Dynamics of Crop Shift and Land Use Change at Farm Household Level in Kerala

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***Abstract*—This paper analyses the dynamics of crop shift and land use change in Kerala. Over the years land use under agriculture has undergone significant changes through a crop shift and then to non-agricultural uses. Since crop shift is one of the determining factors for land use change, this paper examines first the nature of crop shift. Then it proceeds to find out the determinants of crop shift and its impact. The study makes use of both primary and secondary data. For primary data, a census study of the village was done to understand and verify the nature of crop shift at the macro level which has been done first to understand the nature of crop shift. Using simple statistical tools like percentages and averages and the regression analysis. Using the secondary data, the study finds that there has been a significant change in the nature of crop cultivated from the food crops to the perennial commercial crops. The commercial crops whose increase took place at the expense of food crops were coconut, rubber, pepper, ginger, banana and other plantain. The same result was confirmed at the farm household level too. The regression analysis proved that the major determinants of crop shift are high income as the farmers are motivated for getting more income, then perennial nature of the crops and lack of availability of labour were the significant factors that determined crop shift. The study found that consumption expenditure on food items has increased and employment has decreased in the post land reform phase as well in the economic reform phase.**

I. Introduction

The cropping pattern shift has been occurring in India at a faster pace especially since the 1990s. It is shifting from traditionally grown less remunerative crops to crops to more remunerative crops. It has been viewed as a commercialisation in agriculture. At the national level such crop shifts are supported on grounds of employment generation and poverty alleviation through export promotion (Joshi, 2010). However such cropping pattern shift has led to serious environmental consequences such as ground water depletion, soil fertility loss and water logging and salinity and these can reduce the productive capacity and growth potential of agriculture in the long run (Kalaiselvi, 2012). This is a major problem as far as Kerala is concerned where the crop shift is occurring at a faster pace from food crops to perennial crops such as rubber converting the natural wetland agriculture. The study on crop shift assumes importance in Kerala because such shifts will have adverse ecological and employment consequences besides affecting the food security of the state. The major concern here is that it has become a food base insecure state. The paddy land which has been converted for non-food crops initially has been increasingly used for non-agricultural purposes. Moreover as farmers depended mostly on changes in the price in the choice of the cultivation of crops led those to distress as prices often fluctuate for these commercial crops. The agricultural growth also

has been affected due to such crop shifts in Kerala. It is in this context that we analyze the dynamics of crop shifts and how it affects the people in general and farmers' consumption and employment in particular. Hence the present study focuses on the following objectives

1. To examine the nature of crop-shift
2. To find out the determinants of crop shift
3. To analyse the impact of crop shift

This paper has been arranged into eight sections. Section 2 explains the data and methodology. In section 3 examines the cropping pattern shift in Kerala based on the secondary data. Section 4 attempts a household wise analysis of crop-shift based on the primary survey of Manimooly village and presents the present cropping pattern of the village. The nature of crop shift in both the post land reform phase and economic reform phase is analysed in section 5. In section 6 the reasons for crop shift are based on farmers 'perspective and a regression analysis of the same is done to find out the most important determinant of crop shift. Section 7 discusses the impact of crop shift on farmers' consumption and employment. Finally section 8 concludes the entire analysis along with policy implications.

II. Data and Methodology

This study makes use of both primary and secondary data to arrive at the findings. The secondary data is obtained from the Department of Economics and Statistics, Government of Kerala. After the analysis of the secondary data on crop shift using the percentage share analysis, the study attempted to address the nature of crop shift from a village perspective.

The data analysis at the village level is based on 60 households out of 360 households who reported shifting the area under one crop to another. This study takes the census account of Manimooly village in Malappuram district. The interview with the early settlers who are farmers communicated that the entire village has experienced the crop shift from rice and tapioca to perennial crops such as coconut, arecanut, and rubber. The early settlers in the area were able to respond to the questions whereas the new settlers who arrived after the crop shift, the questions were not applicable for them. Among those households who have changed the area under crops, some of them changed their cropping pattern more than once. Hence there are 105 observations. The highest frequency of shift reported is four. The variables used, the measurement technique and the methodology used are explained in Table 2.1.

Table 2.1 Measurement and Data Source of Variables

Variables	How measured	Source	Methodology
Crops changed, year of change, area under the crop, new crops cultivated, year of cultivating new crops, area under new crops, reasons for cultivating new crops, reasons for not cultivating the old crops	A particular section in the questionnaire was devoted to examine the cropping pattern shift and the questions were probed to get details of these variables. There were no difficulty in capturing these information as the nature of shift is from food to perennial crops	A census study was conducted in Manimooly village, in Vazhikkadavu Panchayat in Malappuram District for the period 2013 July to 2014 June.	Simple averages, percentage share, pie diagram and flow chart and regression analysis are used for the study.

Source: Village Survey 2013-14

III. Cropping Pattern in Kerala

1. Cropping Pattern in Kerala

In Kerala, the trend of crop diversification in favour of non-food crops started from the mid-seventies onwards. Kerala's diverse bio-physical resource base and agro-climatic endowments provide multiple opportunities for raising a variety of crops unlike the other regions in India. Cropping pattern in Kerala during the earlier period was mainly guided by agronomic considerations and consumption needs of farmers (Mahesh, 1999). But the trend now is determined by the market forces resulting in a shift in area from seasonal/annual crops to high-value-yielding perennial cash crops having a long gestation period (Mahesh, 1999). This diversification has caused a change in land use in Kerala. The wetland which had been used for the cultivation of rice has been subsequently converted for the growth of these export oriented high value crops. The change in the cropping pattern is depicted in Table 3.1.

Table 3.1 Ranking of crops based on changes in percentage share of Total Cropped Area

Phases	The Land Reform		The Post land Reform		The Economic Reform		
	Phase(1960-1975)		Phase (1976-1992)		Phase (1993-2015)		
Crops	TE1964	TE1975	TE1980	TE1992	TE1998	TE2010	TE 2015
Rice	32.5 (1)	29.2	27.7	18.4 (2)	13.1	8.5 (3)	7.49 (3)
Pulses	1.7 (8)	1.3	1.2	0.76 (12)	0.5	0.15 (15)	0.14
Sugarcane	0.63 (13)	0.6	0.74	0.54 (14)	0.44	0.26 (13)	0.15

Pepper	4.0 (5)	3.8	3.7	5.8 (4)	6.1	6.4 (4)	3.27 (5)
Ginger	0.48 (16)	0.39	0.45	0.47 (15)	0.41	0.25 (14)	0.19
Cardamom	1.16 (11)	1.6	1.9	1.7 (9)	1.38	1.5 (11)	1.51
Arecanut	2.3 (7)	2.8	2.1	2.1 (8)	2.5	3.7 (5)	3.77 (4)
Banana	0.4 (17)	0.3	0.47	0.75 (13)	1	2.1 (8)	2.28 (8)
Other Plantain	1.35 (10)	1.3	1.28	1.43 (10)	1.68	1.85 (9)	2.20 (9)
Cashewnut	3.4 (6)	3.5	4.8	3.7 (6)	3.1	1.8 (10)	1.64
Tapioca	8.6 (3)	0.5	8.8	4.6 (5)	3.9	2.8 (7)	2.64 (7)
Groundnut	0.6 (14)	0.68	0.42	0.47 (16)	0.42	0.06 (16)	0.02
Sesamum	0.49 (15)	0.45	0.58	0.29 (18)	0.14	0.02 (18)	0.01
Coconut	22.2 (2)	24.3	22.9	28.7 (1)	29.9	29.5 (1)	30.1 (1)
Cotton	0.33 (18)	0.25	0.2	0.38 (17)	0.42	0.03 (17)	0.00
Tea	1.5 (9)	1.2	1.2	1.1 (11)	1.16	1.3 (12)	1.15
Coffee	0.82 (12)	1.3	1.9	2.7 (7)	2.8	3.2 (6)	3.23 (6)
Rubber	5.8 (4)	6.8	7.7	14.1 (3)	15.6	19.7 (2)	21.0 (2)

Source: Directorate of Economics and Statistics, Agricultural Statistics Kerala.

Note: The figures in parenthesis represent the changes in rank of the crops.

The cropping pattern during the initial period that is the land reform phase showed a unique pattern which is more conducive to the physical features of Kerala. A portrayal of this type of cropping pattern is seen in the first phase (the land reform phase) ranging from 1960-1975. The land reform initiatives were taken during this phase. The period has been sub divided into three taking the triennium ending of 1964, 1970 and 1975.The food crop area in the TE1964 was 65 per cent of the total cropped area. The major food crops grown in this phase were rice which ranked first with 32.5 percent of the total cropped area. During this phase the area under rice has increased from 802.9 thousand hectares in TE1964 to 877.4 thousand hectares in TE1975. The second most important crop next to rice among the food crops was tapioca with 8.6 percent of the total cropped area in TE1964. The other crops that gained in area are cardamom (1.1% to 1.6%) arecanut (2.3% to 2.8%) and cashewnut (3.4% to 3.5%) among the food crops. From this it is evident that rice was the major food crop occupying almost 33 per cent of the total cropped area. Another peculiarity of cropping patterns in Kerala is that the food crops grown within the state, such as rice, pulses, fruits and vegetables and tapioca are mainly for consumption within the state. All the other crops which are grown in

the state are for consumption outside the state and can be called as commercial crops (Economic Review, 1967). This type of cropping pattern preserved the wetlands. The average total non-food crop area in TE1964 was 35 per cent. The major non-food crops were coconut (22.4%), rubber (5.8%), tea (1.5%) and coffee (1.0%) in TE1964. Among the non-food crops except cotton and tea, all other crops registered an increase in area. During the 1960s the prominent non-food crops were coconut and rubber.

2. Shifts in the Cropping Pattern

Ever after the land reform measures were implemented there has been a remarkable shift in area under food crops to non-food/perennial crops. This phase is termed as post land reform phase as the land reform policies which were initiated were fully materialized and it had its own implications in the land use and cropping pattern of Kerala. From 1976 to 1992 there has been a reduction in the area under food grains and food crops in Kerala. The commercialization of agriculture took place as a result of land reform. Farmers started growing for the market. Thus, except rice, tapioca, vegetables and a few fresh fruits, all other crops were grown not for consumption but for sale in the market. The place of rice has been relegated to second place in the rank of crops following a reduction in the percentage share of area from 32.5 percent in TE1964 to 18.4 percent in TE1992 and to third rank in area during TE2015 with only 7.5 percent of the gross cropped area.

The commercial crops whose increase took place at the expense of food crops were coconut, rubber, pepper, ginger, banana and other plantain. There has been a well spread distribution of area under commercial crops such as pepper, ginger, arecanut, banana, other plantain, which fall along the food crop category and groundnut, coconut, cotton, coffee, and rubber which fall along the non-food category. The total non-food crop area as per state classification went up from 35.0 percent in the TE 1964 to 51 percent in TE1992 represent a remarkable crop shift from food crops to non-food crops in the second phase which is of a peculiar trend from seasonal and annual crop to perennial crops which contributes a remarkable change in the land use in Kerala causing a land cover change.

By the third phase the land use change has been more intensive in terms of cropping pattern with respect to the commercial crops and perennial crops at the cost of food crops. It is noteworthy to observe the changes in the economic reform phase which could be better explained, looking into the dynamism of the first two periods such as TE1998 to TE2004 and then the changes in the recent period in TE2015. There has been observed a concentration of crops in TE1998 and TE2004 in terms of increasing area under a few crops. The area under food crops such as pepper, cardamom, arecanut banana and other plantain registered an increase in area. These are actually the commercial crops. The area under pure food crops such as rice, pulses and tapioca has fallen drastically. The area under rice has decreased from 13 percent in TE1998 to 7.5 percent in TE2015. In comparison with the year 1975-76, area of paddy cultivation decreased 78% during the year

2015-16. The share of area under food crops itself has declined to 44 percent in TE2004 from 65 percent in TE1964.

Among the non-food crops, the area under coconut and rubber has increased between TE1998 to TE2004. The area under coconut has increased from 889.5 thousand hectares to 898.7 thousand hectares between these two periods. Accordingly the share of area out of total cropped area has also increased from 29.9 percent to 30.2 percent. Thus the only crop which occupies most of the area of the total cropped area are coconut (30.2) which stands first in the rank during the third phase and rubber (16.1) which ranks second. The area under total fruits occupy the third rank in terms of area (14.1%).This shows the dynamism of land use change in Kerala. Ever declining wetlands causes concerns over the state. The wetlands are getting converted to commercial crops like coconut, arecanut, pepper, fruits, rubber and other seasonal crops like ginger, banana and other plantain. But recently TE 2015 the area under coconut showed a decrease in area to 790 thousand hectares although it occupies the first rank. But area under rubber showed a consistent increase in all three phases. The land under rice underwent a significant reduction from about 36 percent of gross cropped area in 1960-61 to 7.5 percent of the gross cropped area in 2015-16. The ranking of the crops showed a remarkable shift from paddy and other food crops to mostly two crops such as coconut and rubber. The primary survey also reveals the same pattern of crop shift and depicts the pattern of change from one crop to the other specifically.

IV. Household-wise Analysis of Crop-Shift

The household analysis of crop shift reveals that the households' initially were growing only paddy and tapioca in the study area. This has been reported by the farmers that they were growing these food crops initially for their subsistence. Slowly after the 1970s with the land reform measures the area under paddy were mainly used for planting coconut and arecanut and the preference for other crops such as pepper, cashew, rubber and coffee slowly began to creep in especially in areas where they were growing tapioca. The household wise analyses are done taking the number of observations rather than number of households due to the loss of information if number of households is taken.

In accordance with the information given by early farmers, the survey also revealed that almost 80 per cent of the households were growing paddy and tapioca initially (55 percent of households were growing paddy and 23 percent of households were growing tapioca). Very few households were growing coconut, cashew and rubber (7.6 per cent, 4.8 per cent and 2.9 per cent respectively). The preference for new crops are analysed under altered preference. Almost 37 per cent shifted to rubber and another 22 per cent to coconut and arecanut as mixed cropping and 21 per cent to coconut after the land reform measures. Another preferred crop was arecanut as its preference increased from 1 per cent to 7.6 per cent. The details of household wise analysis of crop shift are given in Table 4.1.

Table 4.1 Percentage of Households Growing Crops

Sl. No	Crops	Percent of Households (Initial Preference)	Per cent of Households (Altered preference)
1	Arecanut	1.0	7.6
2	Banana	1.9	2.9
3	Cashew	4.8	1.9
4	Coconut	7.6	20.9
5	Coconut and Arecanut	2.9	21.9
6	Rubber	2.9	37.1
7	Tapioca	22.9	4.8
8	Paddy	55.2	0.0
9	Teak	0.0	1.0
10	Cocoa and Vegetables	0.0	2.0
11	Coffee	1.0	0.0
12	Total	100 (105)	100 (105)

Source: Field Survey 2013-14

Rubber, the least preferred crop before, especially during the pre-land reform phase has emerged as the single monocrop in the study area. Most of the households preferred paddy and tapioca initially and were compelled to shift the area to the cultivation of other crops. The cropping pattern information collected for the year 2013-14 also unravels the transition of paddy and tapioca to other crops. This is given in Table 4.2.

1. Cropping Pattern in 2013-14

There are only two households who grow paddy in the study area during the survey period. Among these one is a leaseholder, an agricultural labourer who leases the paddy land for cultivation from a landowner. This household produces paddy mainly for home consumption and not for sale. He confessed that cultivating paddy is extremely costly and uncertain due to the lack of availability of labourers for planting and harvesting. He was able to manage the production as he applied his own labour. And the market price cannot compensate even one-fourth of the cost incurred for the production of paddy. This explains the complete abandonment of paddy in the study area and the change in cropping pattern under paddy. Most of the area under coconut, coconut and arecanut and other food crops such as banana and tapioca in the study area were formerly paddy land. But as on the date of survey the paddy land is found to be used for the cultivation of rubber also. The land under tapioca and land under coconut and arecanut were shifted afterwards (in the economic reform phase after 1991) for the cultivation of rubber. Thus the present cropping pattern is mostly dominated by rubber, coconut as monocrop and coconut and arecanut as mixed cropping. A small per cent of households grow banana and plantain as it has market. This analysis supports

the secondary data analysis too. The dynamism of crop shift is visible in the new cropping pattern of the village which is given in Table 4.2.

Table 4.2 Cropping Pattern in 2013-14

Sl. No.	Crops	Total Area (in acre)	Total Production (Kg)	Yield (Kg/Acre)	Percent of HH*
1	Paddy	3.1	5,900	1903.2	1.1
2	Tapioca	1.13	3,100	2743.4	0.8
3	Banana and Plantain	9.97	30,200	3029.1	4.2
4	Rubber	200.89	1,43,122	941.8	28.9
5	Coconut*	75.6	5,02,380	6707.3	20.8
6	Arecanut*	22.33	1,10,188	5008.5	15.0

Source: Field Survey 2013-14
Note: HH means Households and * these crops are measured in nuts.

Nearly 300 acres of rice fields were there in the study area initially. But the present cropping pattern reveals that almost 201 acres are occupied by rubber. And the remaining with mostly coconut and arecanut with very meagre area devoted for banana and other plantain.

V. Nature of Crop Shift

The nature of crop shift examines the area-wise crop shift during the post land reform phase and also the economic reform phase. After which the nature of crop shift of paddy and tapioca, the most important food crops of the state is analysed individually. This will unravel the wetland conversion to other crops clearly.

1. 1Area-wise Analysis of the Crop-Shift

Since the questions were addressed has a time element as they were asked to recall whether they have shifted the area under one crop to another crop and to report how much area under each crop they changed, the year of changing the crops, and to which crop they changed with the area under each crop with its year of changing, it was difficult to find out the total area under each crop before crop shift. Hence the analysis mainly concentrates on two periods when the households shifted the crops. These periods are classified as Post Land reform Phase and Economic Reform Phase in which post land reform phase includes the crop shift prior to 1991 and economic reform phase covers the period since 1991 up to 2013. The area under initial crops and the area under new crops were calculated in both the phases and are presented simultaneously in the same table in each phase. The area wise crop shift in the post land reform phase is analysed first.

2. Cropping Pattern shift during the Post Land Reform Phase (before 1991)

The post land reform phase witnessed massive shifts in area under food crops to perennial and commercial crops. This marks the structural transformation in the agricultural sector. The area under paddy and tapioca was found to be continuously declining after the land reform measures taken. The area under initial crops and the area under new crops confirm the crop shift from paddy and tapioca to perennial crops. The Table 5.1 depicts the percentage of area shifted from one crop to the other. The row sum gives the per cent of area out of the total under initial crops and column sum give the per cent area out of total under new crops.

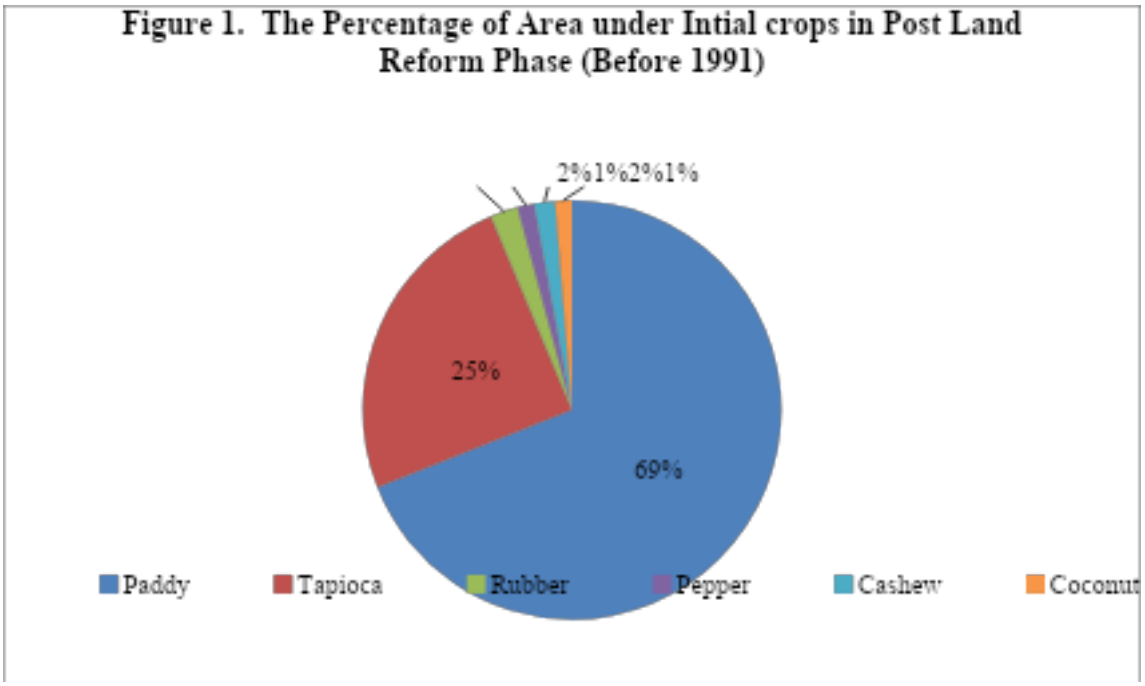
Table 5.1 Cropping Pattern shift in the Post Land Reform Phase (before1991)

Area under initial crops	Area under New Crops (in percentage out of the total)							
	Rubber	coconut	coconut & Arecanut	Arecanut	Banana	Tapioca	Others*	Total
Cashew	1.6	0.0	0.0	0.0	0.0	0.0	0.0	1.6
Coconut	0.5	0.0	0.0	0.0	0.8	0.0	0.0	1.3
Paddy	6.4	15.7	34.6	6.4	1.1	4.8	0.0	69.0
Tapioca	20.7	1.1	0.0	1.1	0.0	0.0	1.9	24.7
Pepper	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.3
Rubber	0.0	0.0	2.1	0.0	0.0	0.0	0.0	2.1
Total	29.2	16.7	36.7	7.5	1.9	4.8	3.2	100 (93.5)

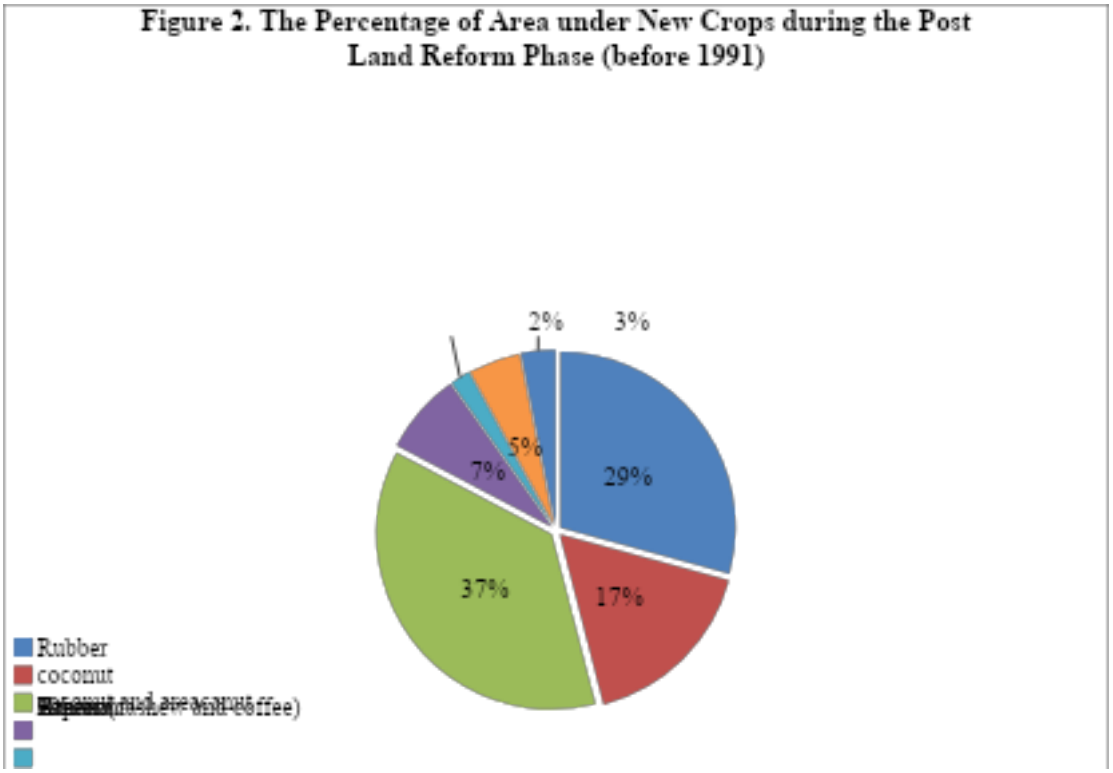
Source: Field Survey 2013-14

*includes cashew and coffee and figure in parenthesis is the total area of land shifted to other crops in acre. The figure in bracket indicates the total area shifted to different crops i.e., 93.5 acres

The figures 1 and Figure 2 depict the dynamism of Crop Shift in Post Land reform Phase that is prior to 1991. The total area shifted under crops during the post land reform phase was 93.5 acres. Out of this total area initially 94 per cent was devoted for the cultivation of food crops such as paddy and tapioca. Only a small per cent was devoted for perennial crops. However the crop shift after the land reform measures was reflected in the cultivation of new crops in this area. This finding also justifies the secondary data on crop shift. The pattern of shift during this phase was from paddy to coconut and arecanut, mainly. The crops such as coconut and arecanut as mixed cropping and coconut as single crop together occupy about 54 per cent of the area shifted. The crop rubber occupied more than one fourth of the area shifted. The crop cultivated in the remaining area was arecanut as single crop, banana, cashew and coffee (17 per cent).



Source: Field Survey 2013-14



. Source: Field Survey 2013-14

3. Crop Pattern Shift during the Economic Reform Phase (Since 1991)

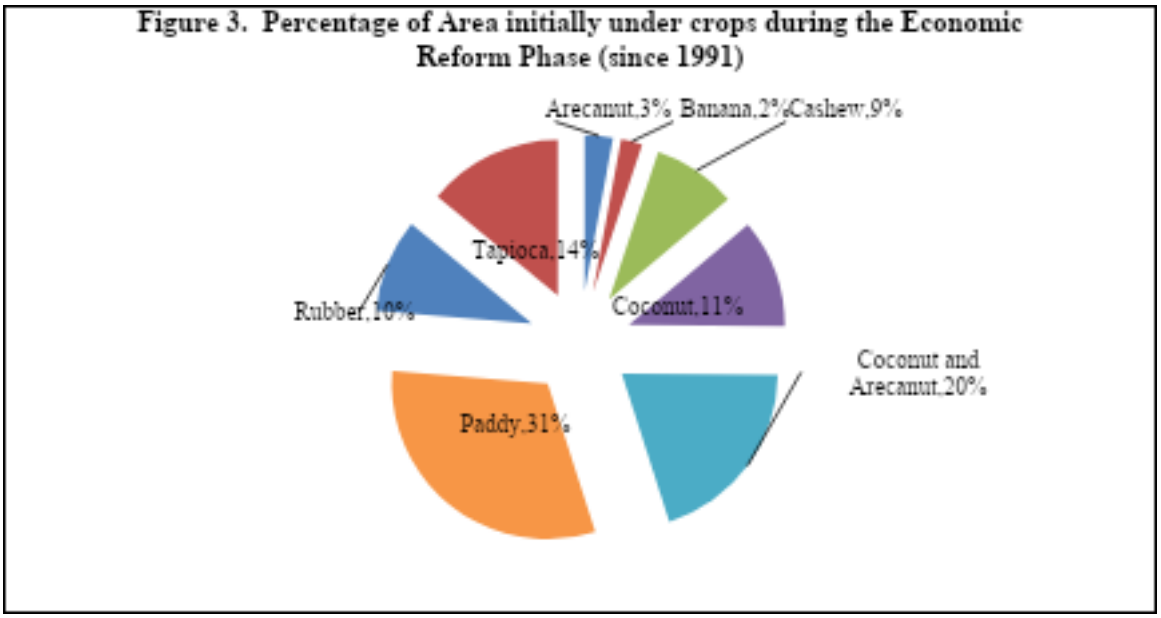
During the economic reform phase, the crop shift is mostly within the perennial crop itself. Since the most of the area under paddy has been shifted for the cultivation of perennial crops, the shift under paddy is seen less compared to the previous period. But the fact is that the entire area by 2012 has been shifted for the cultivation of other crops. The paddy land is even shifted for the cultivation of rubber. This is possible only through levelling the land which causes severe damage to the environment. This also indicates a violation of the law which restricts paddy land conversion. The cropping pattern shift in the post land reform phase is analysed in Table 5.2 and Figures 3 and 4.

Table 5.2 Cropping Pattern shift in the Economic Reform Phase (since 1991)

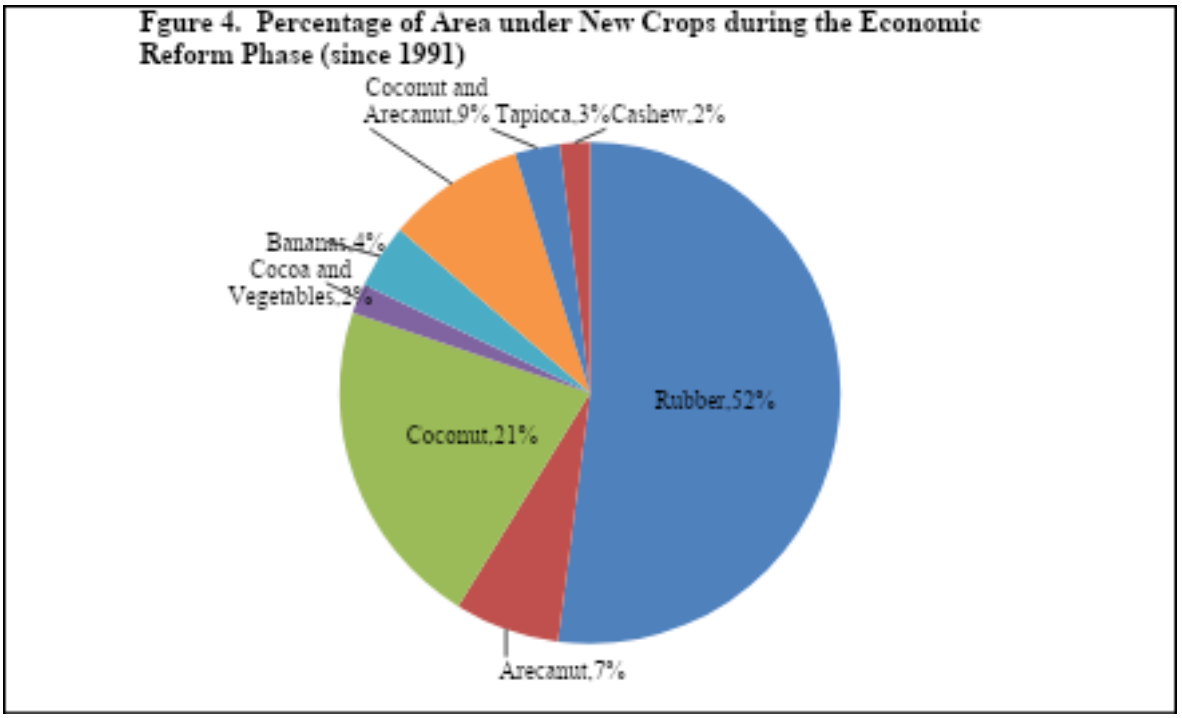
Area under initial crops	Area under New Crops (in percentage out of the total)						
	Rubber	Arecanut	Coconut	Cocoa and Vegetables	Bananas & Tapioca*	Cashew	Total
Arecanut	2.9	0.0	0.0	0.0	0.0	0.0	2.9
Banana	0.0	1.9	0.3	0.0	0.0	0.0	2.2
Cashew	8.7	0.0	0.0	0.0	0.0	0.0	8.7
Coconut	9.4	0.0	0.0	1.9	0.0	0.0	11.3
Coconut and Arecanut	16.1	0.0	0.0	0.0	0.0	0.0	16.1
Coconut, Arecanut #	4.2	0.0	0.0	0.0	0.0	0.0	4.2
Paddy	1.9	4.8	8.5	0.0	16.0	0.0	31.3
Rubber	0.0	0.0	7.7	0.0	0.0	1.9	9.7
Tapioca	8.9	0.0	4.8	0.0	0.0	0.0	13.8
Total	52.0	6.8	21.3	1.9	16.0	1.9	100 (51.7)

* includes also coconut and arecanut
#include plantain Tapioca and vegetables as mixed cropping

Source: Field Survey 2013-14



Source: Field Survey 2013-14

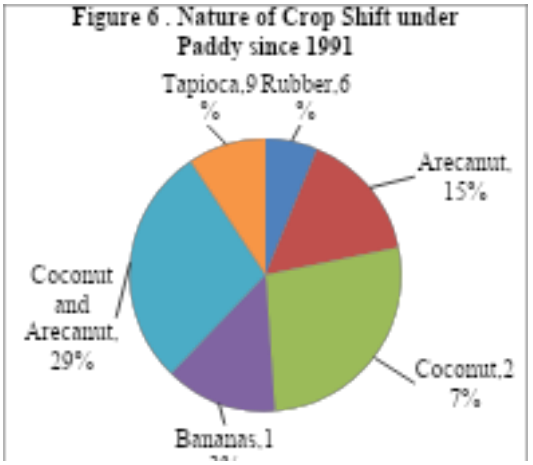


Source: Field Survey 2013-14

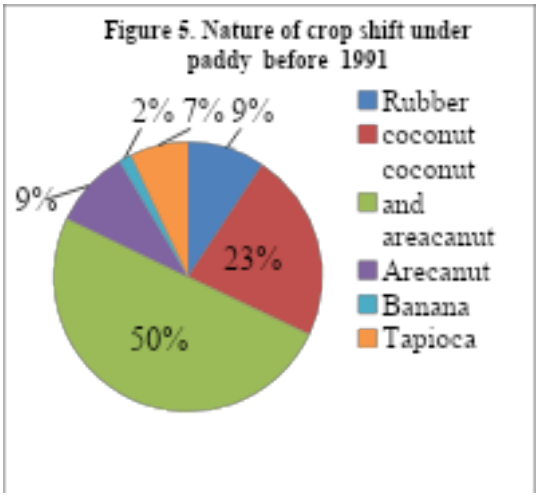
During the economic reform phase there has been crop shift within the perennial crops. The area under arecanut, cashew, coconut and arecanut has been shifted mainly for the cultivation of rubber. The area under food crops such as paddy and tapioca has been shifted for the cultivation of rubber. Another important finding is that the total area shifted for the cultivation also has been reduced compared to the post land reform phase. Only about 52 acres of cultivated land has been shifted for the production of other crops as against 94 acres in the post land reform phase. This point to the possible conversion of agricultural land to

non-agricultural uses. Thus the dynamism of crop shift reveals the dominance of rubber cultivation even at the cost of wetland.

4. The Nature of Crop-Shift under Paddy and tapioca



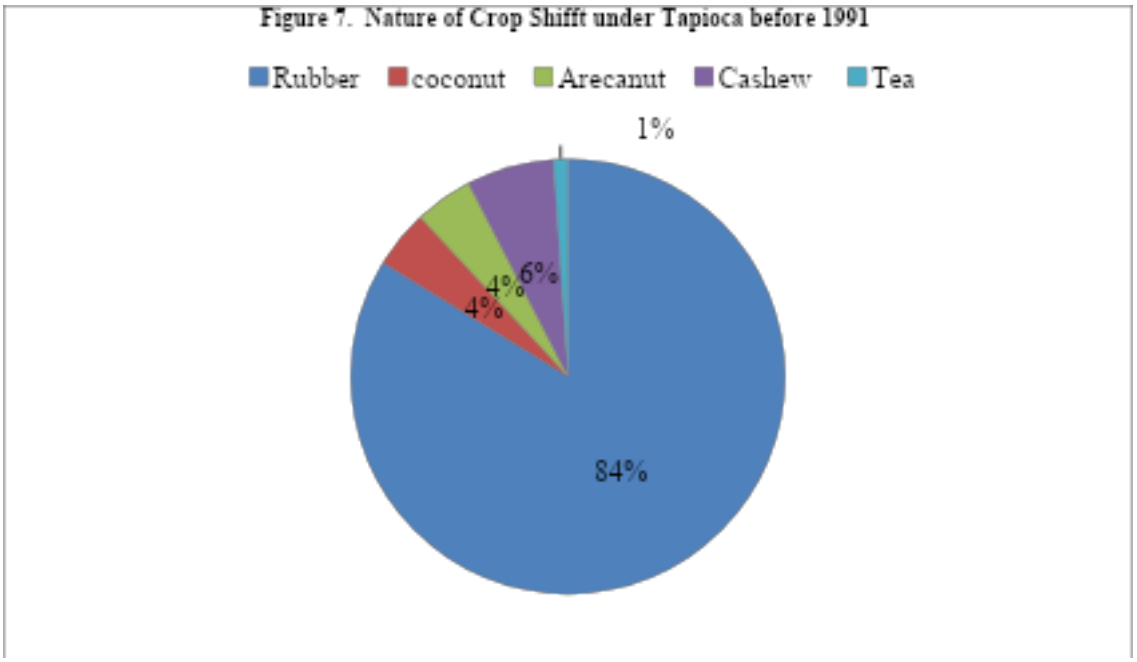
This examines the pattern of shift from one crop to another. This analysis gives an understanding of the type of land used for growing other crops. If paddy land is converted for growing other crops, then the wetland conversion has taken place. These points to the land use change as a result of the crop-shift. It will also unravel the households' preference for various crops. The crop wise analysis shows that, there are major three crops whose areas have been undergone a tremendous change and the area under these crops was shifted to non-food crops/perennial crops in both the period. Since the area under paddy, tapioca and Cashew have undergone a change incessantly, the analysis of these crops were done very specifically.



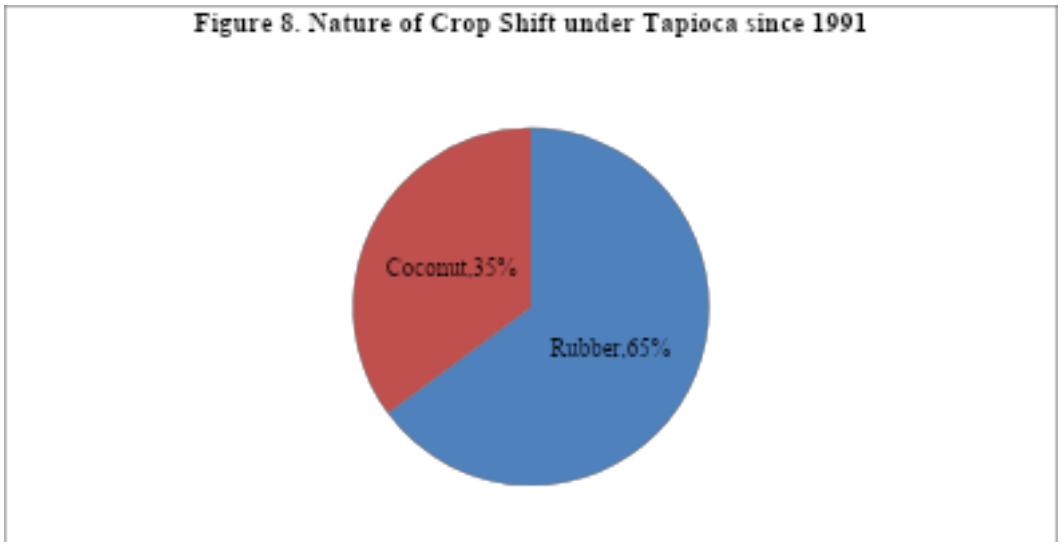
Source: Field Survey 2013-14

From the figures it is clear that the paddy land is transformed for the cultivation of perennial crops such as coconut and arecanut. Meagre percentage was devoted for the cultivation of food crops such as banana and

tapioca. In both periods this pattern is repeated. Even rubber which is purely a monocrop encroached of some of the area under paddy in both phases.

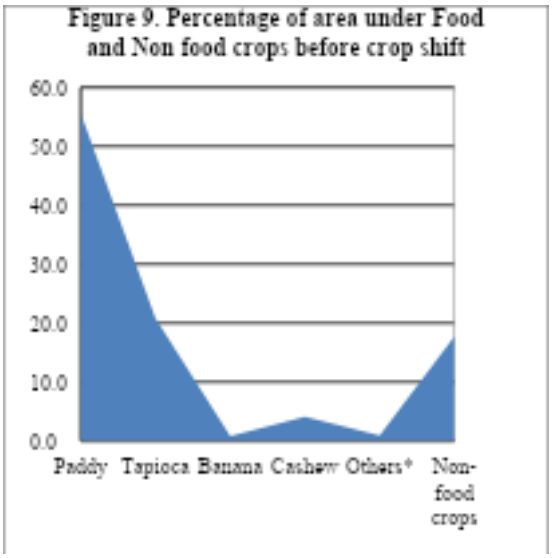


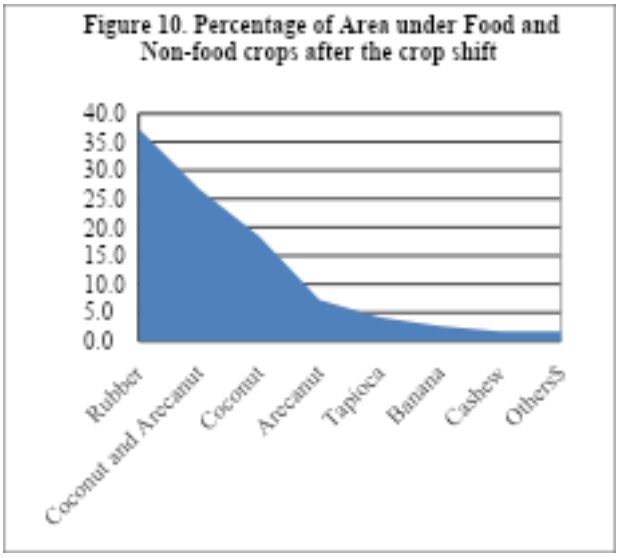
The area under tapioca is mostly shifted for the cultivation of rubber in both the periods. Only some area under tapioca is used for the cultivation of banana, arecanut and coconut. It is important to note that the area under tapioca during the initial period was used for the cultivation of paddy during the monsoons for double cropping. The farmers were cultivating tapioca only in summer season when no water was available. Thus lack of irrigation combined with labour problems prompted the farmers to shift this area for the cultivation of coconut, arecanut and rubber.



Source: Field Survey 2013-14

The area under food crops has been reduced to just 10 per cent after the crop shift whereas the area under non-food crops increased to 90 per cent. Before the crop shift the area under food crops was about 83 per cent and non-food crops occupied only 17 per cent of the total area under crops. Thus a complete reversal of trend is seen in the study area over the period of time. The present cropping pattern the area under food crops is still reduced to 4.5 per cent. Thus the households in the village are more dependent on the market for their food consumption. This dynamism of crop shift is depicted in Figures 9 and 10.





Source: Field Survey 2013-14

VI. Determinants of crop shifts and land use change

The economic rationale behind the crop shift explained by various authors were maximization of income per hectare approach followed by farmers (Oomman, 1963), The price and non-price factors such as increase in wage rate, and a relative price advantage in favor of non-food grain crops and ill- conceived development of critical factors such as water management and land development (Kannan and Pushpangadhan, 1988), the exemption of plantation crops from land reforms act, and the promotional activities by the Government in the area of plantations and cash crops (Pillai, 1994) etc., These encouraged the cultivators in Kerala to opt for higher valued cash crops or plantations wherever possible and to curtail the area under rice and other food grains to the minimum.

These studies do not explain the underlying reasons for such a strategy followed by the farmers. We identify the underlying factors and proximate reasons (Lambin et al, 2003) which have led to crop shift and land use change. The underlying factors are the root causes and proximate reasons are the response of the farmers in terms of peasant rationality. The underlying reasons for such crop shift are the agrarian reform measures which also include the land reforms during the 1960s and 70s. And the proximate reasons which are

captured using the primary survey are the responses of farmers to such root causes. This is expressed as peasant rationality to minimize losses.

1. Reasons for Crop Shift: Findings from Village Survey

The reasons for crop shift have been examined in two parts. The first part, the reasons for cultivating the new crops and the second is the reasons for not cultivating the crops which are shifted. The standpoint of the farmers with regard to the reasons for crop shift is captured and a dummy regression is attempted to know the main determinant of crop shift as per farmers view.

1. Reasons for Cultivating the New Crops

The opinions of the households to the changes in area under crop were gathered first and coded for the analysis. Hence it explains the factors that determine farmers' decision to change their area under a particular crop to another. These are analysed in two periods. The reasons for cultivating new crops in the post land reform phase (i.e., prior to 1991) and the reasons for cultivating new crop during the economic reform phase (since 1991) are analysed here. This is given in Table 6.1.

Table 6.1 Reasons for cultivating New Crops during the Post Land Reform and Economic Reform Phases

Sl. No.	Reasons	Post Land Reform Phase	Economic Reform Phase
1	High income	85.1	84.21
2	Regular income	41.8	55.26
3	Less labour intensive	38.8	7.89
4	Perennial Nature	10.4	0.00
5	High Price	7.5	21.05
6	Subsidy	1.5	10.53
7	Lack of labour availability	3.0	5.26
8	Less risk	4.5	0.00
9	Others*	3.0	10.5$
* includes reasons like animal attack and high labour cost			
$ include the reasons like lack of irrigation, marketing facility and high social and economic status			

Source: Field Survey 2013-14

It is important to note that both post land reform phase and economic reform phase, the farmers were motivated by high and regular income from farming. These are mainly the outcome of the changing scenarios which motivated farmers to go for an income maximisation strategy. The farmers opted for less labour intensive crops to minimise their loss and maximise their income. It was a long run

strategy adopted by farmers as once they switch to perennial crops the initial labour may be costly but in the long run less labour is needed and at the same time it ensures a regular income from farming. And hence less risk in cultivating the perennial crops. In those times farmers needed a regular source of income as they did not have any. This prompted them to choose perennial crops especially rubber.

The commercialisation of agriculture and the resultant cultivation based on the market price is reflected during the economic reform phase. The farmers here are more influenced by high price of the crops, subsidy which will ensure high income and minimise the cost of production through subsidies. But by this time the society has become more polarised as the rich and those who have money including Gulf money started investing in land with high value crop. And there has been more land transfers from the subsistence farmers to this new emerging capitalist farmers who has other sources of income. For them land is not a primary means of production but a source of status and prestige and a secure place for investment. Their preference for crops changes with market prices and in this it is observed that there is shift within the perennial crops. For all categories of farmers and especially for those who have other source of income the labour availability was another problem in the economic reform phase. On the one hand the migration has reduced the labour availability and on the other hand the migrant labourers from other states were all employed in construction sector. Since agricultural work is seasonal in nature it failed to attract labourers to agriculture. The changing land use pattern especially from agriculture to non-agricultural uses such houses and residential building construction has impaired the irrigation facilities which had already existed in that area. Levelling paddy fields for house construction has obstructed the flow of water from one filed to another. Moreover the investment in land by gulf migrants especially in land with high value crops such as rubber has pushed up the land prices more. The increasing socio economic status associated with rubber cultivation as it brought high income compared to all other crops motivated the farmers to opt for rubber in the economic reform period. However a new tendency is also visible in the study area. As the gulf moneyed people became the owners of rubber estates, the low prices in the market affect the cultivation of rubber as they either switch over to more remunerating crops or convert the land for non-agricultural uses as they have other sources of income to live on.

2. Determinants of Crop-Shift; Regression Analysis

The determinants of crop shift is analysed through a regression analysis with reference to the post land reform phase of crop shift only as it is found that most the households have shifted their area under food crops to perennial crops during this period.. The results are given in Table 8.

Table 8. Determinants of Crop Shift during the Post Land Reform Phase		
Variables	**Coefficients**	**t Stat**
Intercept	0.3	0.8
High income	0.9***	2.3
Regular income	0.1	0.4
Less labour intensive	0.1	0.3
Perennial Nature	0.7*	1.5
High Price	0.5	1.1
Lack of labour availability	2.4***	3.8
Less risk	0.2	0.3
R Square	0.5	
Number of Observations	45	

Source: Computed from Primary Survey 2013-14

***, * shows the level of significance at 1% and 10% respectively

The regression on the reasons for crop-shift during this phase reveals that all the variables positively affect the farmers' response to change in their area under food crops. The most important variable that affect crop shift in terms of the increase in area under perennial crop is the lack of labour availability, high income and perennial nature of crops. Since this study is done using population data of the village, the significance of values are not a necessary criterion to prove the argument.

3. The Reasons for not cultivating the Traditional Crops

Along with the reasons for cultivating new crops, the reasons for not cultivating the traditional crops were also probed. The respondents' answers were coded for the analysis. The reasons are based on households' perception on shifting one crop to another in two phases such as post land reform phase and economic reform phase. The response of the famers are analysed in Table 6.2.

Table 6.2 Reasons for Not Cultivating the Traditional Crops (percentage of Households)			
Sl. No.	**Reasons**	**Post Land Reform Phase**	**Economic Reform Phase**
1	High Labour cost	52.2	39.5
2	Animal Attack	32.8	10.5
3	Low profit	25.4	36.8
4	Loss	25.4	2.6
5	Lack of labour availability	23.9	21.1
6	Lack of marketing facility	10.4	5.3
7	Lack of irrigation	6.0	5.3
8	Foodgrains supply through PDS	4.5	0.0
9	Others	6.0*	15.8#
* include the reasons like seasonal nature of crops, less production, and climate change			
# includes the reasons like loss from cultivation, less production, disease, and seasonal nature of crops and climate change			

Source: Field Survey 2013-14.

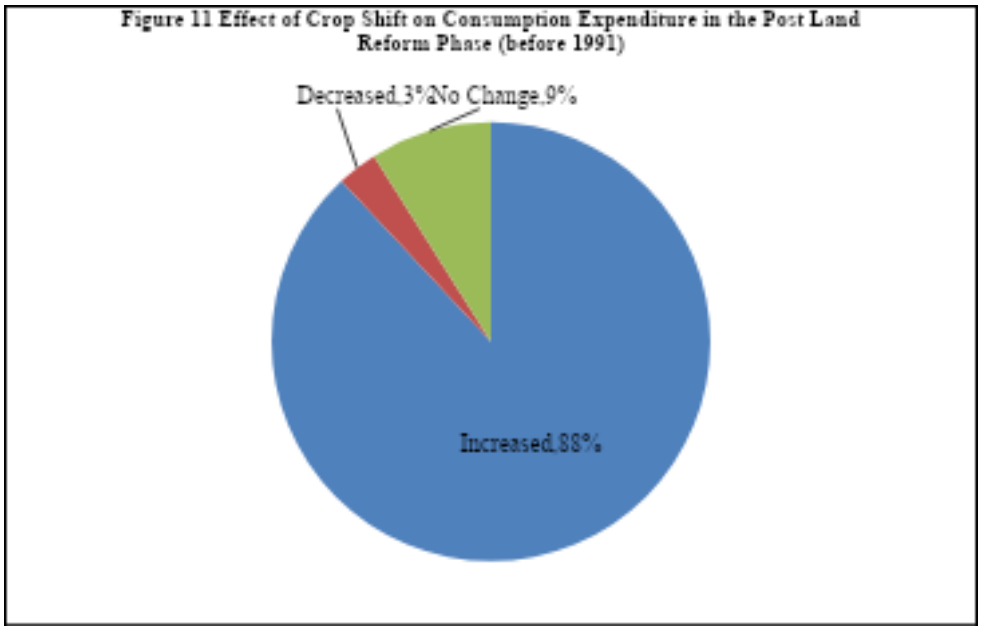
The combination of many factors forced them to change the crops they were cultivating. The reasons for not cultivating the old crops were a mixture of socio economic and natural factors. But the economic factors dominate in the present context. The most highlighted reasons for not cultivating the old crops during the post land reform phase were high labour cost, low profit and loss for the farmer. The cultivation of old crops would have continued had the labour cost been less. It would have helped them to cover the cost of production. On the contrary the increasing labour cost coupled with lack of marketing facility for the food crops they were growing and the supply of food grains through public distribution system at a low price forced the farmers to go for more rewarding crops. Along with it there has been animal raiding of crops which resulted in loss. Lack of labour availability for the cultivation of food crops were also reported during the post land reform phase as everyone had a tiny plot to cultivate and they were also supplied by food grains at a cheaper price by the government. This made them look for other avenues for earning.

During the economic reform phase, it is observed that the same problems continued as they reported the major reasons for crop shift was high labour cost coupled with low profit. Lack of labour availability also continued despite a scheme called MNREGA. This clearly indicates that since the agrarian reform measures in 1960s to 1970s, there has been no effective intervention in agriculture to solve the problem of high labour cost and loss of the farmers. Amidst these problems the peasant rationality is reflected in to go for rewarding crops for which the government also gave subsidy. This explains the crop shift. The crop shift took place not due to low yield but due to low income from farming. This has altered the climate and the environment of the place too. The effect of crop shift will be analysed in the following section.

VII. Crop shift and its impact on famers

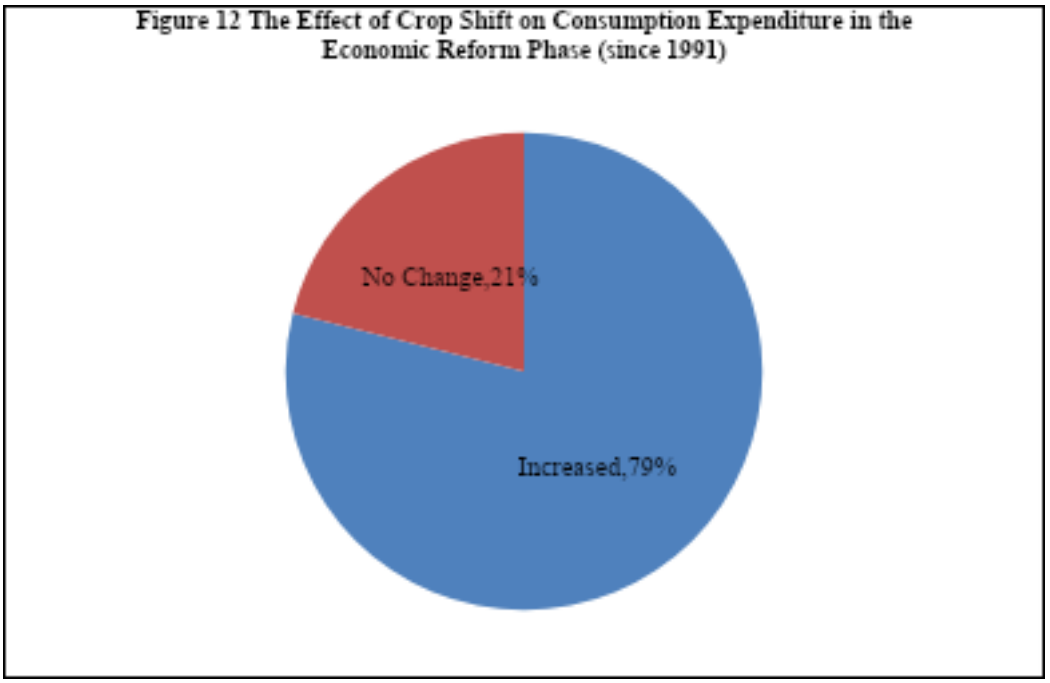
1. Effect of Crop Shift on Consumption Expenditure

The farmers' responses with regard to the crop shift were analysed under two periods. During the Post Land Reform Phase, the farmers who had shifted their crops, especially the food crops like paddy and tapioca, experienced an increase in their consumption expenditure, as they were more dependent on the market for accessing those items. However, for a few households which had shifted from tapioca to paddy and vegetables, there was a reduction in their consumption expenditure. And for those who had shifted their crops from cashew and coffee to rubber, their consumption expenditure neither increased nor decreased. This is the situation of those who shifted their food crops during the Post Land Reform Phase that is prior to 1991. This is given in figure 11.



Source: Field Survey 2013-14

Coming to the Economic Reform Phase, there were only two responses-an increase or decrease in consumption expenditure. According to most of the households, who had shifted their remaining paddy land to coconut and arecanut, there was an increase their consumption expenditure (79 per cent of the households) while as per another 21 per cent of the households, there was no increase in their consumption expenditure as they had shifted their crops from within the non-food crops. This has been a peculiar trend observed during the Economic Reform Phase with the ownership of land changing from farmers dependent on farming to others whose major share of income came from other occupations. This is depicted in Figure 12.

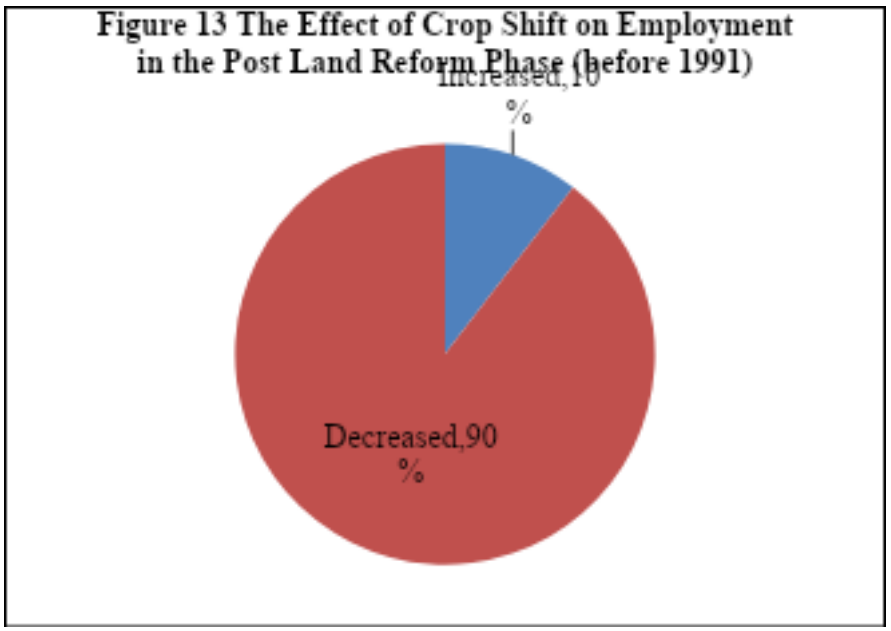


Source: Field Survey, 2013-14.

Although the immediate reasons behind an increase in the consumption expenditure was the crop shift from food crops to plantation crops, later on, the shortage of foodgrains created by a shift and an increasing demand for food, fruits and vegetables created by the Gulf-remittances, caused an increase in prices. Thus, a major chunk of their income got trapped in food inflation. This, in turn, created an additional burden for those farmers and agricultural labourers solely dependent on farming with no other sources of income.

2. Effect of Crop Shift on Employment

A shift from food to non-food crops led to a reduction in employment as expressed by farmers who had shifted their crops. The crop shift reduced the employment opportunities, as the new crops planted were less labour-intensive. It is to be noted that in the case of plantation crops, only in the initial phase, it requires more labour for planting, manuring, and weeding. Thus, there was a considerable reduction in both hired labour and self-employment in the farm sector as a result of crop shift from food to non-food crops as depicted in Figure 13.

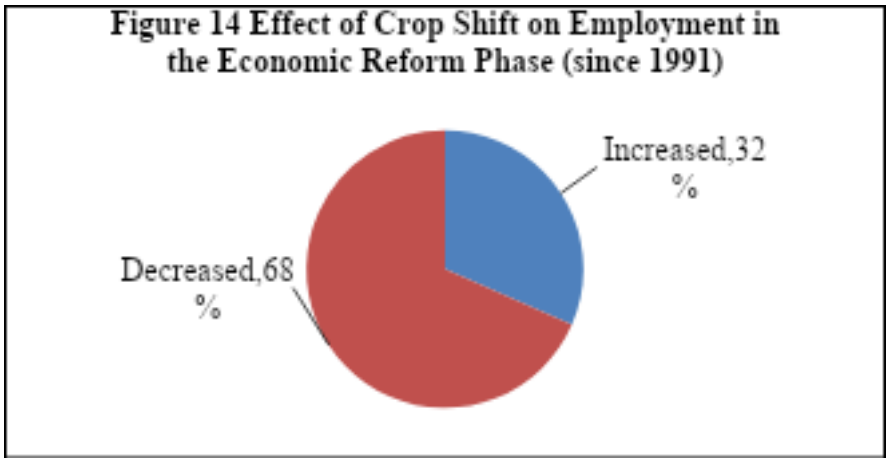


Source: Field Survey, 2013-14.

An analysis of the effect of crop shift on the employment in post land reform phase reveals that the employment has been reduced much. In this phase according to some households (10 per cent), there was an increase in employment mainly due to the nature of crop shift from tapioca to paddy and vegetables.

It was found that both in Post Land Reform Phase and Economic Reform Phase the employment has been reduced due to crop shift. This is consistent with a secondary data based analysis that employment opportunities in agriculture had reduced due to crop crop-shift with the farmers deliberately choosing less

labour intensive crops as a part of minimising their losses. The effect of crop shift on employment in the economic reform phase is given in Figure 14.



Source: Field Survey, 2013-14

During the economic reform phase, the increase in employment was reported because those households shifted their crops from cashew, coffee, coconut and arecanut to mainly rubber which is comparatively more labour intensive than other non-food crops.

But on the whole, the employment opportunities in the farm sector had reduced substantially as the result of crop shift. In the absence of any industry in the study area or in the vicinity, the labourers searching for employment outside of the village explains the large scale migration from that area. Thus the finding by Chandramohan (1998) that the market-oriented agriculture had rendered land and labour as commodities has been proved in the present context of Kerala. Thus, the income maximising strategy of farmers in terms of shifting their crops from food to non-food, though it had a positive impact on income in the initial stages, squeezed their income with the consumption expenditure increasing and the employment opportunities becoming limited. These findings are also in tune with the findings of Immink and Alarcon (1993).

VIII. Conclusion and Policy Suggestions

The dynamics of crop shift from food to non-food/commercial crops and the reasons behind this shift has been the major focus of this study. The underlying forces behind the crop shift has been identified as the government measures starting with land and labour policies and other institutional measures thereafter to support commercial oriented production. This clearly depicts the absence of an organization for farmers to represent their issues. In the absence of this farmers resorted to an income maximization approach as a part of the peasant rationality which led to a shift in cropping pattern which is irreversible in nature.

The dynamics of crop shift using the primary data from the farmers' perspective revealed that their initial preference for paddy has completely altered by the preference for coconut and arecanut. The preference for tapioca also has come down. The most preferred crops of the households at present are rubber, coconut and

arecanut. As these crops are preferred by almost 88 per cent of the households. The present cropping pattern in the village also revealed the same. Similar tendency were observed in the area-wise analysis of the crops. The increasing area is occupied by rubber over the years. Nature of crop shift revealed that initially the shift was from food to non-food garden crops during the post land reform phase. Whereas during the economic reform phase the cropping pattern increasingly becoming homogenous as most of the area under paddy was occupied by coconut and arecanut first and then these area were later converted to the cultivation of rubber. The major reasons for not cultivating the old crops were, high labour cost, lack of labour availability and low price and low profit. The major determinants of for cultivating the new crops during the post land reform phase were lack of labour availability, high income, perennial nature of crops and high price. Whereas determinants of crop shift during the economic reform phase are less labour intensive nature of crops, high social and economic status and marketing facility. The economic rationale for the shift in these crops is revealed here is the on the one hand the policy failure during the initial period and the absence of government support programme for the rejuvenation of the food crops on the other since the land reform measures. The farmers were increasingly responding to the market as there were no sufficient policies to motivate farmers to produce food crops. But in the process household maximisation, the most important resource the land has undergone a significant change in its optimum use. Such change is irreversible and is loss to the economy as a whole.

The dominance of plantation crops especially rubber at the cost of food crops such as rice and paddy and the cultivation of commercial crops such as banana and arecanut in the paddy fields has affected the food security of the village as it is the case at the state level. The farmers became increasingly dependent on market for food grains, fruits and vegetables. Their consumption expenditure has gone up due to the increase in prices of these wage goods amidst scarcity.Thus impact of such crop shift is manifested in reduction of food grains and vegetables on the one hand and increase in consumption expenditure and unemployment on the other. The migration of people to gulf since agriculture failed to absorb the unemployed further aggravated the unemployment situation. The migration to gulf and the resultant remittances changed the attitude of people towards farming and this has impacted their concept of land also. The gulf investment in land as a security and asset made land a commodity. The large scale conversion of paddy land to coconut and rubber needs to be checked as the wetlands are getting destroyed in Kerala. The indiscriminate use of land for profit oriented crops will lead to serious environment problems in the state. Moreover the initial conversion of paddy land to coconut may ultimately lead to non-agricultural uses of land, at the cost of food security and environment. It is high time to take long term measures for the revival of paddy cultivation to preserve the existing paddy land for the production of the same.

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