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AGRICULTURAL ECONOMY OF KERALA IN THE POST-SEVENTIES : STAGNATION OF CYCLES?

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Abstract

One of the ways of thinking current in social sciences in general and economics in particular is to equate analysis with statistical analysis. An off-shoot of such a way of thinking is to go in for sophistication in technics for `better' analysis ignoring the whole question of the appropriateness of such technics to the particular problem at hand. With the work machines becoming increasingly user-friendly the danger of getting lost in the maze of technics is increasing. The paper is an illustration of such a case where the specific problem taken up is the analysis of agricultural production in Kerala. The approach of the paper is constructive and hence the critique of the existing method is only implicit.

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Introduction.

Quantities are measures of the working of certain processes. Yield, Output and Income are quantities summarising the working of economic processes. Although quantities bear these names or labels the underlying processes which throw them up may be very different. It is quite common to find economic analysis of these quantities going simply by the labels without ever bothering to incorporate in the analysis the characteristics specific to the underlying processes which throw them up. This is a problem which recurs in many inter-country and inter-state comparisons of consumption, incomes, agricultural growth.....etc. Some awarness of the problems associated with such comparisons are reflected in the inter-country comparison of real consumption and income [Kravis, Heston and Summers, 1978; Lancieri, 1990].

Such awarness is, however, lacking in many studies dealing with inter-country and inter-state (within the Indian context) comparisons of agricultural production and productivity [Hayami, Ruttan and Southworth, 1979; Mathur, 1987.] Comparisons are often made of agricultural growth and growth of incomes applying statistical methods as if they are `neutral'. These simply do not incorporate the characteristics specific to the underlying processes in their analysis. This paper is an attempt at analysing quantities keeping in mind the substantive processes underlying them. As the observational data taken for analysis are that of agricultural production in Kerala, it is an analysis of the agricultural reality of the state over the last

fifteen years.

The period since the early seventies in the agricultural economy of Kerala is a turning point. The food availability in the state has vastly improved owing to the green revolution elsewhere in the country. The expansion in the net sown area (NSA) which was sharp since the fifties has come to a stop and the area under rice and tapioca, the two staple food crops of the state, are declining rapidly. Along with such rapid transformations there is an apparent `declining trend' in agricultural production and productivity in the state. This has given rise to theories of agricultural stagnation - both at the level of output and incomes - `explained' by institutional constraints on the one end to environmental degradation on the other.

These explanations and theories of agricultural stagnation are founded on rather simplistic analyses of the observed data and suffer from serious methodological weaknesses. One of the main sources of weakness is a rather mechanical application of the methods of analysis appropriate to an agricultural economy predominated by seasonal and annual crops to the analysis of an agricultural economy predominated by tree crops. To put it differently, the weakness arises from the simple fact of not taking into account certain structural characteristics specific to tree crops. Another source of weakness is the discussion of agricultural incomes at constant

prices thereby ignoring the changes in incomes brought about by the movement of relative prices. These are the points of departure of this paper. It is a modest attempt at viewing the agricultural economy of Kerala through the structural characteristics specific to tree crops on the one hand and through the dynamics of relative prices on the other.

The paper is organised in four sections. Section 1 builds a few models beginning with certain structural characteristics specific to tree crops and applies the models to the agricultural reality of the state for the recent period. Section 2 is at the level of crop specific analysis, where the models are applied to two specific crops, namely rubber and coconut. The discussion in both these sections is at the physical level. Section 3 takes the discussion to the level of incomes through the changes in prices. The section opens up into the larger question of price and output cycles but does not pursue it. Section 4 speculates on the wage share in value of agricultural output and consequently on the farmers' incomes. The paper concludes by emphasising the need for taking account of the specificities of tree crops in analysing the various dimensions of Kerala's agriculture.

Section 1: The Replanting Model and Its Application to the Current Agricultural Reality.

We begin with three of the structural characteristics specific to tree crops in this section and go on to work out

their implications to output and yield paths in an economy through what we call below Replanting and Underplanting Models [RM and UM respectively]. The three structural characteristics are: (i) long life span; (ii) moderate pre-bearing period; and (iii) yield profile of the tree over the bearing period. Each of it has its own role to play in shaping the output and yield paths in an economy.

Let us take the first two characteristics and build a RM. For simplicity of exposition let us work with numbers. Let us take the life span of a tree to be 30 years and the pre-bearing period to be eight years. Let us take the agricultural economy to have 100 hectares under the crop. When the distribution of area is uniform over the thirty years, in an ongoing process each year sees 3.3 hectares being replanted and 3.3 hectares replanted eight years back reaching the bearing age leaving the effective bearing area and hence output (as yield is being held fixed for the present) at the same level. For every 100 hectares under the tree crop the effective bearing area and the index of output would only be 73 (22 x 3.3); the rest 27 being the area holding the pre-bearing trees.

Now, let us consider the case of non-uniform distribution of area. Let us take it to be 2 hectares over 22 years and 7 hectares over the next eight years. When the 7 hectare stretch comes for replanting the effective bearing area (equivalently output) starts declining from 84 to 44 over an

eight year period and then increases from 44 to 84 during the next eight years. It follows that when the distribution of area is nearly uniform the decline (and the increase that follows) is milder.

Instead of replanting at the end of the life-span, we can conceive of planting seedlings below the trees a few years in advance of the end of the life span [under-planting in short]. This way the seedlings reach the bearing age by the time the older trees reach their end of life leaving the total number of bearing trees intact. This may be incorporated into an UM. If the under-planting is carried out when the age of the tree is 22 years, by the time the older tree reaches its end of life the younger plant reaches the bearing age. This would leave the effective number of bearing trees (equivalently output if the question of yield profile is not introduced) to be unaltered for any given area under the crop. The total number of trees will, however, increase or decrease over stretches of time if the distribution is non-uniform. But the point to note is that the age distribution of bearing trees will not remain the same over time which will have its own implications to the level of output and yield once the question of yield profile is brought to the fore.

Now, let us bring to the fore the yield profile of the tree over the bearing period. For simplicity, let us take the yield profile to be of the following type: Between the 8th and

15th year the yield per tree is half of what it is beyond that period. To condense the argument, let us assume that the replanting and underplanting is with a variety which has a yield which is 40 percent higher than the existing one. Under these conditions, let us work out the changes in the level of output in the RM and UM. Tables 1 and 2 provide the paths of effective bearing area, output, and yield for 100 hectares of area under the crop the distribution of which is not uniform.

Table 1
Output and Yield in a Replanting Model

Age groups (in years)	T	T+1	T+8	T+9	T+16	T+17	T+18	T+23	T+24	T+30
0 - 8	16	21	56	51	16	16	16	16	16	16
9 - 15	14	14	14	19	49	44	39	14	14	14
16 - 30	70	65	30	30	35	40	45	70	70	70
Bearing Area	84	79	44	49	84	84	84	84	84	84
Output	77	72	37	40.9	72.1	76.4	80.7	102.2	103.0	107.8
Index of Yield/Unit of Bearing Area	100	99.42	91.73	91.05	93.63	99.21	104.30	132.73	133.76	140

Note: The distribution of area by age is not uniform. It is 2 hectares each from the first year to the 22nd year and 7 hectares each from the 23rd to the 30th year.

Table 2

Output and Yield in an Underplanting Model

Age Groups (in years)	T-7	T+6	T	T+1	T+2	T+8	T+9	T+15	T+16	T+22
0 - 8	24	28	52	56	52	28	24	24	24	24
9 - 15	21	21	21	21	25	49	45	21	21	21
16 - 30	77	77	77	77	73	49	53	77	77	77
Total No. of Trees	122	126	150	154	150	126	122	122	122	122
Output	87.5	87.5	87.5	87.5	86.9	86.1	90.1	114.1	115.3	121.3
Index of Yield per Bearing Tree	100	100	100	100	99.31	98.4	102.97	130.4	131.77	140

Note: The distribution of area is 3 hectares, each over the first 14 years followed by 7 hectares each over the next eight years.

The conclusions of our models as brought out in Tables 1 and 2 are unmistakable. Under conditions of non-uniform distribution of area, even when an improved variety with 40 per cent higher yield is introduced over long stretches (16 years) after the introduction of such a variety the level of output and yield are either stagnant or declining. The sharp increases come only later over a short span of seven to eight years and taper off afterwards. Note that the conclusions are the same from both the models. A shorter age at bearing would only shorten the period of stagnation or decline without altering the pattern as such. The yield increases brought about by varietal improvements manifest themselves over a very long stretch, that is over the life span of the tree crop. Thus, a 40 per cent increase for a tree crop with a life span of 30 years would give an average annual increase of 1.3 per cent over a 30year period. The

distribution of the increase itself will be uneven conditioned by the distribution of area. Longer the life span lower the average annual increase.

The conclusion has certain important implications to empirical analysis. First of all, at the empirical level the observed values are effects not only of the above mentioned structural causes-if we may put it so - but also of fluctuations caused by weather and other factors. When the effects of structural causes themselves are small they might be `drowned' by these other fluctuations. A further problem is that based on statistical analysis of any sort of the data over a `long' period of, say 15 to 20 years and then characterising the period as that of declining, or stagnant yield and output can be highly misleading. Interpretation has to be through the models. Let us then turn to the task of applying the model to the reality of the agricultural economy of Kerala in the post-1970 period.

Before going on to apply the model to the reality of the post-seventies in Kerala, let us get our ideas on this reality clear. Since the early seventies the NSA has stabilised around 2200 thousand hectares[1]. But the area under coconut, rubber, coffee, pepper,[2] areca and cashew which was around 1235 thousand hectares in the mid-seventies increased to around 1504 thousand hectares by 1985-86, an increase of roughly 270 thousand hectares. Since the NSA was not changing the area increase could have come about only on account of area shift from seasonal and

annual crops. We can now put back this area shift of the seventies and later into our RM in the following sense. The increase of area under tree crops could be thought of as additional area coming for replanting - over ten year period between 1975-85 - of the 1504 thousand hectares already under tree crops in the mid-seventies. That is, the conversion of yielding area under rice and tapioca is seen as replanting of yielding area under the crops. Going by the model set out above, this would mean the effective bearing area [equivalently output if the yield question is abstracted from] comes down by 27 thousand hectares over 1975-83. It would remain at the 1983 level for another two years the area replanted in 1975 having reached the bearing age by that year.[3]

Going by the area shift of the post-1975 period alone, the effective bearing area should have started increasing by 1985. But this does not in fact take place for two reasons. Firstly, the area shift is continuing beyond 1985. Secondly, the distribution of 1235 thousand hectares as of 1975 is not uniform. To take just one example, that of rubber, the area increase between 1954 and 1963 was phenomenal. As per the model this should be coming for replanting between 1985 and 1993 at the rate of approximately 14 thousand hectares per year (see Table 3 below). This alone would further dampen the increase in the effective bearing area since 1985. The increase in effective bearing area since 1985 being just 13 thousand hectares (27-14).[4]

Now, let us turn to the output and yield paths. Going by the conclusions of the model, even if the replanting were with an improved variety, it would take over 17 years to get reflected in increased levels of output and yield. The area shift begun in 1975 would then get reflected in increased output and yield only beyond 1992. This would be much more dampened by the smaller replanting cycle begun in the mid eighties. Thus, on this count alone it would not be surprising if one observes a fairly long period of stagnancy or decline in output and yield. [The growth rate of output and yield are -0.8 and 0.2 per cent respectively for the period 1975-76 to 1985-86 as is computed by Kannan and Pushpangadan (1988)]. However, such observed stagnancy over a short period of ten years cannot be taken for true stagnancy. It may simply be a reflection of the non-uniform distribution of area or equivalently non-uniform increase in area under tree crops. Consequently, the underlying yield change may be vary different and there may not, in fact, be any stagnancy in yields. Simple computation of growth rates in yield and output are not adequate to bring this out.

The exercise carried out in this section is a very broad approximation of the total reality to the replanting model characterised by a life span of 30 years and age at bearing of eight years. To be more precise one has to begin from particular crops with their own specificities and work out the paths of output and yield for each of these crops before coming to the aggregate. This larger exercise is beyond the scope of this

paper. Here we shall only illustrate the applicability of the model by taking the case of rubber and coconut. We turn to this in the next section.

Section 2: Output Cycles in Rubber and Coconut

In this section we apply the models to the case of rubber and coconut the two crops of which together account for nearly 50 per cent of the NSA in the state by the mid-eighties.

Table 3
Area Expansion under Rubber

Year	Apprx.Area ('000 hectares)
1940-41	12
1945-46	22
1950-51	28
1955-56	45
1960-61	120
1965-66	150
1970-71	179
1975-76	205
1980-81	237
1985-86	330

Source: Ministry of Commerce, Rubber Bulletin (Various Issues)

We begin with rubber. Table 3 provides data on the area expansion under rubber during the last forty years. The period between 1953-54 and 1963-64 reported an annual average increase of 14,000 hectares per year which declined to 8,000 hectares during 1964-65 to 1970-71 and to below 5,000 hectares after 1970-71 till 1980-81. Taking eight years to be the pre-bearing period and going by the conclusions of the RM the area increases would get reflected in output increases after about

sixteen years. Thus, corresponding to the sharp increases in area during 1953 to 1963 the increases in output would be shown only between 1969 and 1976. This is what the observed data in fact show as is evident from column 6 of Table 4. The pattern comes out much better when a three year moving average of these net increases in output are taken so as to smoothen the year to year fluctuations. This is shown in column 7. The discussion so far has abstracted altogether from the question of yield changes over the years. Let us turn to that now.

Table 4

Increases in Area and Production of Rubber in Kerala

Year	ANP	ARP	AGRP	ΔTA	ΔP	MAΔP	ModelΔP
1	2	3	4	5	6	7	8
1960-61	1309	-	1277	32	-	-	-
1961-62	1934	-	2272	-338	-	-	-
1962-63	4362	-	2274	2088	4009	-	-
1963-64	9109	-	2127	6982	5192	5159	-
1964-65	12433	-	2620	9813	6275	6118	-
1965-66	15735	1148	3534	13349	6888	5568	-
1966-67	14504	1691	3255	12940	3542	6638	-
1967-68	11762	1604	2422	10944	9483	6507	-
1968-69	13444	1277	1829	12892	6495	8801	4156
1969-70	16842	2272	1700	17414	10424	6251	5851
1970-71	15429	2274	1989	15814	1834	7486	6497
1971-72	8438	2127	1387	9178	10200	5018	7609
1972-73	8359	2620	1593	9386	3020	13095	9263
1973-74	8440	3534	1397	10577	26066	10876	11935
1974-75	9207	3255	1632	10830	3542	11438	13263
1975-76	8912	2422	1500	9384	4707	7111	11237
1976-77	7241	1829	1000*	8060	13084	4783	11961
1977-78	7317	1700	1300*	7717	-3442	3214	14425
1978-79	7419	1989	1900*	7508	-	neg.	13435
1979-80	3909	1387	4000**	1296	neg.	1238	7914
1980-81	3370	1593	4000	963	3714	945	8070
1981-82	2616	1397	4000	13	-878	5348	8588
1982-83	1874	1632	4000	-494	13207	7310	8701
1983-84	1233	1500	4000	-1267	9500	-	7564

Source: Same as in Table 3

Notes: * Area which had been planted 25 years back was taken as a rough approximation.

** Estimates of the Rubber Board from 1979-80 onwards.

Abbreviations used:

Column 2, ANP : Area coming in for tapping on account of New Planting.

Column 3, ARP : Area coming in for tapping on account of Replanting.

Column 4, AGRP: Area going out of tapping on account of Replanting.

Column 5, ΔTA : Net increase in tappable area over the previous year.

Column 6, ΔP : Net increase in output over the previous year

Column 7, MAΔP: 3 Year Moving Average of ΔP

Column 8, Model Δ P: ΔP are arrived at by taking a yield profile and rough yields of (in tonnes) 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 for the periods before 1960, 1960-65, 1965-70, 1970-75, 1975-80, 1980-85 respectively. Area is in hectares.

Taking the yield profile to be of the complex type, that is there is a period of low yield immediately after reaching the tapping stage[5] followed by a period of high yield during the rest of its life, and using the formula of the RM we may write,

Change in Production at time T = Area coming in for tapping at time T x 1/2 x yield + Area coming in fortapping at time T-8 x yield - Area going out due to replanting x yield.

where the yield figures are different corresponding to respective years.

Taking some rough figures for yield at various points of time a series for change in production was computed (column 8). The rough correspondence between these generated figures and the three year moving averages go to show that the rough yield figures taken for computation correspond to the underlying reality. This reality is simply one where yield has more than doubled over a thirty year period.[6] Needless to say this whole exercise can be refined in various ways to throw up fairly accurate figures. This is not carried out here for the concerns of this paper are broader issues.

The increasing yield does not get reflected in sharp increases in output owing to the complex yield profile and the

complexity brought about by replanting. The period of rapid new planting since tha late seventies seems to have merged at some point with the massive replanting. The replanting is of the area brought under rubber in fifties and early sixties. This may well continue into the early nineties accentuating the already non-uniform distribution of area. Going by the conclusions of the model the massive new planting and replanting of the recent period would show up as sharp increases in output from the late nineties. Thus, the non-uniform distribution of area would only bring a certain cyclical behaviour in output with one peak being observed in the early seventies to be followed by another about twenty five years later.

The case of coconut is more difficult to handle because the life span of the tree is much longer; the gestation period is longer and the yield profile is more complex. Taking the age at bearing to be ten years and the life span to be 50 years and working through the UM, we attempt at generating the total number of palms and the number of bearing palms with their associated age distribution. We begin with the area under coconut with a certain age distribution as of 1930 and go on to generate the figures till 1980 through the model, taking the given area increases (column 2), in Table 5. Three special cases or variations are considered so as to take into account the possibility of conversion of area under coconut. The variations throw up better estimates of the number of bearing palms in that they are closer to the official figures (as is evident from

column 10). Variation III seems to be the best,[7] which points to vast areas not coming for underplanting in the seventies, if not earlier. In fact, the districts of Kottayam and Alleppey were losing area under coconut since the late sixties while the northern districts were gaining area [See Narayana et.al (1988)]. This has resulted in a regional shift in area under coconut with its effects on yield and output which we shall come to in a minute.

The characteristic expansion of area and underplanting led to specific changes in the total number of palms, number of bearing palms and the age composition of palms. Taking the output question first in abstraction of the yield profile and yield changes, the changes in the number of bearing palms in itself must have led to a decline in output over the seventies after showing steady increases during the sixties. This is in fact so. The output of coconuts which increased from 3220 million nuts in 1960-61 to 3981 million nuts in 1970-71 steadily came down during the seventies reaching a level of 338 million nuts by 1980-81. Since then, it has started increasing in response to the increase in the number of bearing palms.

Table 5

Area, Palm Population and its Age Distribution in Kerala

Year	Area in '000 hectares	Distribution of Area by age of garden (years) 0 - 10	10 - 20	20 - 30	30 - 40	40-50	Palm population (million)	Number of palms per hectare	Number of bearing palms (million)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1930	400	150	150	100	0	0	72	180	45
1950	400	(100)	0	150	150	100	90	225	72
1960	550	150+(150)	100	0	150	150	126	229	72 (75)
1970	700	150+(150)	300	100	0	150	153	219	99 (108)
1980	700	0	300	300	100	0	126	180	126 (96)
		I Variation : 50,000 has. area shifting away from coconut							
1970	700	150+(100)	300	100	0	150	144	206	99 (108)
1980	700	50	250	300	100	0	126	180	117 (96)
		II Variation : 100,000 has. shifting away from coconut							
1970	700	150+(50)	300	100	0	150	135	193	99 (108)
1980	700	100	200	300	100	0	126	180	108 (96)
		III Variation: 150,000 has. shifting away from coconut							
1970	700	150	300	100	0	150	126	180	99 (108)
1980	700	150	150	300	100	0	126	180	99 (96)

1. Method of Computation : Area figures are the only data taken, but rough approximations. Stand per hectare is taken as 180. When a garden turns 40 years underplanting is carried out. The bearing age of trees is ten years.

2. Figures within brackets in column 3 are area underplanted.

3. Figures within brackets in column 10 are estimates by Bureau of Economics and Statistics based on sample surveys.

The question of yield change is rather difficult to handle for want of appropriate data on exact distribution of palms by age and yield profile. If we assume the 20 to 40 years of age as peak bearing age then going by our model as worked out in Table 5 the percentage of bearing palms in the peak bearing

age which was 75 in 1950 came down to 40 percent by 1960 and to about 20 percent by 1970. The percentage has started going up since then and must have reached around 60 by 1980. The per palm yield which is crucially dependent on the percentage of palms in the peak bearing age was declining all through the sixties and early seventies- from 41 nuts in the early sixties to 33 in the early seventies. Altough it had not begun its upward climb the very fact that it had not shown any further decline since the mid-seventies, remaining at around 31, is explained by the turn around in the percentage of bearing palms in the peak bearing age.

The regional shift in area must also have been acting against any sharp increase in the overall yield per palm because the northern districts report lower yields than the districts in the Travancore region. A rough computation shows that the area shift is of the order as shown in Table 6. Given the yield differences across the districts such a shift will induce a decline in overall yield even when the yield levels across the districts remain the same or are increasing.

Table 6

Distribution of Area under Coconut

Region	Distribution of Area (in percentages)	
	1960-61	1981-82*
Trivandrum, Quilon	23.91	21.43
Alleppey, Kottayam	26.88	21.85
Ernakulam, Trichur	16.01	18.18
The Malabar Districts	34.00	38.54
Total	100.00	100.00

Source: Same as in Table 5.
Note: * The distribution is of bearing palms.

Though no satisfactory explanation of the many observed patterns could be given a few points no doubt emerge from the discussion so far. The question of overcrowding [the number of palms per hectare being 25 to 30 percent above the accepted norm of 180] which is often held to be the reason for low yields is no overcrowding at all but mere maintenance of the tree population in its bearing stage through underplanting. There is no easy way of getting to understand the changes in yield but through the distinct yield profile and age distribution. This whole exercise is rather complicated because we do not have much information on the yield profile, especially the declining phase of it late in the life of the tree, and the age distribution of the palms. As is evident from the model, improvement in yield can only be assessed with this background and hence are not taken up here at all. But we could safely assert that such improvements will get manifested only over a period of forty to fifty years depending upon the life-span of the tree and will be imperceptible in the

face of fluctuations induced by weather and other factors unless they are really massive. And probably there is no such massive increase if we go by the outright rejection of the so-called HYVs by our farmers [See Narayana et.al (1988)].

There is an important implication of the long term scenario of slow increases, or stagnation in output of tree crops to the individual farmer's response. Depending upon the price situation (taking for the present that there are upswings and downswings in prices which is gone into in the next section) they would probably take better care, or apply more manure during the upswings. During the downswings their response would probably be to grow inter-mixed crops more intensively. For decades banana and pepper have been grown in coconut and arecanut gardens. But in the early seventies when the output increases of many crops were small[8] and prices were depressing a new dimension was added by the introduction of a number of minor crops like cocoa, nutmeg, nutmace and other spices. Although taken in themselves they do not add upto much, given the non-uniform distribution of area and the particular phase of the tree crop economy this simply was a response of the farmer to a situation of declining or stagnant incomes.[9]

Section 3: Price Cycles and Income

Having confined the discussion in the last section to the physical plane and to the level of individual crops with their specificities let us get back to the aggregate level. It

is, of course, possible to move from the level of individual crops to a composite using fixed area weights or fixed price weights and talk about changes in that composite in exactly the same sense as the output of any individual crop. This still remains at the physical plane in the sense that we cannot talk of changes in income brought about by changes in prices. How do we then reach the plane of incomes and talk about changes in the same?

To reach the plane of incomes and changes in the same it is necessary that the play of prices be brought in explicitly. Let us begin with the basic equation,

Income (Y) = Output (O) x Unit Value (P)

We may express the change in income between two points of time O and 1 as:

$$Y_1 - Y_0 = O_1 P_1 - O_0 P_0 .$$

Now,

$$O_1 = \Sigma_i \, q_{1i} \, p_{1i} / \Sigma^i \, p_{1i}$$

$$O_0 = \Sigma_i \, q_{0i} \, p_{1i} / \Sigma p_{1i}$$

where q_1 is the output of the i th commodity and pi its price.

Similarly, the unit values may be expressed as weighted averages of individual crop prices,

$$P_1 = \Sigma_i \, P_{1i} \, q_{0i} / \Sigma_i q_{0i}$$

$$P_0 = \Sigma_i \, P_{0i} \, q_{0i} / \Sigma_i \, q_{0i}$$

Supposing that there was no increase in the physical output between the two time points, we can write

$$O_1 = O_0 \Rightarrow \Sigma_i \, q_{1i} \, p_{1i} = \Sigma_i q_{0i} \, p_{1i}$$

Then,

$$Y_1 - Y_0 = O_0 / \Sigma_i q_{0i} \; [\Sigma_i p_{1i} q_{1i} - \Sigma_i p_{0i} q_{0i}]$$

The term within the bracket on the R.H.S. is the difference of domestic product in agriculture at current prices between the two time points. The change in income received by farmers is entirely owing to price changes and is proportional to the change in domestic product in agriculture at current prices. In what sense is such a change real?

The change is real and is a real increase when the prices received by the farmers more than compensate for the prices paid by them. In order to assess the real gains an ideal index number would have been the index of parity between prices received and paid by farmers. But the existing index number of parity suffers from many inadequacies[10] and hence we use the consumer price index (CPI) number for urban workers to deflate the Gross State Domestic Product in agriculture at current prices to arrive at real income.[11] Such a deflated series [Column 3 Table 7] showed a mild increase of 0.8 per cent per annum over 1970 to 1987 pointing to some increase in real income of the

Table 7

Gross Domestic Product of Agriculture in Kerala

Year	GSDP (In Agriculture at Current Prices)	Real GSDP*	Index of Column 3
(1)	(2)	(3)	(4)
1970-71	59420	59420	100
1971-72	55778	55225	93
1972-73	65258	60989	103
1973-74	87556	68403	115
1974-75	95710	56970	96
1975-76	94378	-	-
1976-77	102375	62424	105
1977-78	101283	63302	107
1978-79	110996	66865	113
1979-80	126907	70898	119
1980-81	129384	63424	107
1981-82	131163	57276	96
1982-83	153826	63303	107
1983-84	199323	72481	122
1984-85	214908	69102	116
1985-86	191989	59810	101
1986-87	228515	65290	110
1987-88	253149	66971	113

Source: GOK, Statistics for Planning and Economic Review. (Various Issues)

Note: * In computing column 3 we have used the conumer price index number of urban workers for Trivandrum centre. Although one cannot go by the absolute figures presented in column 4 which would have been different if one had used a different CPI the trend would not have changed.

agriculture sector in Kerala. As already pointed out such an increase is purely on account of relative price movements to the characteristics of which we turn now.

Table 8

Indices of Prices Relative to CPI
(1970-71 = 100)

Year	Rice	Tapioca	Coconut	Arecanut	Cashew	Pepper	Rubber*
1960-61	84.9	71.7	71.7	135.8	109.4	122.6	132.1
1961-62	89.0	89.0	69.2	181.8	76.4	92.7	127.3
1962-63	78.9	82.5	77.2	129.8	68.4	71.9	122.8
1963-64	84.5	74.1	72.4	139.7	86.2	75.9	120.7
1964-65	117.2	132.8	73.4	142.2	82.8	101.6	109.4
1965-66	134.3	121.4	98.6	148.6	97.1	82.9	100.0
1966-67	144.9	111.5	83.3	111.5	96.2	75.6	89.7
1967-68	177.6	131.8	94.1	115.3	104.7	61.2	104.5
1968-69	130.4	108.7	75.0	107.6	96.7	57.6	96.7
1969-70	117.7	93.8	91.7	108.3	109.4	94.8	113.5
1970-71	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1971-72	108.9	100.0	73.3	79.2	112.9	82.2	90.1
1972-73	123.4	115.9	86.9	60.7	146.7	79.4	92.5
1973-74	162.5	132.0	122.7	64.8	183.4	100.8	86.7
1974-75	162.5	108.3	89.3	54.2	117.9	97.6	108.9
1975-76	-	-	-	-	-	-	-
1976-77	96.0	105.0	98.0	72.0	220.0	155.0	78.0
1977-78	91.0	88.0	109.0	69.0	239.0	163.0	85.0
1978-79	-	-	-	-	-	-	123.0
1979-80	-	-	-	-	-	-	122.0
1980-81	82.0	87.0	120.0	100.0	257.0	96.0	128.0
1981-82	86.0	104.0	88.0	94.0	205.0	86.0	138.0
1982-83	95.0	124.0	105.0	89.0	140.0	80.0	128.0
1983-84	101.0	124.0	156.0	97.0	226.0	102.0	137.0
1984-85	71.0	89.0	148.0	10..0	194.0	1..2.0	115.0
1985-86	83.0	135.0	81.0	100.0	236.0	219.0	116.0
1986-87	77.0	132.0	122.0	275.0	275.0	242.0	106.0

Source: Same as in Table 7.
Note : * The price was controlled till 1968.

As is evident from Table 8 the period between 1964 and 1987 can be divided into two distinct sub-periods in terms of the movement of prices relative to the CPI. The index of price of rice which was above the CPI line till 1975-76 went below it the next year and remained well below it during the rest of the period. The movement of prices of all the tree crops showed a marked contrast in that they remained below the CPI line till the mid or late seventies moved up and remained above it since then.

Compared to this pattern the price behaviour of arecanut and tapioca stand out. The price index of tapioca was above the CPI all through the period, with the exception of the late seventies, and that of arecanut above it till 1970-71and below it since then.

On the whole, as regards the behaviour of prices the mid or late seventies form a dividing line. The period till then favouring the price of rice and the period beyond favouring the prices of the tree crops. The increase in real income observed above was on account of the sharp increase in the prices of the major cash crops in the state.

Now, the price behaviour of tree crops itself seems to be closely related to the changes in output. This is a larger issue the full ramifications of which we cannot go into here. But taking the two specific crops studied, namely rubber and coconut, it may be seen that the price of rubber which was slightly above the CPI line till 1970-71 went below it the next year and remained well below it for the next seven years which was roughly the period of a sharp increase in output the structural factors behind which are explained above. The output of coconut was steadily increasing from the early sixties to the early seventies and the price of coconut was well below the CPI line all through this period.[12] The drop in production since the early seventies triggered off a rise in price.

The argument that the cyclical growth path of output underlying which is the non-uniform increase in area under crops resulted in a cyclical behaviour of prices has another side to it. That is, does this growth path of output or equivalently the non-uniform increase in area come about in the first place by a cyclical behaviour of price. This is a question we cannot answer here. We go back to the question of real incomes started with.

The improving real incomes in agriculture are getting reflectd in the asset holding position of rural households in Kerala. Per capita asset value wise Kerala which held the eighth rank in 1971 climbed to the second rank by 1981. As land accounted for nearly 70 percent of the total assets and as land values have been increasing rather sharply ranking of the states was attempted in terms of assets exclusive of land. The picture did not show any change pointing to the fact that increases in household durables, buildings, and other such tangible assets have also been equally sharp in Kerala [See Narayana (1989)]. Then, it could, in fact, be argued that the undue increases in land values in Kerala (700 per cent compared to around 300 percent in other states) itself was owing to the sharp increases in prices of most of the cash crops. The impact of the sharp increase in prices is widely felt is evident enough from the general improvement in the asset holding position of the rural households.

Section 4. Some Speculations on Farmers' Incomes:

It is one thing to talk about changes in price and real incomes in agriculture but quite another when it comes to its distribution among factors. Out of the income accruing to the farmer one of the important factor payments is wages. How has the share of wages in value added been behaving over the years? It is not an easy question to answer and we do not propose to provide a complete answer. But there is an off-shoot of our discussion of price behaviour which we wish to mention here.

Let us begin with the wage share in value of output,[13]

Wage share = W.L./P.O where, W is the money wage rate
L is the labour input
O is the output, and
P is the price.

There is no reason to expect the second term on the R.H.S. (L/O) to increase as the crop shift would have only reduced it. As regards the first term (W/P), if we replace P by the price of rice it would show an increase from the late seventies. Now, as the price increase for the other crops has been sharp since the late seventies, when W is deflated by any of these other prices it would not show such increases. In the net then W/P must be maintaining its level. So, there is no reason to expect the wage share to go up during this period.

However, there is a catch in the argument regarding the movement of wage share provided above. The time series data on wage rates pertains to what is called common paddy field labour hired on casual basis and the rates are for a standard man-day. In a situation of rapid changes in cropping pattern, labour mobility (both spatial and occupational) and aversion to certain manual operations comparison of wage rates as in the above has only a limited relevance because labour hiring practices themselves may have changed. In the context of changes in labour hiring practices comparison of real wage rates or labour use per unit of output is not at all an easy matter and calls for great care and caution.[14] So, this issue cannot be resolved here. But going by the available data there is no reason to believe that the incomes of farmers are affected to any great extent.

Concluding Observations:

Given the structural characteristics specific to tree crops any non-uniform increase of area under tree crops over a period of time, or non-uniform distribution of area over age of trees at a point of time results in output and yield cycles. Under such circumstances, a mere statistical analysis of such observed data on output and yield over a period of fifteen or twenty years could not be taken to conclude that the period is one of all round stagnancy. In fact, the period could as well be one of intense investment activity in replanting, under-planting and intermixed cropping as is the case from the mid-seventies onwards.

Stagnancy or decline n output and yield over long periods need not necessarily mean stagnancy in income levels. This would depend on the movement of relative prices, and analysis of agricultural incomes at constant prices would totally miss out the real movement of incomes.

In an agricultural economy predominated by tree crops, under conditions of stagnant output and increasing real wages farmers' incomes need not show any declines. This again would depend on the movement of relative prices as is shown by the Kerala experience of recent years.

On the whole, relative price movements play a central role in determining the growth path of output, agricultural incomes, and the share of wages in value of agricultural output. But the relative price movements are a complex outcome of the cyclical path of output, world market prices of export crops, and import of some of these commodities. Thus, our export-import strategy regarding many of those crops has an immediate bearing on movements of prices and in turn production. It is hardly ever that a long-term export-import strategy is adopted keeping the structural characteristics of tree crops and the requirements of Kerala's agricultural development in mind.

NOTES

1. Note that the figures given in this paper are all rough approximations. It is not an exercise in arriving at exact numbers.

2. Although pepper is not a tree crop, going by the characteristics enumerated above it can be taken to be one such.

3. If we assume the distribution of 1235 thousand hectares as of 1975 to be uniform [at 41.2 thousand hectares each year] the effective bearing area for the agricultural economy as a whole would be 2200 - (41.2x8) = 1870. It would be coming down at the rate of 27 till 1983 reaching a level of 1654 in that year.

4. The conclusion is not as straightforward as it is here made out to be. Corresponding to the replanting of additional area under rubber if there was area under some other crop reaching the bearing age the conclusion would have been different. But this, in fact, is not so and our conclusions are valid.

5. Instead of the term bearing age used so far we use the term tapping stage going by the common usage.

6. The yield we refer here are the yields of the trees reaching the tapping stage in those points of time.

7. Still it is far from approximating the reality as is observed in the 1970s and 1980s. The estimates of palm population are wide off the mark; the stand is wide off the mark. Obviously the life span is longer than 50 years and the age at bearing is different. More importantly, all these may be changing during the period from 1930 to 1980.

8. Rubber is the exception. But the possibility of inter-mixed cropping is also minimal in the case of rubber.

9. One cannot talk of incomes without bringing in the question of price changes which we come to in the next section.

10. We need simply quote from Eswarankutty et.al (1983):
" .... many of the important items for the cultivation cost have not been accounted for. Chemical fertilisers and insecticides are some of the chief omissions. Again weights assigned to the components of the cultivaton cost are arbitrary. In the light of the above comments it is seen that the present computation of parity index is no realistic

index of parity for the agricultural sector".

11. One may ask why a CPI for urban workers. We can only say that it has to be something different from the price index for agricultural labourers and hence we have used the CPI for urban workers.

12. This story is slightly complex because of the large scale import of copra and coconut oil till the early seventies.

13. It should have been wage share in value added but we have kept to the level of value of output all through this discussion.

14. For an instructive analysis of this issue see Narayana and Nair (1989).

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