Crop Diversification and Food Security in Kerala

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Abstract

The recent developments in agriculture in Kerala show crop diversification. The process of diversification is evident in different forms such as the cultivated area under food grain crops to non-food grain crops and one non-food grain crop to another non-food grain crop. During the early 1960s, the order of the first five preferred crops were rice, coconut, tapioca, rubber and pepper, in descending order of proportion to the total cropped area. But today the preferred crops are coconut, rubber, rice, pepper and arecanut. Rubber came in the second position. Coconut, rubber and pepper together constituted a major portion of the total cropped area. The main crops losing area were rice and tapioca. The crop diversification indices for all Kerala and districts revealed less diversification in the pre-1991 period compared to recent years. This has created an imbalance in the cropping system with serious economic and environmental consequences. Reduction in rice production, decline in the availability of livestock and its products, decline in food availability, and changes in the employment pattern in rural areas are some of the important economic consequences of crop diversification. Food security, particularly in the case of rice, is the vital issue for Kerala at present. This study shows that there will be an increasing demand for rice in Kerala in the coming years. This will enlarge the supply demand gap of rice in Kerala in future.

Keywords

Crop diversification, supply-demand gap, food security, Kerala

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Introduction

The agricultural scenario in Kerala continues to be the most important and single largest sector of the state's economy in terms of income and employment. In spite of the significant advances in industrial and service sectors, it continues to be the largest provider of employment and livelihood, both at state and district levels. The main agricultural systems comprising seasonal, annual, tree crops and plantation agriculture are prevalent throughout the state and cover the lowlands, midlands and parts of the highlands. Diversification of crops is the dominant feature of the state at the moment.

The concept of crop diversification has different meanings at different levels. Diversification means moving away from growing a single crop to a number of crops, a shift of resources from farm to non-farm activities, use of resources in a larger mix of diverse and complementary activities within agriculture, and a movement of resources from low value crops to high value crops (Sharma, 2007). In practice it is a relative concept and is used in terms of the degree of diversification. Crop diversification has been recognised as an effective strategy for achieving the objectives of food security, nutrition security, poverty alleviation, employment generation and income growth, judicious use of land and water resources, sustainable agricultural development and environmental improvement. No farm in India specialises in a single crop. A farm is treated as a diversified farm if no single product accounts for 50 percent or more of the total income. Several farmers adopted mixed cropping as a strategy of diversification. It is conditioned by the availability of inputs and growth in yield as well as prices (Deshpande, 2000).

One of the significant features of Kerala's agricultural scenario is the gradual shifting of areas from food crops like rice and tapioca to plantation crops like coconut, rubber and coffee (Karunakaran, 2013). The reduction in the area under food crops in Kerala from 40.43 percent in 1970-71 to 18.74 percent in 1992-93 and 16.52 percent in 2002-03 is a phenomenon that has happened very rarely in any state (Mani, 2009). The current trend reveals that Kerala is being converted into a non-food crop area. The main feature is the change in the cultivated area under food grain crops to non-food grain crops and from one non-food grain crop to another non-food grain crop. This creates an imbalance in the cropping system which affects

sustainable development and thus threatening food security, particularly rice securityand human progress. This paper therefore attempts to analysethe extent ofcrop diversification and the supply-demand gap of ricein Kerala during the pre-reform 1991 and post-reform 1991 periods. The projected demand for rice, which is very relevant following the introduction of the new economic policy in 1991, is also estimated.

Materials and methods

The study uses secondary data which was collected from publications of the Government of Kerala such as the*Economic Review, Statistics for Planning, Agricultural Statistics and Season and Crop Reports.* Different approaches tomeasure the extent of crop diversification are prevalent at present (Goswamiand Challa, 2004) and in this study the Herfindahl Index (HI) is employed. The Herfindahl Index (HI) is calculated by taking the sum of squares of acreage proportion of each crop to the total cropped area.

$$HI = \sum_{t=1}^{N} Pi^2$$

Where N is the total number of crops and P_i represents acreage proportion of the ith crops to total cropped area. With the increase in diversification, the Herfindahl Index would decrease. The index takes a value of 1 when there is a complete specialisation and approaches 0 as N gets large (i.e., if diversification is perfect). Thus the HI is a measure of concentration; transformed by subtracting it from one, as follows:

Diversification Index (DI) = 1 – HI

Individual demand for rice for the state as a whole is worked out by multiplying the per capita consumption of rice by the population and aggregated by rural and urban. An attempt has been made to calculate the demand for rice in Kerala up to the year 2026 under different scenarios of growth in income (5-10%). The demand projections for rice were obtained by using the formulae developed by Sekhon et al (2008).

$$D_t = d_o * N_t (1+ y*e)^t$$

Where D_t is individual demand for rice in year t (2026), d_o isper capita demand for rice in the base year (2011), N_t is projected population in year t (2026), y is growth in per capita income (5-10%), and e is expenditure elasticity of demand for rice.

Analysis and discussion

In order to understand the extent of crop diversification in Kerala, a state level and district level analysis of the crop diversification areprovided. Firstly, the status of the land utilisation pattern in the state is examined. The data on the land utilisation pattern is shown in Table 1. It presents the land use classification during the pre-1991 and post-1991 periods in the state.

Table 1: Land use pattern in Kerala

Classification of Area	Pre-1991 period			Post-1991 period		
	1960-61 (%)	1970-71 (%)	1980-81 (%)	1990-91 (%)	2000-01 (%)	2011-12 (%)
Total geographical area	100.00	100.00	100.00	100.00	100.00	100.00
Forest	27.37	27.16	27.85	27.85	27.85	27.84
Land put to non-agricultural use	5.31	7.08	6.95	7.64	9.83	9.31
Barren and uncultivated land	3.91	1.85	2.21	1.49	0.75	0.46
Permanent pastures and grazing land	1.17	0.72	1.39	0.49	0.41	0.002
Land under miscellaneous tree crops	5.29	3.98	1.65	0.88	0.39	0.11
Cultivable waste	3.73	2.06	3.32	2.45	1.52	2.52
Fallow other than current fallow	1.61	0.59	0.69	0.67	0.88	1.17
Current fallow	1.74	0.62	1.13	1.13	2.01	1.98
Net area sown	49.87	56.34	56.09	57.81	56.78	56.11
Area sown more than once	11.02	19.59	18.15	19.89	20.98	12.56
Total cropped area	60.89	75.49	74.26	77.73	77.79	68.67

Area in 1000 hectare, percentage to Total Geographical Area.
Source: Computed from (i) Statistics for planning (various issues), Department of Economics and Statistics, Government of Kerala, Thiruvananthapuram. (ii) *Economic Review* (various issues), State Planning Board, Government of Kerala, Thiruvananthapuram.

On the basis of the cropping pattern, in 1960-61 the order of the first five crops was rice, coconut, tapioca, rubber and pepper. Table 2 reveals

that currently the first five crops are coconut, rubber, rice, pepper and arecanut. Rubber movedinto second position by pushing rice to third. Coconut, rubber and pepper together constituted 54.54 percent of the total cropped area. The main crops losing area were rice and tapioca.

Table 2: Rank of principal crops in the Total Cropped Area (TCA) in Kerala

Principal crops	Pre-1991 period			Post-1991 period		
	1960-61	1970-71	1980-81	1990-91	2000-01	2011-12
Rice	1	1	1	2	3	3
Coconut	2	2	2	1	1	1
Arecanut	6	7	7	10	8	5
Rubber	4	4	4	3	2	2
Pepper	5	5	6	4	4	4
Cashewnut	6	6	5	6	7	9
Tapioca	3	3	3	5	5	7
Coffee	10	11	8	7	9	8
Tea	8	10	11	11	11	11
Cardamom	9	9	9	8	10	10
Ginger	11	12	12	12	12	12
Banana and other plantains	7	8	10	9	6	6
TCA (%)	100	100	100	100	100	100

Source: Computed from (i) Statistics for planning (various issues), Department of Economics and Statistics, Government of Kerala, Thiruvananthapuram. (ii) Economic Review (various issues), State Planning Board, Govt. of Kerala, Thiruvananthapuram.

At the all-India level there were changes in the cropping pattern and this led to diversification in Indian agriculture (Goswani and Challa, 2004). Table 2 clearly shows the shift from food crops, mainly rice and tapioca, in favour of tree crops such as rubber and coconut in Kerala, which is supported by the diversification index shown in Table 3.

The transformed values of the Herfindahl Index were lower in the pre-1991 period which implies less diversification. The higher values in the post-1991 period indicate more diversification. Considering the value of

Table 3: Crop diversification indices for Kerala

Districts	Pre-1991 period			Post-1991 period		
	1960-61	1970-71	1980-81	1990-91	2000-01	2011-12
Thiruvananthapuram	0.799	0.793	0.809	0.779	0.749	0.785
Kollam	0.844	0.817	0.833	0.819	0.805	0.848
Pathanamthitta	_	_	_	0.813	0.778	0.781
Kottayam	0.892	0.896	0.842	0.746	0.713	0.701
Alappuzha	0.739	0.736	0.764	0.727	0.736	0.763
Ernakulam	0.824	0.822	0.776	0.799	0.813	0.848
Idukki	_	_	0.876	0.831	0.898	0.918
Trissur	0.692	0.718	0.676	0.734	0.747	0.784
Palakkad	0.631	0.693	0.694	0.783	0.821	0.873
Malappuram	_	_	0.824	0.812	0.803	0.833
Kozhikode	0.828	0.806	0.857	0.667	0.673	0.699
Wayanad	_	_	_	0.808	0.835	0.870
Kannur	0.808	0.828	0.879	0.831	0.837	0.853
Kasaragod	_	_	_	0.834	0.801	0.813
State	0.821	0.833	0.852	0.867	0.858	0.863

crop diversification indices for Kerala, the relatively less diversification in the pre-1991 period compared to the post-1991 period could be attributed mainly to the farmers' preference for growing more commercial crops and less subsistence crops. Crop diversification indices for districts in Kerala also show a high value of diversification index.

The main objective of any developmental activity is to improve the consumption levels of the poor sections of the society (George, 1980) and it has been one of the objectives of planning in Kerala (Venkiteswaran, 1984). Among the food items, rice is the staple food and it is an important and sensitive item of the consumption basket. An analysis of the changes in food availability over time has special significance in Kerala.

The immediate result of crop diversification in Kerala in the last few years, particularly during the post-1991 period, was a reduction in rice

production (Karunakaran, 2014). In 2011-12, the annual production was down to 598.34 thousand tonnes from 1067.53 thousand tonnes in 1960-61. Table 4 shows that during 1960-61 to 2011-12, the decrease in the supply of rice was observed compared to the continuous increase in the demand for rice in Kerala. A comparison of the figures in Table 4 reveals that, during 1960-61, Kerala had a shortage of rice of about 40.12 per cent, increasing to 64.17 per cent in 1990-91 and 77.37 per cent in 2000-01. In 2011-12, the rice shortage in Kerala was 83.45 per cent.

Table 4: Supply demand gap and projected demand for rice in Kerala

Supply demand gap of rice				
Year	Demand for rice	Supply of rice	Supply demand gap of rice	
	(1000 tonnes)	(1000 tonnes)	(1000 tonnes)	%
1960-61	1782.93	1067.53	-715.40	40.12
Pre-1991 period 1970-71	2248.86	1298.01	-950.85	42.28
1980-81	2674.29	1271.96	-1402.34	52.44
1990-91	3032.43	1086.58	-1945.85	64.17
Post-1991 period 2000-01	3319.82	751.33	-2568.49	77.37
2011-12	3615.98	598.34	-3022.64	83.45
Projected Demand for Rice				
	Growth rate (In %)	Rural (In'000 tonnes)	Urban (In'000 tonnes)	Total (In'000 tonnes)
5	4673.28	1761.27		6434.55
2026 AD 6	5190.75	1925.16		7115.91
7	5762.98	2103.63		7866.61
9	7095.05	2509.66		9604.71
10	7866.60	2739.95		10606.55

In view of the increasing demand for rice in Kerala, it is felt that the conversion of paddy fields into gardens or orchards of rubber and coconut will accentuate the food problem of the state in the long run. Therefore

an attempt has been made to calculate the demand for rice in Kerala for the year 2026 under different scenarios of growth in income (5-10%). The projected population calculated by the Census Commission of the Government of India, was also used. The income elasticity calculated by Viswanathan and Meenakshi (2006) for the rural and urban populations in Kerala was used in the demand projections for rice. Here expenditure elasticity was used as a proxy of income elasticity. Theaverage monthly per capita consumption of rice for rural and urban areas in Kerala calculated by the NSSO 55th round Report was employed for demand projections (Viswanathan and Meenakshi, 2006).

The results of the projected household demand for rice in Kerala are presented in Table 4 and the data presents the increasing demand for rice in Kerala in the coming years compared to the existing supply. This will enlarge the supply-demand gap of rice in Kerala in the coming years, indicating a threat to food security and revealing a further increase in rice production in a sustainable way (Government of India, 2005).

Conclusion

The analysis of the cropping system according to the land utilisation pattern shows that the area under tapioca and rice has declined continuously ever since the pre-economic reform year, 1991. The area under total food crops also declined rapidly. Rice and tapioca lost the area of cultivation during the period while rubber and coconut gained in area.

By calculation of the index of crop diversification, the extent of crop diversification can be noticed. The measure of diversification informs that there was less diversification in the pre-reform 1991 period and high diversification in the recent years. The diversification in the cropping pattern mainly towards rubber was also noticed in more recent years.

The substitution of rubber and coconut at the cost of rice and tapioca has far reaching implications for food and price policies. The continuous rise in the price of food grains and the food shortage affects the poor population adversely more than ever before.The conversion of rice lands into other farm lands has decreased the supply of rice in Kerala and widened the supply-demand gap of rice. The estimated projected demand for rice reveals that the demand will increase in the coming years in Kerala. The situation of rice production in the state can be augmented only if policy

prescriptions are launched by the government to make the farmers risk bearers. The yield of rice can be improved by adopting better technology involving adequate, efficient and effective types of inputs. In the paddy sector,strict enforcement of various laws relating to land use should be followed by the revenue authorities. Keeping in view the sustainability and ecological problems created by crops like rubber, there is a need to introduce legislative measures, if possible, to divert area from these crops to rice.

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