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Full Length Research

Trend Analysis of Area, Production and Productivity of Rice in Kerala in the Context of Food Security

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Kerala has the total geographical area of 38.86 lakh ha and accommodate 2.76 percentage of India's population. According to the 2011 census, total population in Kerala is 333.87 lakh consisting of 160.21 lakh males and 173.66 lakh females. Almost 52% of the population lives in rural area and majority of the population are non agricultural labours. Agriculture in Kerala is characterized by small land holdings and exhibited a shift from food crops to cash crops in the last few years. Around 90% of the net cropped area of 20.72 lakh Ha is dominated by plantation crops like rubber, coconut, tea and cardamom. Out of the gross cropped area of 26.62 lakh. Ha food crops like rice, pulses, minor millets and tapioca occupied only 10%. The share of agriculture and allied sectors in GSDP has declined from 9.51 percent in 2012-13 to 8.83 percent in 2013-14. Kerala's agricultural economy has undergone a structural transformation and subsistence crops like rice and tapioca switched on to more remunerative crops. Therefore kerala is remaining as a food deficit state and depending on neighboring states for food grains. The study encompasses the trend in acreage, production and productivity of rice in kerala.

Keywords: trend in area, production and productivity, food security, self sufficiency, sustainability**.**

INTRODUCTION

Kerala ranks highest position among all states in India with respect to social development indices such as elimination of poverty, primary education and healthcare. People are accommodated in agriculture sector in the yester years. With the dominance of service sector, migration and high standard of living has led agriculture sector on the verge of ruin. Kerala is a consumer state and there is a mismatch between purchasing power and accessibility of commodities. People have higher purchasing power but lacking accessibility of food items due to agricultural backwardness. Though Kerala is the chronic food deficit state there is a wide gap between demand and supply of food grains particularly rice which is the staple food grain of the population. The deficit in food grains production receives greater significance because cereals are the major source of calories and proteins intake in Kerala. Sustainable agriculture is necessary for continuous supply of food grains to meet growing demand. Kerala had experienced rapid urbanization and villages have been converted as semi urban or an urban area where the percentage of people depends upon agriculture has reduced drastically. The significant changes in the society tend to change the land use pattern. However the tendency of shifting agriculture land to non agricultural purposes has accelerates the problem of food shortage and remains as a threat to food security in kerala.

Kerala is still depending on its neighbouring states, particularly Tamil Nadu and Andhra Pradesh to meet its daily needs of food items. According to the report of Agriculture Department of Kerala (2001) 68 percent of vegetables traded in the state are produced in Tamilnadu and Karnataka. The question is Why Kerala, has to be dependent on its neighbors when it is bestowed with good natural resources and performs well in literacy & human development indicators? The answer to this question is associated with several factors including shortage of cheap labor, high population density, urbanization, emigration and high literacy. Higher demand for export make Kerala more inclined to cultivating spices and rubber which yield

more money to farmers from limited land area. Rice and vegetables are available at lower costs in neighboring states than it producing in kerala. Therefore, number of full time farmers is reduced and gradually many more agriculture lands are converted for non agriculture purpose. Under these circumstances a review of the changing agricultural production trend in Kerala is necessary to give some insights to the emerging tendencies in relation to food security.

According to Sen (1981), the poor are vulnerable do not have adequate means or entitlements to secure their access to food, even if food is available in the local or regional markets. Food deficit is a severe problem in kerala due to over dependence on imports, unsustainable agriculture, urbanization and structural changes of the economy and dominance of service sector. The important aspect of availability of food is the question of internal production. The present study examines the behavior of production, productivity and area under cultivation of rice in kerala.

Review of Literature

There are number of studies related to rice cultivation and food security in kerala. Some of the studies are selected on the basis of relevance in the concerned area and made detailed review.

Richard Scaria and P.K. Vijayan (2015) examined the conversion of paddy fields to other uses and its impact on the food security. The main objective of the study is to estimate the conversion of paddy fields, and its impact on the food security status of Karrimpuzha watershed in Palakkad district. The study state that Current agriculture land is not sufficient for satisfying the existing dietary needs, so Agriculture land use planning is necessary in Karrimpuzha watershed for satisfying the existing dietary needs. Nearly 2800 tons of rice is deficit per year the in Karrimpuzha watershed, hence people in this area are de- pending on other sources and neighboring states or region for receiving rice for their dietary needs. To overcome this issue, additionally 2000 hectors for agriculture land are required. Land use planning analysis point out that total 3463 hectors of paddy fields are mandatory for achieving the status of self sufficient watershed in rice. The study suggests that Government should implements sustainable land-use planning technique to manage the development of land within their jurisdictions. In doing so, the governmental can plan for the needs of the community and safeguarding natural resources.

Karunakaran N (2014) in his paper entitled “Paddy Cultivation in Kerala – Trends, Determinants and Effects on Food Security” analyzed the trends and determinants of paddy cultivation in Kerala and the effects on food security. The study used secondary data which was collected from various publications of the Government of Kerala like Economic Review, Statistics for Planning and Agricultural Statistics. Time series analysis of acreage, production and productivity data of rice in Kerala during the five decades from 1960-61 to 2009-10 has revealed the performance of rice in terms of growth of area, production and productivity. The found that production of major food crop, rice, reached negative growth rates due to the declining trend of their area. The diversification of crops in terms of variation in acreage allocation has taken place due to price and non-price factors like agro-climatic conditions, labour availability, irrigation facilities, soil fertility, cost of cultivation, price levels, profitability, mechanization etc. The change has taken place largely in favour of non-food crops and recently it is towards rubber. The study also examines food security aspects of the state and found that rice security is the vital issue for Kerala today. The data revealed that during 1960-61 Kerala had a shortage of rice of about 40.12 percent, which increased to 83.45 percent in 2009-10. The study clearly revealed 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 future years indicating a threat to food security bringing out a need for further increase in rice production in a sustainable way.

Scaria Richard et al (2014) in their paper “Paddy land conversion as a threat to floristic biodiversity – a study on Karrimpuzha watershed, Kerala state, south India” understand the changes in cropping pattern and impacts of paddy fields declination upon the floristic diversity of Karrimpuzha watershed, which is situated on the north western parts of Palakkad District of Kerala State. The study revealed that there would be a considerable variation in the cropping pattern of paddy fields and are transformed into different land use system. During the year 1970-71 paddy growing areas in Karrimpuzha watershed amounted to 53.16 percent of its total cropped area. It is declined to 18.38percent in 1990-91 and further decreased to12.10 percent by the year 2010-13. The transformation of paddy field causes several severe economic, environmental, and socio- cultural impacts. The study concluded that the reduction area of paddy cultivation affect the food security in bidirectional way. The reduction the paddy production leads to loss of diversity, rice variety in food system and shortage in supply of rice to the market in required quantity and it will cause price hike and related socio economic problems.

Manikandan A.D. (2011) in his article on “Application of the NREGS in the Food Crop Sector for Improving Food Security in Kerala: A Theoretical Analysis” considers that Kerala has a long history of food grain deficit, especially in rice. For instance, deficit in rice has increased steadily in the state from 45 percent to 85 percent between 1957 and 2008.

However, there is no enough attention has been given to mitigate food insecurity problem in the state in a context there has been a large scale decline in the area and production of paddy. This paper gives a theoretical analysis on the application of the NREGS in agricultural sector of Kerala, especially in food crop sector in order to minimize labour cost of production in the paddy field. This is because labor cost of production of paddy is too high in Kerala compared to other states in India. Recent studies show that 60-70 percent of the total cost of production of paddy is labor cost. In order to mitigate higher labour cost of production of farmers we argue that the need for the introduction of the NREGS in food crop sector, especially in small and marginal paddy land owned by vulnerable sections like SCs/STs, and women. Hence, farmers can reduce the cost of labor in the production process considerably. As a result, net return of farmers will increase due to increased competitiveness. In addition to this, we can improve not only food security by enhancing supply of food and but also bio-diversity and eco-system in the state. In sum, the intervention of 'the NREGS in the small and marginal paddy land is nothing but giving the unskilled agricultural labourers to farmers in ‘zero' wage.

Kumar B.M (2005) in his paper “Land use in Kerala: changing scenarios and shifting paradigms” has examined the changing land use pattern of kerala. The study reveals that agricultural land-use changes in Kerala record an initial increase in total cropped area, followed by dramatic shifts in the coverage of individual crops. The expansion of total cropped area together with removal of forest has significant effect on the ecosystem of kerala. It is observed that such shifts in land-use may have profound implications for the food security of the state, which already depends on ‘outside supplies’ to meet more than half the its food grain requirements. In addition to the conversion of agriculture land, population growth and urbanisation have led to a marked increase in clay mining and other non-agricultural uses of land which further intensify the problem of food security.

The studies showed that paddy cultivation in kerala is deteriorating and agriculture land conversation has significant impact on declining paddy production. The declining trend has cause shortage of rice and widening demand and supply gap. Studies noted that declining trend of rice cultivation is the upcoming thread in kerala.

Statement of the Problem

Unique features of kerala model of development have received global attention and are subject to able criticism by economists and policy makers across the world. One of the features of model is its interregnum of development in agriculture and industrial sector. Though, most of the population in kerala has sought accommodation in service sector. Better education and high literacy has enabled the people to look high remunerative jobs in foreign countries. Gradually emigration of people from kerala cause shortage of skilled labours and paved the way to increase in wage and price of commodities, especially food items. Rice is the staple food of kerala. The State Agriculture Statistics 2012 reveals that after 2008, Kerala lost more than 25,000 ha rice fields. Paddy, which was the first choice among the crops in 1970s, has been pushed to the third position after coconut and rubber. Rice production has fallen from 1,365,000 tonnes in 1970 to 569,000 tonnes in 2011-12. The state’s food grain needs could be met by production of rice in other states and is always remain as a food deficit state. The gap between the state’s demand and production has increased from 50 per cent in 1960s to more than 85 per cent recently. Kerala needs 4 million tonnes of rice a year compared to 0.56 million tonnes it produces. The steady loss of paddy fields will have a serious impact on the state’s economic and ecological sustainability, and food security. The study examines changes in acreage, production and productivity of rice in Kerala from 2005-06 to 2014-15.

Objective of the study

The prime objective of the study is to examine the trends in area, production and productivity of rice in Kerala. In addition the study attempts to predict the future trend in area, production and productivity of rice. The scarcity of food has cause anxiety among the people about future availability. The study also explored the food insecurity situation in kerala

METHODOLOGY

The study is entirely relay on secondary data, has been collected from the web site of Directorate of Economics and Statistics, Kerala. Data were also been collected from other sources such as journals, newspapers, magazines, thesis and electronic resources. The time series data from 2005-05 to 2014-15 has been used to analyze the trend in area, production and productivity of rice in kerala.

Trend projection method was employed to estimate the trend from past data to obtain a forecast in production, productivity and area under cultivation of food crops in kerala. The basic idea behind this method is that the past data serves as a guide to estimate future trend. The trend projection method is based on time series analysis. In this method, a trend equation and a trend line is framed keeping a view in the past trend of data. On this basis forecast of future trend is made. Trend equation in the time series analysis is based on least

Table 1: Area production and productivity of rice in kerala

Sl. No	Year	Area (Hectare)	Production (Tonnes)	Productivity (Kg/Ha)
1	2005-06	275742	629987	2285
2	2006-07	263529	641575	2435
3	2007-08	228938	528488	2308
4	2008-09	234265	590241	2520
5	2009-10	234013	598339	2557
6	2010-11	213187	522738	2452
7	2011-12	208160	568993	2733
8	2012-13	197277	508299	2577
9	2013-14	199611	564325	2719
10	2014-15	198159	562092	2837

Source: Department of Economics and Statistics, Kerala

square method. The basic formulas of trend projection method are given below.

$Y_t = b_0 + b_1 t$

Where,

Y_t = trend forecast for time period t

b_t = slope of the trend line

b_0 = trend line projection for time 0.

$$b1 = \frac{n\sum ty1 - \sum t\sum yt}{n\sum t2 - (\sum t2)}$$

$$b_0 = \bar{Y} - b_1 \bar{t}$$

Simple linear regression model was used to check the association between area, production and productivity of rice. The regression equation is

y = a+bx+u

Where, y = dependent variable

x= independent or explanatory variable

a and b= parameter to be estimated

u=disturbance term

Scope of the Study

The study focuses its attention on trend in area, production and productivity of rice in the context of food insecurity. Rice is the main staple food as well as production of rice is main source of livelihood to farmers of kerala in recent past. The shift of cropping pattern from food crops to highly remunerative cash crops has resulted in widening gap been demand and supply. Likewise, area and productivity of rice has cause mammoth changes in socio-economic scenario of kerala. The scope of the study is related with (1) the study helps to understand the present trend of agriculture in kerala (2) helpful to policy makers to design the plan of action and decision making (3) research findings helps to reveal the real problems of farmers (4) helps to understand food insecurity situation of the state.

Area, Production and Productivity of Rice in kerala

Total geographical area of kerala is 38,863 sq.km which is stretching over 580 km in length and 30.130 km in width. Kerala occupies only 1.2% of the total area of India. During the year 2014-15, the net area under cultivation was 20,42,881 Ha, which occupies 52.57% of the total area in the State. The total cropped area is 26,24,624 Ha. The state has approximately 300,000 rice growers, mostly small and marginal farmers with their average land holding below 0.4 ha. . Paddy is cultivated in three seasons viz…, autumn, winter and summer. The state government has launched several initiatives to enhance paddy cultivation. Providing additional incentives, interest free loans, supply of raw materials at a subsidized price and minimum support price (MSP) to agriculture products are included as incentives. The procurement price of Rs. 15 per Kg was given. Kerala is producing only one fifth of its total requirements of rice and continue as a deficit state. Production, productivity and area under rice in kerala shows a declining trend over the years. Table 1 depicts the trend in area, production and productivity of rice in kerala from 2005-06 to 2014-15.

The area under rice has been declining systematically over the last years. After a long period of continuous decline, area under rice shows a mild increased during 2008-09and sharply declined in the following years. During 2011-12, the area under rice declined by 5027 ha, and during 2014-15, the area under rice declined by 1452 ha. Production since 2012-13 shows an increasing trend. Production of rice during 2004-05 was 667105 tonnes, reduced to 528488 tonnes during 2007-08. This trend was continued till 2010-11. During 2011-12, rice production was increased unexpectedly, but then declined during 2012-13. Since 2012-13, rice production has been increased. Increase in production and productivity of

Table 2: Projected area, production and productivity of rice in kerala

Year	Area (Hectare)	Production (Tonnes)	Productivity (Kg/Ha)
2020-21	135999	482930	3105
2025-26	93480	440735	3372
2030-31	50961	398550	3639

rice during the last few years due to advancement of modern technologies, high yield seeds, and also the assistance and programmes on the part of government at various levels has helped to enhance the growth in agriculture sector.

The projected area, production and productivity of rice are shown in table 2. The area under rice shows a declining trend. Despite the diminishing degree of change in earlier periods, the gap will increase significantly in future. The production is also shows the declining trend. Moreover, productivity of rice will expect to increase in future. If the state continues the existing trend, no doubt food insecurity will become a severe problem in kerala.

District wise area under rice cultivation from 2005-06 to 2014-15 is shown in table 3. During 2005-06, the total area under rice cultivation is 113919 Ha, decreased to 96190 Ha during 2008-09. The declining trend is continued and reached 83998 Ha during 2011-12. During 2012-13 the land under rice has declined to 77201 Ha and shows a mild increase during 2013-14. But this increase not last since 2013-14. During 2014-15, area under rice in kerala is 81912 Ha. Palakkad is the leading district in kerala in area under rice cultivation. Palakkad is known as the rice bowl of kerala is experiencing spatial decline in distribution of land for rice. Second district in distribution of land for rice cultivation in kerala is Thrissur, exhibiting continues decline over the years. During 2005-06, area under rice in Thrissur was 31074 Ha has been declined to 20259 Ha by 2010-11. During 2014-15, area under rice is 24151 Ha, which is comparatively higher than earlier years. Alappuzha is the third district in kerala in allocation of land for rice cultivation. During 2005-06, the district has puts 28768 ha for rice cultivation. Since 2007-08, there is a steady increase in area under rice cultivation in Alappuzha. But during 2014-15, area under rice has declined to 34415 Ha as against 37403 Ha during 2013-14. The district with least area under rice cultivation is Idukki which consist of 2932 Ha during 2005-06, declined to 1819 Ha during 2010-11 and to 697 Ha during 2014-15. The geographical condition of Idukki is not conducive for rice cultivation. Cash crops, especially rubber, cardamom, etc are mostly favourable for cultivating in Idukki.

The low profitability in paddy cultivation appears to have contributed to the shifting of paddy land to other crops or non agriculture purposes. The future of the rice production in Kerala lies in improving productivity with reasonable cost of production through promotion of high yielding varieties of seeds and scientific management of cultivation to make rice production a remunerative enterprise for the farmers. The paddy fields have been converted for various other crops and for non- agricultural use. The recent trend in cropping pattern i.e. cultivation of cash crops instead of food crops have played a significant role in declining area under rice. The land men ratio is very low in kerala. Therefore optimum utilization of land is the main economic problem. Over flow of remittance from abroad and growth of real estate business has made land as highly valuable commodity. The development of other sectors than agriculture necessitated more allocation of land and stagnation in agriculture sector had further intensified the crisis. The number of persons who depends upon agriculture for their livelihood has been reduced. Though production of and demand for agriculture products, especially food items is always in dearth.

Table 4 shows districts wise production of rice in Kerala. Production is the determinant factor of availability and production is determined by a combination of factors including climatic condition, labour availability and productivity, availability of inputs, market demand, availability of land and irrigation facilities. Naturally kerala is blessed with abandoned water resources and vegetations. The question is why kerala, the green state of India is poor in agriculture production? In order to answer this question, we have to examine many factors especially changes in peoples attitude towards agriculture, influence of literacy rate, dominance of service sector, gulf migration and remittance, real estate and higher land value, etc. rice production in kerala shows a fluctuation over the years. In general sense rice production is declining but comparative to earlier years, rice production is subjected to increase in some extend. Rice production during 2005-06 was 669387 tonnes, declined to 530271 tonnes during 2008-09 and increased to 598339 tonnes during 2009-10. During 2010-11, rice production again declined to 522738 tonnes and increased by 568990 tonnes during 2011-12, whereas the rice production is somewhat stable in the last two years.

By analyzing district wise data, Palakkad is the leading producer of rice in kerala followed by Thrissur

Table 3: Districts wise area under rice cultivation in kerala (Ha.)

Sl. No	District	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
1	Thiruvananthapuram	4705	3849	2867	2995	2940	2919	2395	1816	2001	2093
2	Kollam	7218	5497	3538	3859	3453	3342	2097	1387	1363	1327
3	Pathanamthitta	3291	2616	2001	2681	2996	2986	2803	2280	2467	2592
4	Alappuzha	28768	31060	33335	34143	33440	32060	36251	36195	37403	34415
5	Kottayam	12557	13116	10969	10951	15474	14275	21410	17571	15746	17295
6	Idukki	2932	2878	2190	2115	2328	1819	1264	1176	661	697
7	Eranakulam	24934	21895	12343	12966	10787	9016	7731	3940	4052	4644
8	Thrissur	31074	27311	24422	22958	25439	20259	21172	23098	22274	24151
9	Palakkad	113919	109208	99173	96190	100522	87511	83998	77201	82896	81912
10	Malappuram	14885	15109	9496	11013	8338	8949	7528	6674	7549	8402
11	Kozhikode	4703	4295	3800	4038	3277	3003	2920	3511	2433	2321
12	Wayanad	11503	11832	12408	12746	12995	11054	8995	10230	11481	9620
13	Kannur	9223	8842	7232	7649	7130	6339	5740	6684	5080	4955
14	Kasargod	6030	5323	5164	4991	4394	4155	3857	3514	4205	2665
	KERALA	275742	263529	228938	234265	234013	213187	208168	197277	199611	198159

Source: Department of Economics and Statistics, Kerala

Table 4: Districts Wise Production of Rice in Kerala (Tonnes)

Sl. No	**District**	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**	**2013-14**	**2014-15**
1	Thiruvananthapuram	11034	10077	71182	7274	7564	6923	6139	4096	5326	5561
2	Kollam	16063	12580	7988	8292	7947	7155	4768	2928	3234	3150
3	Pathanamthitta	7518	7103	4631	7399	7738	6628	8989	6041	7554	7573
4	Alappuzha	71748	90160	62270	104280	97976	91325	111979	104593	106866	103095
5	Kottayam	31261	35550	28428	32154	39413	40970	63578	51019	50729	49393
6	Idukki	7507	7507	5959	5494	6137	4744	3134	3183	1796	1803
7	Eranakulam	48033	44007	24407	25907	21024	17823	16573	8533	9056	9974
8	Thrissur	72951	65036	59381	71909	63854	53079	62318	67569	66653	76016
9	Palakkad	266634	220103	244244	240143	266231	218155	224410	189229	238065	236398
10	Malappuram	31377	33123	21748	23265	19893	21069	18577	15377	19709	22279
11	Kozhikode	3614	6092	5097	5613	4302	3814	4274	526	3850	3423
12	Wayanad	28385	30722	32079	33861	33157	27911	23526	28052	30755	26168
13	Kannur	17383	17375	14111	13637	13843	13308	12170	14237	11293	11164
14	Kasargod	13786	12142	10963	11043	9260	9834	8555	8116	9439	6095
	KERALA	669387	641575	528488	530271	598339	522738	568990	508299	564325	562092

Source: Department of Economics and Statistics, Kerala

and Alappuzha. The least producing districts are Idukki, Kollam and Kozhikode. Palakkad keep its dominance in rice production since the formation of kerala state. Palakkad has produced 266634 tonnes of rice during 2005-06 and then shows a decline in quantity produced till 2012-13. During the last two years rice production seems to be constant. The long time dominance Palakkad district is due to the higher percentage of irrigated land where paddy is mostly cultivated. Palakkad District is blessed with Irrigation facilities. Irrigation Dams were constructed across almost all the important tributaries of Bharathapuzha. About 80 percent of the rural population of this district is agriculturists or agricultural laborers. Annual production of rice in the district is 2,37.800 tones out of the total production of 7,26,800 tones in the state, i.e. this district produces about 1/3rd of the total production of rice in the state. Kozhikode is the lowest producer of rice in kerala during 2005-06 which had produced 3614 tonnes during 2005-06. Later the production of rice shows a gradual improvement. At present Idukki is the lowest producer of rice in kerala followed by Kollam.

It is interesting to note that rice productivity in the state is increasing over the years (Table 5). During 2005-06, productivity of rice was 2285 Kg/Ha, increased to 2557 in 2009-10. During 2013-14, the rice productivity is 2827 Kg/Ha and in 2014-15 it is reached to 2837 Kg/Ha. Rice productivity in kerala is fluctuating significantly from region to region due to various factors such as soil type, soil fertility, rainfall pattern, flood, water logging, and climatic conditions. District wise productivity of rice in kerala is shown in table 5.5. During 2004-5-06, Idukki is remained as the highest productivity district in rice, which accounts 2558 kg/ha followed by Kottayam (2490 kg/ha), Wayanad (2468 kg/ha), and Thiruvananthapuram (2345 kg/ha). At the same time lowest productivity is at Kozhikode (1343 kg/ha) whereas in 2006-07 Thiruvananthapuram had the highest productivity as 2618 kg/ha, while lowest in Kozhikode (1418 kg/ha). During 2010-11, Thrissur become first in rice productivity among the districts in kerala followed by Idukki. Also in 2014-15, Thrissur hold the first position in productivity and Alappuzha and Pathanamthitta has holds second and third position respectively.

Table 5: Districts wise productivity of rice in kerala (Kg/Ha.)

Sl. No	District	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
1	Thiruvananthapuram	2345	2618	2505	2429	2573	2372	2563	2256	2662	2657
2	Kollam	2225	2289	2258	2149	2301	2141	2274	2111	2373	2374
3	Pathanamthitta	2284	2714	2314	2760	2583	2220	3207	2650	3061	2922
4	Alappuzha	2294	2903	1868	3054	2930	2464	3089	2890	2857	2996
5	Kottayam	2490	2573	2592	2936	2547	2773	2970	2904	3222	2856
6	Idukki	2558	2608	2721	2598	2636	2608	2479	2707	2717	2587
7	Ernakulum	1926	2010	1977	1998	1949	1977	2144	2166	2235	2148
8	Thrissur	2348	2381	2431	2575	2510	2620	2943	2925	2992	3148
9	Palakkad	2341	2473	2463	2497	2648	2493	2672	2389	2872	2851
10	Malappuram	2108	2192	2290	2113	2251	2354	2648	2304	2611	2652
11	Kozhikode	1343	1418	1341	1390	1313	1270	1464	1517	1582	1475
12	Wayanad	2468	2597	2585	2657	2552	2525	2615	2742	2679	2701
13	Kannur	1885	1965	1951	1783	1942	2099	2120	2130	2223	2253
14	Kasargod	2286	2281	2123	2213	2107	2367	2218	2310	2244	2287
	KERALA	2285	2435	2308	2570	2557	2452	2733	2577	2827	2837

Source: Department of Economics and Statistics, Kerala

The increase in production of rice during the past decades was mainly due to the increase in the area under these crops rather than improvement in productivity. Food crops in general have suffered severe setback in production mainly on account of the reduction in area under rice, tapioca and pulses. The lease land-farming project implemented by 'Kudumbasree' is one of the reasons for the increase of area and production under rice. During 2004-05 the total area under lease land cultivation was 21554 hectares indicating an increase of 3979 hectares over 2003-04. Rice is the major crop cultivated in these lands. During 2005-06, Department of Agriculture has stated another scheme on rice cultivation in fallow lands by utilizing the services of unemployed youths. In addition government of kerala introduced land conversion act. Therefore the conversion of agriculture land for non agriculture purpose has been prevented in some extends. In this regard, more effort on the part of government is necessary for the sustainable agriculture and food security in kerala.

To estimate the trend in rice production over the years, simple linear regression model was used. The result is shown below.

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	617910.867	26345.590		23.454	.000
year of rice production	-8436.939	4245.976	-.575	-1.987	.082

a. Dependent Variable: production of rice
(*) significant at 5per cent level

From the above estimated results it is observed that the value of a= 617910.867and b = -8436.939 which are significant at 5 per cent level of significant. The estimated regression equation can be written as

Y= 617910.867+-8436.939x+u

From the estimated equation it is said that increase in year leads to decrease in the production of rice. It is clear that production of rice is declining in kerala.

Food Security in Kerala

Food security means continues and adequate availability of food grains to everyone at a reasonable price. Food availability is the unique determinant of intensity of food insecurity. As per the Food and Agricultural Organisation (FAO) of the United Nations "food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life" (FAO 2014). Food security is closely associated with production of food crops. Major food crops in kerala are rice, wheat and pulses. The production of food crops in kerala was declined drastically. Rice production shows a declining trend since 1980s. Lowest production in rice has recorded in 2012-13. As per state planning board 2011 report, the state is only producing about 12 percent of total rice requirements. During 1960-61, Kerala had a shortage of rice about 40.12 percent, increased to 42.28 percent in 1970-71, 52.44 percent in 1980-81, 64.17 percent in 1990-91 and 77.37 percent in 2000-01. In 2009-10 the rice shortage in Kerala was 3022.64 thousand tonnes of the total demand (that is, 83.45 percent shortage). Food security in Kerala on the one hand is not a considerable issue due to easy availability of food from imports and negative population growth in the last few years. But on the other hand food security is highly considerable because of continues and faster decline in area, production and productivity of major food crops. Keralites need 42.65 lakh tonnes of rice per year, while the quantity of production is only 5.98 lakh tonnes. In other words, 86 % of the food grain required are comes from neighbouring states. The gap between production and requirement is always in imbalance and widening over the years. The unseasonal rainfall, rising temperature, urbanization, migration of skilled labours, shortage of manual labours, higher cost of production, export potentiality of cash crops and the shortage of water for irrigation are some crucial factors that worsen the situation. Thus in this circumstances, food security is the most addressed issue in every development programme in Kerala. To achieve sustainable agriculture is the only solution and is a difficult goal to state.

According to the 2011 census data, out of 1,16,19,063 workers, 6,70,253 (5.77%) are cultivators and 13,22,850 (11.39%) are agricultural labourers. On the whole, 17.16 % of workers in kerala are engaged in agricultural activities as against 22.80 % in 2001 census. Of the remaining workforce, 2,73,022 (2.35%) workers are engaged in household activities and 93,52,938 (80.50%) are other workers. By comparing 2001 and 2011 census data, exhibits a fall of 53902 cultivators and a decrease of 2,98,001 labourers. At the same time other workforce have increased by 17,83,724. The percentage of both male and female cultivators has shows a declining trend during 2001-2011. The percentage of male cultivators has decreased to 6.47 % from 7.5 % and percentage of female cultivators has reduced to 3.89 % from 4.85 % during this period. The reduction in the percentage of labour force and cultivators has indicating the declining stability and reliance on agriculture. Stability of

agriculture is determined by changes in area under cultivation, production, productivity, cropping pattern, work force participation, income to the state and so on.

The unsustainable nature of agriculture in kerala is the reason behind this food scarcity problem. The declining production has necessitated import of food items from neighbour states or countries. This will enlarge dependence and wipeout self sufficiency in food production. Kerala model of development is wildly accepted, even developed countries adopt kerala model as model for development. But backwardness of agriculture sector is considered as the main drawbacks of the model. As India adopted sustainable development policies to conserve natural resources for future generation, thereby resources are protected and preserved. But the situation is different in kerala, especially agriculture sector. Kerala agriculture sector has been and remain as stagnated and deficit in food grains is the unsolved problem.

CONCLUSION

The declining trend in area, production and productivity of rice has been a cause of worry and is emphasized as threat to food security. Area under rice increased from 228938 ha in 2007-08 to 234265 ha in 2008-09 and sharply declined by 208160 ha in 2011-12. During 2011-12, the area under rice declined by 5027 ha, and during 2014-15, the area under rice declined by 1452 ha. Production since 2012-13 shows an increasing trend. The production is increased due to increased productivity. Production of rice during 2004-05 was 667105 tonnes, reduced to 528488 tonnes during 2007-08. This trend was continued till 2010-11. During 2011-12, rice production was increased unexpectedly, but then declined during 2012-13. Since 2012-13, rice production has been increased. During 2005-06, productivity of rice was 2285 Kg/Ha, increased to 2557 in 2009-10. During 2013-14, the rice productivity is 2827 Kg/Ha and in 2014-15 it is reached to 2837 Kg/Ha.

Paddy, Pulses and grains include the category of food grains. The total area under cultivation of food grains during 2014-15 is 2,02,109 Ha. The area of food grains has decreased by 4% during 2014-15 from the year 2013-14. Also comparing with 2001-02 total area under food grains has decreased by 40%. Also it can be noted that there is a decrease of 5% in the area of food grains from 2011-12 . No doubt kerala is in big trouble and it is very difficult for the state to conserve the exisisting resources to future generation in this context. The significant changes in the society put pressure on the land and gradually paved the way to change the land use pattern. The factors such as high growth rate of population, engulfing precious land for settlement, scarcity of land for ever increasing demand for food, development of industrial sector, urbanization, conversion of paddy lands for non- agricultural purposes etc. contribute for the change in land use pattern of the society. Though, in every year the society is losing a percentage of arable land due to population growth and infrastructural development. The major reason for the changing agricultural land is found to be increasing cost of cultivation, shortage of labour, high price for input etc. so there is a need to encourage proper planning of cultivation at the village level. Further for reducing shortage of inputs, develop and disseminate farmer's friendly, less costly, and appropriate small farm techniques like zero budget farming, encourage judicious use of inputs, link MGNREGS with farming activity, provide low interest loans with insurance coverage to the farmers, promote mechanization and water management technique depending on the case.

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