FOODGRAIN) was regressed on intensity of irrigation is percent of gross irrigated to gross sown area (IRIP), percentage of electrified villages (VE), size of holding in ha (SIZE), percentage of marginal and small holdings in total holdings (SMH), number of regulated markets/1000ha gross cropped area (MARKET), per capita income (PCA) and length of rural road (km) per km of geographical area (ROAD).

III

RESULTS AND DISCUSSION

Growth in Agriculture

During the pre-green revolution period, from independence to 1967-1968, and green revolution period from 1968-69 to 1980-81, the agricultural sector has grown at an annual average of around 2 per cent (Table 1). The major driving forces during the pre-green revolution period were land reforms and the infrastructural development such as irrigation, road, etc. while during green revolution these were high-yielding varieties of major cereals, viz. wheat and rice. The growth rate picked up to 3 per cent during post green revolution period from 1981-82 to 1990-91 which was characterised by input intensification period and the major policy reformers increased the supply of agricultural inputs such as chemical fertilisers and pesticides,

development of major and minor irrigation facilities, introduction of minimum support prices for major crops, and provision of agricultural credit (Acharya, 1998). Thereafter, the sector increased nearly at the rate of around 4 per cent/annum, except during IX Plan.

TABLE 1. AVERAGE GDP GROWTH RATE OF AGRICULTURE AND OTHER SECTORS
(AT 2004-05 PRICES)

<i>(per cent/annum)</i>				
(1)	Periods (2)	Agriculture and allied sector (3)	Crop and livestock (4)	Total economy (5)
Pre-green revolution	1951-52 to 1967-68	2.05	2.03	3.70
Green revolution period	1968-69 to 1980-81	2.01	2.23	3.67
Wider technology dissemination period	1981-82 to 1990-91	3.10	3.18	3.67
Early reform period	1991-92 to 1996-97	4.13	4.15	3.68
IX plan	1997-98 to 2001-02	3.23	3.21	6.05
X plan	2002-03 to 2006-07	4.19	4.60	8.46
XI plan	2007-08 to 2011-12	3.78	3.92	7.93

Source: Estimated from National Accounts Statistics, Government of India.

An important feature of progress in agriculture is its success in eradication of its critical dependence on imported foodgrains. During pre-green revolution, India was a net importer of foodgrains. During the 1960's, more than seven percent of the total availability of foodgrains had to be imported and the situation was further worst in two severe drought years i.e. 1966 and 1967. But today our country is a net exporter of the foodgrains. The foodgrain production increased to nearly five times during the last six decades and touched all time high of around 260 million tonnes during 2012-13 (Table 2). Similarly, the oilseed, cotton and sugarcane production increased by six times while, jute and mesta by 3.4 times during the reference period. The production of oilseeds has drastically increased from 1990's.

TABLE 2. AGRICULTURAL PRODUCTION IN INDIA

Year (1)	1950/51 (2)	1960/61 (3)	1970/71 (4)	1980/81 (5)	1990/91 (6)	2000/01 (7)	2012/13 (8)
Foodgrains	50.83	82.02	108.42	129.59	176.39	196.81	255.36
Oilseeds	5.16	6.98	9.67	9.37	16.61	18.44	31.01
Cotton	5.88	5.6	4.8	7.01	9.84	9.54	34.00
Sugarcane	57.05	100.00	126.20	154.25	241.04	296.55	338.96
Raw jute and mesta	3.31	5.3	6.2	8.16	9.23	10.50	11.30

Source: Directorate of Economics and Statistics, Ministry of Agriculture, Government of India.

Sectoral Composition of Agriculture

The composition of income from agriculture and allied sector of economy has changed during the last six decades. A temporal comparison of various constituents of agricultural income at 2004-05 prices shows that after the 1980s, share of livestock is continuously increasing. As a result of high growth, livestock now accounts for around 1/3rd of agricultural (crop and plantation) output which was less than 20 per

cent initially. The contribution of fisheries has been 1.71 to 5.39 per cent during the reference period. Forestry, another sub-sector of agriculture presents an opposite picture. In absolute terms also, livestock and fishery sectors have increased much faster than the others sectors. During 1950-51 to 2012-13, livestock increased by nearly seven times from Rs. 37880 crore to Rs. 261771 crore and fishery by 15 times from Rs. 2732 crore to 41222 crore as against merely two times increase in forestry sector during the concerned period (Tables 3A and B). This clearly indicates diversification towards the livestock and fishery sector in terms of income contribution. In a study, Singh *et al.* (2006) also found the same observations.

TABLE 3A. VALUE OF SELECTED AGGREGATED OF AGRICULTURE SECTOR IN INDIA
(AT 2004-05 PRICES)

Period (1)	Value of output		Gross Domestic Product				Aggregate economy (8)
	Crop (2)	Livestock (3)	Agriculture (4)	Forestry (5)	Fisheries (6)	Agriculture and allied sector (7)	
1950-51	118540	37880	116959	40107	2732	159798	279618
1960-61	166206	44061	161708	41175	4647	207530	410279
1970-71	212947	47467	201455	55499	6572	263526	589787
1980-81	262541	68093	238102	50513	8646	297260	798506
1990-91	345678	108489	336176	52061	14959	403196	1347889
2000-01	429505	156050	439432	58836	24487	522755	2348481
2010-11	579233	240166	610905	70509	36400	717814	4918533
2011-12	609352	251831	643543	71816	38473	753832	5247530
2012-13	609126	261771	649424	73864	41222	764510	5482111

Source: National Accounts Statistics.

TABLE 3B. COMPOSITIONAL CHANGES IN AGRICULTURE AND ALLIED SECTOR (SELECTED RATIOS)

Period (1)	Ratios of value of output		Ratios of gross domestic product			
	Crop/ agriculture (2)	Livestock/ agriculture (3)	Agriculture/ agriculture+ (4)	Forestry/ agriculture+ (5)	Fisheries/ agriculture+ (6)	Agriculture+/ economy (7)
1950-51	76.03	24.30	73.19	25.10	1.71	57.15
1960-61	79.00	20.94	77.92	19.84	2.24	50.58
1970-71	81.45	18.16	76.45	21.06	2.49	44.68
1980-81	79.32	20.57	80.10	16.99	2.91	37.23
1990-91	76.07	23.87	83.38	12.91	3.71	29.91
2000-01	73.35	26.65	84.06	11.25	4.68	22.26
2010-11	70.69	29.31	85.11	9.82	5.07	14.59
2011-12	70.76	29.24	85.37	9.53	5.10	14.37
2012-13	69.94	30.06	84.95	9.66	5.39	13.95

Note: Agriculture+ stands for agriculture and allies; Computed from figures as available from National Accounts Statistics.

IV

DIVERSIFICATION WITH THE CROP SECTOR

Changes in Cropping Pattern

The cropping pattern in India has undergone significant changes over time. Since the cultivated area remains more or less constant, crop intensification could be

undertaken to meet the increased demand for food due to the growing population and urbanisation. The food crops are being substituted by high value/commercial crops (Table 4). During triennium ending (TE) 1970-71 to TE 2009-10, the per cent area under oilseeds increased from 9.85 to 14.92, horticultural crops from 3.28 to 6.92 per cent and sugarcane from 1.62 to 2.51 per cent. Favourable market conditions for refined oil and protein-rich soya food might have been responsible for inducing farmers to allocate larger areas for oilseed crops (Srinivasan, 2005) while growing demand for high value crops might be the driving force for increasing area under fruits and vegetables. It is interesting to note that area under food grains in gross cropped area (GCA) declined by more than 10 per cent mainly due to the fall in area under coarse cereals between TE 1970-71 and TE 2009-10. Wheat has gained importance with area allocation of only 10.42 per cent in TE 1970-71, and it steadily increased to 14.62 per cent in TE 2009-10, while per cent area under rice is almost stagnant.

TABLE 4. SHARE OF AREA UNDER MAJOR CROPS IN INDIA

Crops (1)	<i>(per cent of GCA)</i>				
	TE 1970-71 (2)	TE 1980-81 (3)	TE-1990-91 (4)	TE 2000-01 (5)	TE 2009-10 (6)
Rice	23.02	23.18	23.00	23.82	22.51
Wheat	10.42	12.98	13.04	14.28	14.62
Total cereals	61.93	60.41	56.53	54.27	51.57
Total pulses	13.50	13.23	12.94	11.49	12.45
Oilseeds	9.85	10.11	12.51	12.96	14.92
Total fibres	5.41	5.08	4.64	5.27	5.46
Sugarcane	1.62	1.62	1.90	2.23	2.51
Horticultural crops	3.28	4.00	4.89	5.87	6.92
Total non-food crops	19.39	20.13	23.60	25.44	26.49
Cross cropped area (GCA)	100.00	100.00	100.00	100.00	100.00

Income Diversification in Crop Sector

The agricultural commodity basket has changed significantly during the last sixty years. The contribution of different crops in total value of output takes into account both physical outputs as well as prices and given in Table 5. From the table it shows that cereals accounted for the largest share of total output followed by horticultural crops, oilseeds and fibres. Whereas, the contribution of cereals declined from 38.13 per cent in 1950-51 to 29.02 per cent in 2011-12, the share of horticultural crops increased drastically from 10.49 per cent to 27.77, oilseeds from 8.26 per cent to 9.71 per cent, sugarcane from 3.49 to 5.83 per cent and fibres from 4.29 to 7.15 per cent during the reference period. The diversification of value of output from cereals to high value crops is a good sign towards sustainability of the sector. The changing share was determined both by quantity as well as prices, but the contribution of prices was more as the prices were high in case in horticultural crops in the beginning of current decade (Chand *et al.*, 2011).

TABLE 5. STRUCTURAL CHANGES WITHIN CROP OUTPUT

Items (1)	1950-51 (2)	1960-61 (3)	1970-71 (4)	1980-81 (5)	1990-91 (6)	2000-01 (7)	2010-11 (8)	2011-12 (9)
Cereals	38.13	42.64	43.43	37.32	34.69	33.10	28.56	29.02
Pulses	6.34	6.31	5.42	6.46	6.86	4.61	4.82	4.30
Oilseeds	8.26	8.01	9.55	8.34	12.86	6.88	9.52	9.71
Sugars	3.49	4.45	4.25	6.06	5.08	7.33	6.50	5.83
Fibres	4.29	5.48	4.93	4.09	4.26	2.99	6.64	7.15
Drugs and narcotics	3.02	2.81	2.48	2.35	2.48	3.11	3.49	3.99
Horticultural crops	10.49	12.93	16.89	17.59	19.45	28.72	28.26	27.77
Others	25.97	17.37	13.05	17.78	14.33	13.25	12.21	12.22

Income Diversification in Livestock Sector

Livestock is an important sector of agriculture and accounted for 30 per cent of agricultural output in the country and it is increasing continuously during last six decades. The absolute value of livestock output is also growing faster than any other agricultural sub-sectors. The sector is considered as pro-poor sector and is often considered as a new source of agricultural growth in the country. The relative share of different components of livestock calculated based on the data from Central Statistical Organisation indicates that milk group is the major constitute of the livestock accounting for more than 2/3rd to the total value of output from livestock (Table 6). Second important component is meat group (18.87 per cent) followed by dung (7.88 per cent) and eggs (3.45 per cent). Over 1950/51 to 2012/13, the share of eggs, milk, and meat group in total livestock output has increased while that of wool, hair, dung, and silkworm has decreased.

TABLE 6. PERCENTAGE SHARE OF DIFFERENT COMPONENTS OF LIVESTOCK IN INDIA
(AT 2004-05 PRICES)

Components (1)	1950's (2)	1960's (3)	1970's (4)	1980's (5)	1990's (6)	2000's (7)	2010's* (8)
Milk group	53.44	53.97	59.03	64.45	67.64	69.49	68.62
Meat group	19.86	19.95	17.37	16.39	17.36	17.46	18.87
Eggs	1.19	1.58	1.90	2.59	2.97	3.26	3.45
Wool and hair	0.67	0.63	0.57	0.25	0.21	0.18	0.14
Dung	24.42	23.31	20.24	15.28	10.75	8.64	7.88
Silk worm cocoons and honey	0.42	0.56	0.90	1.04	1.07	0.97	1.05

Note: Figures are calculated based on the average value of the decade. For current decade, it calculated from the average value from 2010-11 to 2012-13; Source: National Account Statistics, MOSPI, Government of India

Diversification and Agricultural Trade

The agricultural export basket has also changed in the country. The value of agricultural export is given in Table 7. During 1960-61, the major export earning was from Tea and mate, sugar and molasses, cashew kernels, etc.. The country was net importers of cereals during the sixties. The agricultural revolutions like green revolution, white revolution, yellow revolution, brown revolution impacted the

agricultural production and as a result, in the current years the major exporter earning items are rice, particularly Basmati rice, raw cotton, livestock and fish products, processes horticultural products, etc. A large share of export earnings came from non traditional items in the export basket, namely rice, fruits, vegetables, livestock and marine products. The progress in export of these items achieved during 1990s clearly signifies the positive impact of diversification. The globalisation of agricultural trade has brought to the forefront access to markets, new market opportunities for employment and income generation; productivity gains and increased flow of investments into sustainable agriculture and rural development (Singh *et al.*, 2006).

TABLE 7. AGRICULTURAL EXPORT FROM INDIA (VALUE IN \$ MILLION)

(1)	1960-61 (2)	1970-71 (3)	1980-81 (4)	1990-91 (5)	2000-01 (6)	2010-11 (7)	2011-12 (8)
Agricultural and allied products:	596	644	2601	3521	6256	24448	37618
Coffee	15	33	271	141	259	662	953
Tea and mate	260	196	538	596	433	736	848
Oil cakes	29	73	158	339	448	2438	2420
Tobacco	34	43	178	147	191	875	836
Cashew kernels	40	76	177	249	412	627	928
Spices	36	51	14	133	354	1768	2750
Sugar and molasses	60	39	50	21	112	1246	1881
Raw cotton	25	19	209	471	49	2910	4328
Rice	0	7	283	257	644	2545	4940
Fish and fish preparations	10	40	274	535	1394	2623	3444
Meat and meat preparations	2	4	70	78	322	1971	2921
Fruits, vegetables and pulses (excl. cashew kernels, processed fruits and juices)	13	16	101	120	352	1397	1579
Miscellaneous processed foods (incl. processed fruits and juices)	2	6	45	119	239	806	1139
Total Exports	1346	2031	8486	18143	44076	251136	304624

Source: Government of India, 2013.

Factors Affecting Crop Diversification

Since, the results of Simpson Index indicated that there is no variability in the index, the percentage of area under other than foodgrain crops in gross cropped area was used as dependant variable instead of diversification index. The results of correlation and regression are given in Tables 8 and 9.

The perusal of correlation table shows that all the variables were in accordance with the expected hypothesis, i.e. area under high value crops increases with increase in irrigation potential, infrastructural facilities such as rural electrification, marketing facilities and rural roads and per capita income. The percentage area under non-foodgrain crops was inversely correlated with size of holdings. Differences in the quantity and quality of resource basis were largely responsible for variation in diversification. Gupta *et al.* (1985) also found that irrigation intensity, farm net

worth, price risk, and farm size were strong variables affecting the level of crop diversification.

TABLE 8. CORRELATION COEFFICIENT BETWEEN PER CENT AREA UNDER NON FOODGRAIN CROPS AND OTHER VARIABLES

Variables (1)	NON-FOODGAIN (2)	IRIP (3)	VE (4)	MARKET (5)	SIZE (6)	SMH (7)	PCA (8)	ROAD (9)
NON-FOODGAIN	1.00							
IRIP	0.98	1.00						
VE	0.94	0.95	1.00					
MARKET	0.91	0.91	0.98	1.00				
SIZE	-0.97	-0.99	-0.98	-0.95	1.00			
SMH	0.98	0.99	0.97	0.93	-0.99	1.00		
PCA	0.86	0.90	0.79	0.69	-0.85	0.89	1.00	
ROAD	0.94	0.97	0.95	0.91	-0.97	0.97	0.86	1.00

TABLE 9. FACTORS AFFECTING DIVERSIFICATION OF AGRICULTURE

Variable (1)	Coefficients (2)	Standard error (3)
Intercept	-435.7376	90.2143
IRIP	0.1923	0.1775
VE	0.1231*	0.0439
MARKET	-0.1141	0.0745
SIZE	53.2843*	10.4119
SMH	4.8348*	1.0080
PCA	-0.0005*	0.0001
ROAD	0.2660	3.3568
R2	0.98	No. of observations (42)

Note: *Denotes significance at 1 per cent level.

The influence of rural electrification on increasing area under high value crops was also justified by the regression results. These results were contradictory with the results of Singh *et al.*, (2006) where the study found the presence of electricity and road density were negatively associated with crop diversification, as the tended to influence farmers for income enhancing activities, owing to the presence of developed market led by specialized farming while fertilizer consumption per hectare was positively associated with diversification. However, the comparison of road density only with crop diversification index may not sufficient to interpret in terms of non-influence of road density on crop diversification. This is because of the reason that the diversification index takes into account the crops only and role of high value crops/ enterprises like livestock/fishery, etc are not taken into account exclusively. If diversification is about increase in percent area under non-food crops and enterprises, then the road density may have a positive effect on diversification. A study by Jha *et al.* (2009) substantiates the fact as road density has positive effect on percentage of area under non-food crops. Similarly, though income has a negative effect on the diversification index, it was found directly affecting the percentage area under non-food crops in his study.

Though the variable size of holding was found to be directly related with area under high value crops, it was also found to be directly related with proportion of small and marginal holdings in total holdings which indicates that diversification increases with decreasing size of holdings. The results of correlation also substantiate the facts. In number of studies also, it was observed that the size of holding is inversely related with diversification and interpreted that small farmers are more risk averse than the large farmers (Jha *et al.*, 2009, Jha and Jha 1995). The availability of technological inputs and technology also determined the diversification towards non-food crops and enterprises other than crop. The dietary pattern is also a cause of diversification of production portfolio (Barghouti *et al.*, 2003).

V

CONCLUSION AND POLICY IMPLICATIONS

India, being a vast country of continental dimensions, presents wide variations in agro-climatic conditions leading to evolution of regional niches for various crops. In the past, regions were generally associated with the crops in which they specialize for various agronomic, climatic, hydro-geological, and even, historical reasons. But, as a consequence of technological changes, these niches are undergoing significant changes without much disturbance in output level. Therefore, the diversification is considered as one of the strategy for reducing risk in agriculture and augmenting income of farmers. The present study is therefore an attempt to identify whether the diversifying is taking place or not. The result shows that foodgrain production increased to nearly five times during the last six decades and touched all time high of around 260 million tonnes during 2011-12. Similarly, the oilseed, cotton and sugarcane production increased by six times while, jute and mesta by 3.4 times during the reference period. Over the years the composition of agriculture is changing and it is shifting towards livestock and fishery. Within the sector also, the composition is changing over the period. The contribution of cereals declined from 38.13 per cent in 1950-51 to 29.02 per cent in 2011-12 while the share of horticultural crops increased drastically from 10.49 per cent to 27.77, oilseeds from 8.26 per cent to 9.71 per cent, sugarcane from 3.49 to 5.83 per cent and fibres from 4.29 to 7.15 per cent during the reference period. In livestock sector also the share of eggs, milk, and meat group in total livestock output has increased while that of wool, hair, dung, and silkworm has decreased during 1950/51 to 2012/13. The diversification of value of output from cereals to high value crops is a good sign towards sustainability of the sector. The changing share was determined both by quantity as well as prices, but the contribution of prices was more as the prices were high in case in horticultural crops in the beginning of current decade. The agricultural export basket has also changed in the country. During 1960-61, the major export earning was from Tea and mate, sugar and molasses, cashew kernels, etc while in the current years the major export earning items are rice, particularly Basmati rice, raw cotton, livestock and fish products, processes horticultural products, etc. The study

recommends that for harnessing the potential of diversification there is need of strengthen infrastructural facilities like road connectivity, markets, etc as the high value crops are more perishable. The policy interventions are also required for providing the minimum support prices of fruits and vegetables.

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