

The Demographic Challenge to Food Security in Kerala.

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ABSTRACT

Demographic dynamics have a far-reaching impact on the various aspects of economies across the world, especially food security. India, being the second most populous country in the world, demographic transitions bring about challenges to feed the growing population. Though development has brought in accelerated decline in mortality rates, reduction in birth rates and fertility rates have reduced the rate of growth of population in India. But the country has also experienced highest demographic heterogeneity across its different states. A different demographic experience is presented by the state of Kerala which was the first state in India to reduce fertility rates. The state presents an experience of social and human development triggering fertility reduction. Yet the state has experienced a doubling of the population between the period 1960-2020. Being a land scarce state with a high density of population [860/ sq.km as per 2011 census], Kerala faces the challenge of ensuring food security to its people. In 50 years, the land under its staple food crop paddy has declined to a quarter and cash crops like rubber and coconut have dominated the cropped area. The alarming fall in per capita availability of food grains is of serious concern to the state. The recent incidence of climate disasters like floods and landslides have only aggravated the food security issue faced by the state. Though the state has been adding to human capital, it has been witnessing a deterioration in natural capital and production base. The youth bulge in age structure and their entry into the labour force has coincided with the structural transformation of the economy- from agriculture to service. The spiralling unemployment rate actually makes a mockery of the high levels of human capital in the state. The existence of lack of self-sufficiency in food grain production is dangerous especially in the face of epidemics and natural calamities.

KEY WORDS: Food security, demographic heterogeneity, Average agricultural land holdings, Per capita food grain availability, Cropping pattern.

INTRODUCTION

Food security entails ensuring adequate food supply and basic nutrition to people. Food security has been a major concern for nations across the world. The population in India is about 1.3 billion and by 2030, it is estimated that population will increase to 1.5 billion. The challenge to produce more for the growing population is becoming increasingly hard for a country of its size and economic growth. The land in India is a shrinking resource for agriculture and the productivity of agriculture needs to be higher per unit of land

to feed the growing population. The book *An Essay on the Principle of Population* published in 1798 by T R Malthus warned the world of a future crisis - on account of the population increasing in geometric progression while food production increased in arithmetic progression, which would cause a disequilibrium. Epidemics and natural calamities are seen as positive checks on population. Anyhow the world has witnessed an explosive growth in population, but due to public health revolution, it has not doubled in 25 years in all nations as visualised by Malthus and food production in most countries have increased geometrically due to technological revolution and innovations. But developing countries of the world still suffer from food insecurity. The world's population is projected to reach 8 billion on 15 November 2022, and India is projected to surpass China as the world's most populous country in 2023¹. The demographic bulge has a negative impact on food security. Between 702 and 828 million people in the world faced hunger in 2021, India accounting for 224.3 million of the undernourished in the world, which is a quarter of the world's hunger burden [The State of Food Security and Nutrition in the World 2022-FAO]. The report stated that Indians, who were unable to afford a healthy diet touched 973.3 million in 2020 or nearly 70.5%, up from 948.6 million in 2019 (69.4%). India ranks 71st in terms of Global Food Security 2020 and the Global Hunger Index-2020 places India in the 94th position among 107 countries. It is of significance to a country like India which is home to the largest number of children with Anaemia [58.5%], under-weightedness [35.8%] and stuntedness [38.4%]. A gloomy picture unfolds- Prevalence of undernourishment in India is higher than the global and Asian average [Food and Agricultural Organisation Report 2018]. It is worth mentioning that self-sufficiency in food production is a pre requisite for food security and is challenged by demographic expansion.

At the regional and state levels the country exhibits one of the highest demographic heterogeneities experienced anywhere in the world. Demographic changes taking place across the country contradicts the most often quoted theories of demographic change and poses a greater challenge to predicting the impact of demographic changes on the economy. Although the state Kerala in the southern tip of India has attained better human development indices compared to other states and has been able to control fertility rates, the state has not been able to attain self-sufficiency in foodgrain production. The production of paddy has not increased in the arithmetic ratio as stated by Malthus, it has actually declined. The production of paddy has shown a downward trend posing a demographic challenge to food security through a drastic fall in per capita availability of paddy in the state.

Objective of the Study

The objective of the study is to examine the leading issues and challenges to food security in Kerala in the context of demographic changes and structural transformation.

Methodology

The study has employed secondary data available from various sources such as various issues of Kerala Economic Review, Department of Economics and Statistics, Labour Bureau Reports, Census Reports, FAO

Reports, MHFW, Agricultural Statistics, National Commission on Population and published journals. Simple statistical tools like Correlation, average and percentage are used in the analysis.

I. KERALA- THE DEMOGRAPHIC PROFILE

Kerala is one of the most densely populated states in India accounting for 1.18% of the land area, but approximately 2.76% of the population of the country. During the 1950s, the population growth rate in Kerala was one of the highest in India. However, by the 1970s, it began to fall significantly and subsequently became the lowest among the Indian states. Decline in fertility in India was witnessed first in the state of Kerala located in the southwest part of the country—as early as in the 1960s. The rate of population fell During the fertility transition, Kerala had relatively high levels of poverty, undernourishment, and low per-capita income compared with the national average. However, it had higher social development indicators, in particular high rates of female literacy. The Kerala experience shows that social development in itself can trigger fertility transition. But even for Kerala which scores high in Human Development Index, there has been a doubling of the population over a period of 60 years 1960-2020. Density of population has increased simultaneously in the land –scarce state. As a direct consequence of population growth, population density in Kerala is estimated to take a staggering level of 1,101 persons per sq km in 2026² Though increased population symbolises human resource potential, food security is in danger because of reduced production of food grains. All the achievements in the social and human development indicators have not helped to attain self-sufficiency in food. Whereas population doubled over this period, production of its staple food crop paddy has been reduced to half in spite of the commendable increase in productivity. This has been primarily due to decline in land under paddy cultivation.

TABLE-1 DENSITY OF POPULATION IN KERALA 1971-2020

YEAR	POPULATION	DENSITY OF POPULATION/SQ. KM
1970-71	21347000	549
1980-81	25454000	655
1990-91	29099000	749
2000-01	31844000	819
2010-11	33406061	860
<2011-12*	33641000*2	866
2012-13	33875000	872
2013-14	34109000	878
2014-15	34344000	884
2015-16	34578000	890
2016-17	34761000	894
2017-18	34943000	899
2018-19	35125000	904
2019-20	35307000	908

Source-, Census Reports, DES, Ministry of agriculture and Farmers welfare, Govt. of India*1 Authors estimation from data on land area and population*2 Report on Population Projection-National Commission On Population-MHFW-NOV 2019.p49

The decadal growth rate of Kerala's population being 4.9% [KER-2017] is the lowest in India³. Ranked high in social and human development indices, Kerala has been a pioneer in controlling fertility rates. But a land scarce state, density of population has continuously increased from 165/ sq. km in 1905 to 860 in 2011. The past century [1900-2000] has witnessed a five-fold increase in population. The increase has led to a fragmentation of landholdings and size of land holdings have decreased in Kerala. Average size of land holdings in Kerala in 1970-71 was 1.2 acres [.4856 hectares] which decreased to 0.18 hectares in 2018⁴[10th agricultural census-]. Kerala is the state with one of the lowest per capita agricultural land holdings in India.

The surging demand for land for non-agricultural activities have led to the conversion of land under cultivation. Reduced economic viability, labour shortages and population pressure on land are the major drivers for the transformation of paddy fields to other land uses⁵. Increase in the commercial, industrial and infrastructural needs of the state have increased due to rising population.

II. PERCAPITA FOOD GRAIN AVAILABILITY IN KERALA

Cereals and pulses are included in food grains. The production of pulses in Kerala is meagre and is only about 2103 tons in 2019-20. Tapioca though a major food crop in Kerala, is not included in the category of food grains by the Govt. of India. Rice is the major constituent accounting for almost 100% of the food grains produced in Kerala. International Rice Research Institute classifies rice as the most important human food and the staple food of billions of people. Rice is a source of carbohydrates, proteins and vitamins and supply major chunk of the calories required for daily life. The per capita food grain availability has declined over the years in Kerala. Though there is a doubling of the yield or productivity from 1971-2020, production has been reduced to less than half and over the period 1960-2020 population of Kerala has doubled.

TABLE-2 PER CAPITA AVAILABILITY OF RICE IN KERALA.

YEAR	PRODUCTION IN TONS	POPULATION	PERCAPITA AVAILABILITY OF PADDY (kg)*
1970-71	1292000	21347000	61
1980-81	1272000	25454000	49.9
1990-91	1087000	29099000	37.3
2000-01	751000	31844000	23.58
2010-11	522730	33406061	15.64
<2011-12*	568993	33641000*2	16.9
2012-13	508299	33875000	15
2013-14	564325	34109000	16.5
2014-15	562092	34344000	16.36
2015-16	549275	34578000	15.88
2016-17	436483	34761000	12.55
2017-18	521310	34943000	14.91
2018-19	578256	35125000	16.46
2019-20	587078	35307000	16.62

Source-1- pocket book of Agricultural Statistics 2018, Directorate of Economics and Statistics-2-Ministry of agriculture and Farmers Welfare, Govt. of India-3- Agricultural Statistics at a glance 2017, DES, Ministry of agriculture and Farmers welfare, Govt. of India* Authors estimation from data on production and population*2 Report on Population Projection-National Commission On Population-MHFW-NOV 2019.p49

Data reveals that production has declined from 1292000tons in 1970-71 to 587078 tons in 2019-20, showing a 54.6% decrease. Population during this period increased from 21347000 to 35307000(65.4%increase). The impact is a severe and chronic declining per capita availability of rice from 60.5kg (166g per day) in 1971 to 16.62kg (45.5g per day) in 2019-20. Per day availability has been drastically reduced to 27 % of the availability in 1970-71. It indicates the increasing dependence of the state on external sources for rice. At the national level per capita availability of rice shows only a marginal decline of 1.8% [192.6 gm/day to 189 gm/ day] and the total food grain availability per day in India has increased from 468.8g in 1971 to 493g in 2019. Availability of other foodgrains like wheat, bajra , maize and pulses enrich the food basket of other states in India, where as for Kerala such crops are absent.

CORRELATION –

1. An increase in population necessitates an increase in foodgrain production. But the correlation between production and population in Kerala shows high negative correlation which means that an increase in population is consistent with a decrease in production of paddy. This points towards the demographic danger to food security.

$$1. \text{Corr (Production in Tons, Population)} = -0.95119443$$

Under the null hypothesis of no correlation:

$$t(12) = -10.6776, \text{ with two-tailed p-value } 0.0000$$

2. Similarly the correlation between population and percapita availability of paddy in Kerala also shows high negative correlation indicating a fall in percapita availability of paddy as population rises.

$$2. \text{corr (Population, Percapita Availability of paddy)} = -0.98774185$$

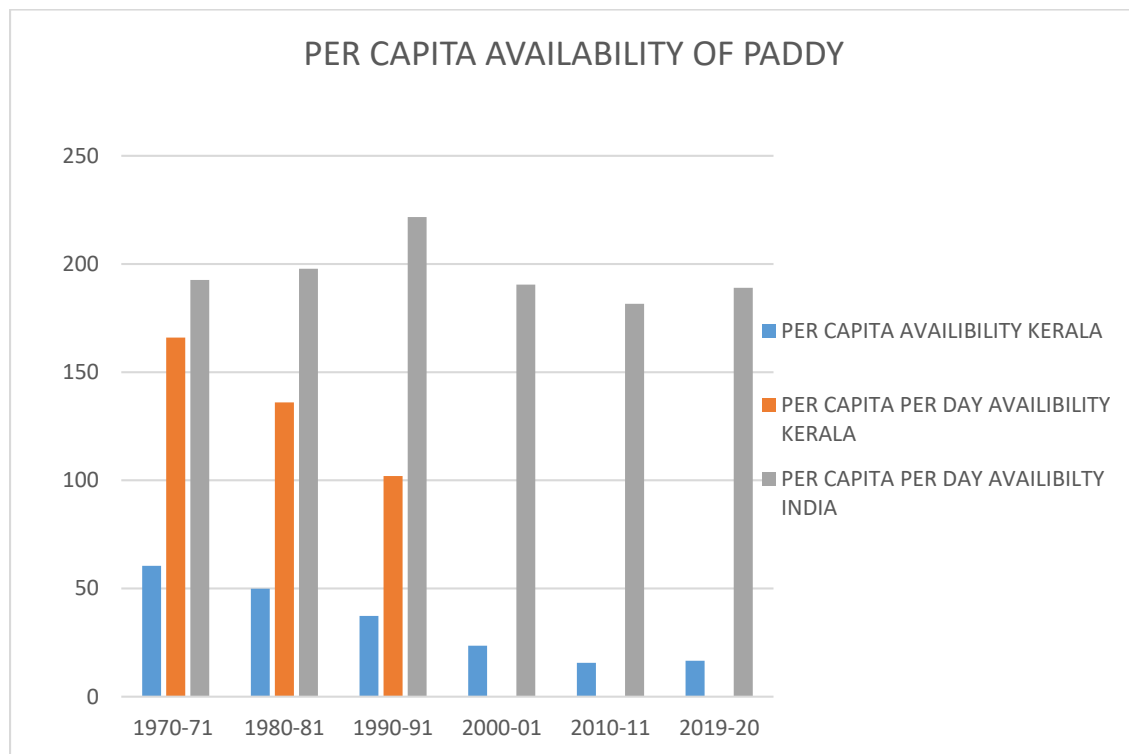
Under the null hypothesis of no correlation:

$$t(12) = -21.9201, \text{ with two-tailed p-value } 0.0000$$

TABLE-3 PERCAPITA PER DAY AVAILABILITY OF PADDY IN KERALA AND INDIA

YEAR	PER CAPITA AVAILABILITY OF PADDY IN KERALA/ PER YEAR (in kg)	PER CAPITA PER DAY AVAILABILITY OF PADDY IN KERALA (in grams)	PER CAPITA PER DAY AVAILABILITY OF PADDY IN INDIA (in grams)	PER CAPITA AVAILABILITY OF FOOD GRAINS IN INDIA
1970-71	60.5	166	192.6	468.8
1980-81	49.9	136	197.8	454.8
1990-91	37.3	102	221.7	510.1
2000-01	23.58	64.6	190.5	416.2
2010-11	15.64	42.8	181.6	468.2
2019-20	16.62	45.5	189	493

Source-1- pocket book of Agricultural Statistics 2018, Directorate of Economics and Statistics 2- Agricultural Statistics at a glance 2017, DES, Ministry of agriculture and Farmers welfare, Govt. of India 3. Per capita availability in Kerala is estimation based on author's calculation based on data

FIGURE.I

The total requirement of rice in the state was 24.96 lakh tons in 1971 and 47% of the demand was met from home production. In 2010-11 the total demand for rice being 39.03 lakh tons, only 14% of the demand was met from production in the state, 60% of the demand was met by purchase from other states and 26% through the PDS supply [KER]. The per capita food grain production of Kerala continuously declined and reached mere 15 kg in 2010-11⁶.

III. RICE INFLATION IN KERALA

The dwindling production of paddy is due to a multitude of factors like the conversion of land for non-agricultural uses, commercialisation of agriculture and the low profitability in the cultivation of paddy. Food grain inflation is a different experience in different states because states that are not major foodgrain producers have higher inflation as transport costs are also added up. The supply demand dynamics have raised the price of rice in the state. The following table illustrates the price of rice in the state in a 10-year interval from 1971-2011 and also the price movements in the recent past from 2012-2020. Though many varieties of rice are available, the red matta rice, which is popular in Kerala is considered for the study.

TABLE-4

PRICE OF RED MATTA RICE IN KERALA-1971-2020

YEAR	PRICE OF RED MATTA RICE / kg
1971	1.55
1981	3.08
1991	6.99
2001	13.34
2011	27.43
<2012	24.16
2013	36.59
2014	32.097
2015	33.23
2016	34.31
2017	37.82
2018	41.80
2019	37.30
2020	41.01

Source- Price Bulletin, Prices Division, Department of Economics and Statistics, Govt. of Kerala.⁷ A Hand book of Statistics-1977, GOK.

The price of rice in Kerala shows a highly increasing trend. The magnitude of fluctuation was higher (1670%) in the 40-year period from 1971-2011. In the recent period, from 2011-2020 there was an increase of 495%. The fluctuations indicate that several factors influence the supply and availability of rice in the state which influence the price. The increase in price from 1971-2011 shows a very steep increase ie; the price has almost doubled in every 10 -year period. But, from 2012 to 2020, the increase has been rather controlled or subdued. The period from 1971 to 2020 shows an overall increase of 2546% [1.55 to 41.01].

IV. MINIMUM SUPPORT PRICES-A COMPARISON

State interventions in the foodgrain markets have been in existence in India for a long time. The public distribution system (PDS) in India has close links with food security for the vulnerable segments of the population, budgetary support for food subsidy and the price policy⁸.

TABLE-5 Minimum support prices for paddy announced by the Government of India and Government of Kerala, 2004-05 to 2021-22 in rupees per quintal

YEAR	MSP-CENTRAL	MSP-KERALA
2004-05	560	700
2005-06	570	707
2006-07	620	850
2007-08-[I]	645 + 100 (bonus)	850
2007-08-[II]	645+100	900

2008-09-[I]	850 + 50 (bonus)	1000
2008-09-[II]	850+50	1100
2009-10-[I]	950+50	1100
2009-10[II]	950+50	1200
2010-11-[I]	1000	1200
2010-11-[II]	1000	1300
2011-12-[I]	1080	1400
2011-12-[II]	1080	1500
2012-13-[I]	1250	1500
2012-13-[II]	1250	1700
2013-14-[I]	1310	1800
2013-14-[II]	1310	1900
2014-15-[I]	1360	1900
2014-15-[II]	1360	1900
2015-16	1410	2150
2016-17	1470	2250
2017-18	1550	2330
2018-19	1750	2530
2019-20	1815	2695
2020-21	1868	2748
2021-22	1940	2800

Source; *Note:* In 2007-08 and 2010-11, Kerala State Government raised MSP more than once during the course of the year.

Source: Information provided by Kerala State Civil Supplies Corporation ltd., Kochi and Supplyco, GoK.

It is worthwhile to compare the MSP of the state with that of centre since the MSP policy has an impact on production and price of paddy. The MSP or procurement price for paddy was Rs 65/quintal in 1970-71⁹[A Hand book of Statistics-1977, p.38]. This has increased to Rs 2800/quintal in 2020-21, marking a huge increase over the 50-year period. Generally the MSP in Kerala has been much above the one announced by the Centre in all the years. But the gap between the Minimum Support Prices of Central govt and the one announced by the state has been increasing over the years. In 2004, the difference was only Rs 140 which increased to Rs.860 in 2021-22. Though the policy of a higher MSP in the state was intended to arrest the fall in area under paddy cultivation, the increase in support price in Kerala has also been instrumental in increasing price of rice over the period.

V. WAGES OF AGRICULTURAL LABOUR IN KERALA-

It is worthwhile to study the increase in labour cost of paddy cultivation over the same period since paddy is highly labour intensive in nature and increase in wages have larger impact on cost of production of paddy.

TABLE-5**AVERAGE DAILY WAGE RATES FOR MALE AGRICULTURAL LABOURERS IN KERALA**

YEAR	AVERAGE DAILY WAGES OF MALE AGRICULTURAL LABOUR
2010-11	305.96
2011-12	363.71
2012-13	433.05
2013-14	486.20
2014-15	536
2015-16	576.47
2016-17	582
2017-18	613
2018-19	673
2019-20	700.7

SOURCE: DEPT.OF ECONOMICS AND STATISTICS, GOVT. OF INDIA

Of the total cost of production, human labour accounts for a significant portion, more than 60% for labour intensive crops like paddy. Agricultural statistics reports from Kerala Directorate of Economics and Statistics state that in Kerala there exists high hired labour to family labour ratio of paddy farming per hectare compared to the national average which further raises the cost of production of paddy.

The male agricultural wage in 1977 in Kerala was Rs 8.67[DES, GoK]. Whereas the price of paddy records a growth of 2546% [1.55 to 40.01], agricultural labour cost has recorded a growth of 7982% [8.67 to 700.7]. While there is a 26-fold increase in the price of rice, there is a 80-fold rise in agricultural wages. It means that increase in labour cost is more than three times the increase in prices and this makes the cultivation of paddy unprofitable. Moreover, the number of agricultural households in Kerala per 1000 rural labour households is 189 compared to 223 in India [GoI 2010], putting further pressure on farm wages.

TABLE-6 WAGE RATES IN DIFFERENT STATES

STATES	AVGE DAILY WAGE RATES FOR RURAL MALE AGRI.LABOUR[DEC.2018-LABOUR BUREAU
TAMIL NADU	557.38
ASSAM	283.89
BIHAR	293.79
KERALA	767.50
ODISHA	239.29
WEST BENGAL	329.48
MP	222.01
UP	247.03
INDIA	320.85

Source: Labour Bureau, Govt. of India-2018

The Labour Bureau Reports reveal the disparity in wage levels in different states in India. In the data provided by both Dept. of Economics and Statistics and labour Bureau, Kerala has the highest wage level for casual agricultural labour and is a major contributing factor for increase in the cost of cultivation of paddy.

VI. PRODUCTIVITY OF PADDY IN KERALA

The increase in wages is also complemented by the increased productivity as seen in the case of paddy in Kerala. The demographic challenge to food security posed by increase in population can only be solved through expanding productivity. But the positive impact of increased productivity was neutralised by the fall in area under paddy.

TABLE-7 PRODUCTIVITY OF PADDY IN KERALA [1970-2020]

YEAR	PRODUCTIVITY OF PADDY[Kg/hectare]
1970-71	1483
1980-81	1587
1990-91	1942
2000-01	2162
2010-11	2452
2011-12	2733
2012-13	2577

2013-14	2827
2014-15	2919
2015-16	2877
2016-17	2627
2017-18	2757
2018-19	2920
2019-20	3073

Source- Kerala Economic Reviews [Various issues]

Over the period, the productivity of paddy more than doubled from 1483kg/ha to 3073kg/ha. The decline in area and production of paddy is a challenge to Kerala, but the state enjoys the positive impact of increased productivity. The increased productivity is one of the factors complementing high wages.

TABLE-8 WAGE, PRICE AND PRODUCTIVITY IN KERALA [2010-2020]

YEAR	AVERAGE DAILY WAGES MALE AGRICULTURAL LABOUR	PRICE OF RED MATTA RICE/KG	PRODUCTIVITY OF PADDY[KG/HECTARE
2010-11	305.96	27.43	2452
2011-12	363.71	24.16	2733
2012-13	433.05	36.59	2577
2013-14	486.20	32.097	2827
2014-15	536	33.23	2919
2015-16	576.47	34.31	2877
2016-17	582	37.82	2627
2017-18	613	41.80	2757
2018-19	673	37.30	2920
2019-20	700.7	41.01	3073

Source; **Department of Economics and Statistics, GoK-2019-20.**

Price Bulletin, Prices Division, DES, GoK &KERALA ECONOMIC REVIEWS

$$\text{Corr}(\text{Wage, Price}) = 0.83966799$$

Under the null hypothesis of no correlation:

$$t(8) = 4.37293, \text{ with two-tailed p-value } 0.0024.$$

$\text{Corr}(\text{Wage, Productivity}) = 0.75943037$

Under the null hypothesis of no correlation:

$t(8) = 3.30162$, with two-tailed p-value 0.0108.

The Correlation between wage and price is high proving the wage price spiral effect though the impact on wages is higher. But the correlation between wages and productivity is also high.

VII.FALL IN AREA UNDER PADDY CULTIVATION

The greatest blow to production of paddy was fall in area under cultivation. The impact on production of paddy is apparent from the tables below.

TABLE-9 AREA, PRODUCTION AND PRODUCTIVITY OF PADDY IN KERALA [1970-71 to 1980]

YEAR	AREA HECTARES 000'	PRODUCTION 000' TONNES	PRODUCTIVITY, KG/HECTARE
1970-71	874.93	1292.01	1483
1971-72	875.16	1351.74	1544
1972-73	873.70	1376.37	1575
1973-74	874.68	1257.67	1437
1974-75	881.47	1333.03	1513
1975-76	876.02	1331.19	1520
1976-77	854.37	1254.00	1468
1977-78	840.31	1294.64	1541
1978-79	779.24	1272.74	1592
1979-80	793.27	1299.70	1638

Source: Kerala Economic Review

TABLE-10 AREA, PRODUCTION AND PRODUCTIVITY OF PADDY IN KERALA[1980-81-1989-90]

PERIOD	AREA,000' HECTARES	PRODUCTION 000 ' TONNES	PRODUCTIVITY[KG/HECTARE]
1980-81	801.70	1272.00	1587
1981-82	806.92	1339.87	1660
1982-83	797.89	1308.01	1639
1983-84	740.09	1207.92	1632
1984-85	730.38	1255.94	1720
1985-86	678.28	1173.05	1729
1986-87	663.28	1133.79	1708

1987-88	604.08	1032.58	1709
1988-89	577.00	1013.00	1754
1989-90	583.39	1141.23	1956

Source: Kerala Economic Review

TABLE-11 AREA, PRODUCTION AND PRODUCTIVITY OF PADDY IN KERALA [1990-91-1999-2000]

PERIOD	AREA,000' HECTARES	PRODUCTION 000 ' TONNES	PRODUCTIVITY[KG/HECTARE]
1990-91	559.45	1086.58	1942
1991-92	541.33	1060.35	1959
1992-93	537.00	1085.00	2018
1993-94	507.00	1004.00	1977
1994-95	503.00	975	1937
1995-96	471.00	953	2023
1996-97	431.00	871	2023
1997-98	387.00	765	1975
1998-99	353.00	727	2061
1999-2000	350.00	771.00	2203

Source: Kerala Economic Review

TABLE-12 AREA, PRODUCTION AND PRODUCTIVITY OF PADDY IN KERALA [2000-01to 2009-10]

PERIOD	AREA,000' HECTARES	PRODUCTION 000 ' TONNES	PRODUCTIVITY[KG/HECTARE]
2000-01	347.00	751.00	2162
2001-02	322.00	704.00	2182
2002-03	311.00	689.00	2218
2003-04	287.00	570.00	1984
2004-05	290.00	667.00	2301
2005-06	276.00	630.00	2285
2006-07	264.00	642.00	2435
2007-08	229.00	528.00	2308
2008-09	234.00	590.00	2520
2009-10	213.19	598.00	2557

Source: Kerala Economic Review

TABLE-13 AREA, PRODUCTION AND PRODUCTIVITY OF PADDY IN KERALA [2010-11-2019-20]

YEAR	AREA , 000ha	PRODUCTION, 000 MT	PRODUCTIVITY (kg/ha)
2010-2011	213.19	522.73	2452
2011-12	208.16	568.99	2733
2012-13	197.28	508.29	2577
2013-14	199.61	564.32	2827
2014-15	192.58	562.09	2919
2015-16	190.94	549.28	2877
2016-17	166.18	436.48	2627
2017-18	189.006	521.31	2757
2018-19	198.026	578.26	2920
2019-20	199.05	587.07	3073

SOURCE- KERALA ECONOMIC REVIEWS

The area under paddy in Kerala was 8.75lakh hectare in 1970-71. It reduced to 1.98lakh hectare in 2019-20. During the period, production of paddy decreased from 12.92lakh tons to 5.87 lakh tons (In 1972-73 there was even a peak production of 13.76lakh tons). Over the period, the productivity of paddy more than doubled from 1483kg/ha to 3073kg/ha. But the positive impact of increased productivity was neutralised by the fall in area under paddy. This fall in area under paddy is the most important factor hampering food security.

REASONS FOR THE FALL IN PERCAPITA DOMESTIC AVAILABILITY OF PADDY -

Though there is indication of a slow shift in preferences of Keralites from rice to wheat [Report of NSSO- 55TH, 61ST AND 66TH Rounds of survey], there is still demand for approximately 4 million tonnes of paddy. This demand has been met by importing from the other states and also on the PDS share from the central govt- the state only contributing to approximately 15% of the total demand¹⁰.

1.CHANGES IN LAND USE PATTERN

Conversion of agricultural lands for non-agricultural purposes and conversion of food crops area to cash crops area or commercialization of agriculture were the major factors responsible for the falling production of paddy. During the period 1971-2020, area under the cultivation of cash crops like rubber increased from 133000ha to 551200ha (314%) whereas land under paddy cultivation decreased from 7, 79,000 ha to 198,180ha (74.5%). During the same period, production of paddy decreased from 12.92lakh tons to 5.87lakh tons [KER]. During the period 1970-71 to 2016-17, land put to non-agricultural use increased from 275000 hectares in 1970-71 to 441934 hectares in 2016-17. The percentage change during the period is 86.72[KER]. A state with a high density of population [860/sq.km as compared to 382 in 2011] there has been an increased demand for land for non -agricultural purposes. In addition to the infra structural and residential needs for land, conversion of land for real estate business prevails in Kerala. A land-scarce state, there has been a

decrease in the gross cropped area of the state and about 6-7 lakh hectares of paddy have been lost from 1971 to 2020¹¹. Studies have pointed out that paddy lands are the kidneys of nature and one hectare of paddy land has the capacity to store 5 lakh litres of water and their environmental value as bio-reserves can never be ignored.

There are a multitude of reasons for the fall in per capita availability. Competition from the other crops and commercialisation, biotic stress due to disease, rodents and weeds, high cost of inputs etc also pose challenges. Labour problems, procurement problems, unscientific storage facilities and lower profitability are some of the other reasons.

2.RISING BUT INSUFFICIENT PRODUCTIVITY

The present yield of 3073/hectare in Kerala is above the national average of 2600kg/hectare but below the yield achieved by states like Punjab [4366 kg/hectare]. The gaps between the potential and the national average yields is high for India at 55.9%¹². The FAO data shows productivity in countries like China [6710 kg/hectare] and Indonesia [5152/hectare] to be much higher which points towards an unexplored potential in the state. With a higher population density, increasing productivity seems to be the way forward. The improvement in productivity achieved by the state over the years was, however, neutralized by the high decline in area under paddy.

3. FRAGMENTED LANDHOLDINGS

Pressure on land and reduced size of land holdings have made paddy cultivation unviable. Size of land holdings have decreased in Kerala in the study period as indicated by 10th agricultural census-Kerala has one of the lowest agricultural land holdings in the country. The average size of operational holdings in Kerala in 1970-71 was 0.57 hectares and it became 0.18 hectare in 2015-16. Marginal and small cultivators constitute 98% of the total cultivators in Kerala. One of the reasons for the poor performance of the agriculture sector is small holding size of farm land. Subdivision and fragmentation of landholdings due to pressure of population have led to small plots which makes cultivation uneconomic. Farmers face the problem of lack of accessibility to mechanisation.

4.LABOUR SHORTAGE AND RISING LABOUR COST

, The percentage of cultivators in Kerala declined from 17.80% in 1971 to 5.77% in 2011 and the percentage of agricultural laborers in Kerala declined from 30.70% in 1971 to 11% in 2011. At the same time the percentage of non-agricultural workers in Kerala remarkably increased after 1971. The share of other workers- workers in secondary and tertiary sectors- increased from 47.2% in 1971 to 80.5% in 2011¹³. Majority of the workers in Kerala are mostly working in tertiary sector and the construction sub-sector of the secondary sector. Kerala pays the highest wages for casual labour which makes cultivation costly and since paddy is more labour intensive the cost impact is much larger. Labour cost (wage cost) constitutes-about 60 percent of the total cost of paddy cultivation¹⁴ (Kannan, 1998: 63). Studies prove that between 1993-94 and 2004-05, persons engaged in agriculture and allied activities in the State declined by 8,79,000, even as the

total number of workers increased by 16,05,000¹⁵. High labour costs, increasing charges of agricultural inputs and hiring charges for harvesters lead to rising costs of cultivation. The Preference for white collar jobs by the elite population has led to shortage of agricultural labour.

5.DEPLETION OF NUTRITIVE VALUE

About 7000 of the 2, 50,000 globally identified plant species have historically been used in the human diets. Today, the basis of world's agriculture is 30 crops and just 3 species of rice, wheat and maize supply the world's dietary calories¹⁶. Modern varieties of seeds are cultivated. But research shows that traditional rice cultivation has lower costs of cultivation than modern varieties and also are less susceptible to pests and diseases. These also have climate resilience and have more medicinal and nutritive values. Studies from ICAR report that rice does not have the same density of essential nutrients as those cultivated 50 years ago. Depleting trends in grain density of zinc and iron in rice have been scientifically proved¹⁷. It is dangerous for future nutritional security of the state. Sustainable cultivation of traditional varieties need to be encouraged.

6. INCREASING INCIDENCE OF CLIMATE DISASTERS.

Kerala is a land of geographical diversity having places like Munnar which is 1532 meters above the sea level and areas like Kuttanad which is 9 feet below the sea level, which is also the region with the lowest altitude in India. Kerala is prone to both flood and landslides. According to GSI, out of 39000 sq.km area of Kerala, hill area having slopes higher than 10 degree constitute about 19000 sq.km. The Rebuild Kerala blue print identified 50 taluks across the state covering an area of 5619 sq.km with a population of around 28 lakhs at the risks of landslips. According to GSI data, Kerala had experienced 67 major landslide events and many minor ones from 1961 – 2013. According to KSDMA, landslides claimed 177 lives in Kerala in 2018 and 2019. KSDMA has recorded 1362 landslides in 2018 and 700 in 2019. Idukki topped the chart with a total of 1048 landslides in this period. The state presents a history of climate change, destruction of natural vegetation and reckless construction-ecological devastation by human intervention. Constructions whether roads, residences or resorts do not respect the slopes.

Extreme rainfall and climatic events have become common in recent years. The flood in 2018 destroyed 57000 hectares of agricultural crops and killed around 500 people. Such adverse incidents make agriculture a gamble and discourage people to engage in cultivation. In spite of continuous efforts to increase land under paddy cultivation, there is a marginal decrease in land area under paddy after 2018. Kuttanad -referred to as the Rice Bowl of Kerala is continuously tormented by flood events in the recent past, reducing area under paddy.

7.HIGH PRICE FOR LAND IN KERALA-

Being a state with a high density of population there has been an intensified demand for land for non - agricultural purposes. In addition to the infra structural and residential needs for land, conversion of land for real estate business is rampant. A land-scarce state, the price of land is higher compared to other states and increasing demand is fuelled and accelerated by foreign remittances entering the economy. Approximately

9-10% of the population in the state are employed abroad in other nations and Kerala leads in migrants and remittances in India. Accounting for approximately 25% of the migrant population in India, the share of remittances in NSDP of the state has increased from 8.9% in 1981 to approximately 36% in 2017. These high remittances have contributed to the construction boom in the state and conversions have been rampant.

8.NO STRICT AND PROPER REGULATION OF CONSTRUCTION ACTIVITIES.

Regulations against improper construction are not strictly adhered to in Kerala. From 1971-2020, approximately 7 lakh hectares of paddy land have been converted and only 30% of these have been retained in the cultivation of other crops. The Kerala Conservation of Paddy Land and Wetland Act-2008 was enacted to conserve ecologically sensitive paddy fields and wetlands. But in 2018 the Bill was amended adding provisions for easier reclamation and conversion of paddy lands. Changes in such land use pattern have created ecological and environmental problems and added to the food insecurity.

CONCLUSION

The challenge to food security arises because of a multitude of factors. The decrease in area under cultivation of paddy is the major reason which is accelerated by the high labour cost of cultivation, increase in non-agricultural usage of land for constructions and real estate business and other purposes due to the increased density of population. The danger to food security also occurs due to falling production, rising price of rice over the years and nutritional insecurity due to the absence of other foodgrains in Kerala as compared to other states in India. The increasing productivity of paddy is commendable but not sufficient and not at par with the best productivity performance in India by states like Punjab.

Another important reason is the increasing incidence of climate disasters in India. Geographical features in Kerala are undergoing rapid alterations and the conversion of paddy lands is a cause for urgent concern. Very Soon, with the disappearance of lush green fields, its geography may become history. There are commendable initiatives by the government to expand the production of paddy. The multi-pronged strategy, has been successful in arresting the decline in land under paddy cultivation in the past decade compared to the earlier periods.

But to accelerate the revival of paddy cultivation, there should be the implementation of technology and mechanisation suited to local needs and soil conditions. Bio technological research can be navigated for the development of HYV seeds with a higher resilience. The problem of low production and profitability can be solved by combining paddy cultivation with allied activities of fish culture, tourism and live-stock rearing. FAO and UN Water Development Reports state that production of 1 Kg of foodgrain requires 1500 litres of water¹⁸. Paddy being highly water intensive, water management and flood management should also be a priority. To address ecological devastation and food insecurity, there is need for reorienting priorities. Kerala needs a paradigm shift in the management of its land resources. The development policies pursued by alternate governments have eroded the state's natural capital and has increased the dependence of the state on other states for food grains. The state faces a paradoxical situation of high social and human development but low productivity in both agricultural and industrial sectors. It should be corrected through innovative

programmes at the grass root level. If not, God's own country will lose its lush green fields which is its identity and tradition.

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