

New Agricultural Technology: A Gender Analysis

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In this study, an attempt is made to assess the impact of the new agricultural technology (NAT) on rural male and female workers in terms of employment, wages and living conditions in Thiruvaiyaru taluka of Thanjavur district in the state of Tamil Nadu. Based on a sample survey, the study reveals that NAT in paddy cultivation has increased the time spent on different activities and has also generated additional employment for both sexes per season. The NAT has doubled the return on investment on farm, through an increase in the yield per acre. Despite the increase in productivity per acre, cropping pattern is undergoing a change with area under paddy cultivation declining. Money wages have increased, but there is no increase in the real wages of the workers. About 25-35 per cent of the families bear the brunt of poverty and the incidence of poverty is higher among the landless labour households. To reduce overcrowding of women into agriculture as labourers, women need access to inputs such as education, training, credit and other agents of growth and change.

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INTRODUCTION

In recent decades the role of women has increased to a great extent in all walks of life. But the number of women engaged in agriculture has always been high. Nearly 63 per cent of all economically active men are engaged in agriculture as compared to 78 per cent of women. Almost 50 per cent of rural female workers are classified as agricultural labourers and 37 per cent as cultivators. The corresponding figures for men is the reverse: 55 per cent cultivators and 24 per cent as agricultural labour. In the Himalayas, a research study reveals that a pair of bullocks work for 1064 hours, a man for 1242 hours, and a woman for 3485 hours in a year on a one hectare farm. For a one hectare farm, women, on an average, spend 640 hours for agricultural operations like weeding, 384 hours for irrigation, 650 hours for transporting

organic manure, 557 hours for sowing, and 984 hours for harvesting and threshing (India, 1995: 60).

Women in the three main rice-growing States of Kerala, Tamil Nadu, and West Bengal make crucial contributions to the entire process of cultivation. Outside ploughing, an exclusively male task, women have a predominant role in transplanting, weeding, manuring and fertilising, harvesting, threshing, winnowing, drying, stacking and carrying the produce. More than two-thirds of the labour inputs are provided by women (India, 1995).

Micro-level studies quoted here show that modern agricultural technologies have increased the per hectare absorption of female labour (Acharya and Panwalkar, 1988: 120-133; Chand, Sindhu, and Kaul, 1985: 87-95). Contrary to the above conclusion a study of Punjab and Haryana (where there is the lowest work participation rate of women — 3.09 per cent and 4.82 per cent respectively) show that the Green Revolution with its tractorisation, agricultural mechanisation and high yielding variety (HYV) technology have rendered women jobless (Singh, 1980: 18-19). Another study of Tamil Nadu, West Bengal and Kerala highlight that any innovation in paddy cultivation, whether it is a switch over from traditional manures to artificial fertilisers, from weeding out herbs to use of herbicides, from manual transplanting to machine transplanting, throws women out of work (Mencher and Saradmoni, 1982: 149-167). On the basis of data from Andhra Pradesh and Tamil Nadu, it is found that there is a positive correlation between the spread of HYV cultivation and the demand for male and female casual labour (Agarwal, 1991:233). A study of West Bengal reveals two divergent trends in agricultural modernisation. Agricultural modernisation is uneven with some southern parts of the State being highly modernised. In the agriculturally developed villages of Hooghly district, the demand for male workers has increased and a section of female agricultural workers has been displaced (Singha, 1992:23).

An inter-district analysis of female work participation in Tamil Nadu points out that though women workers in Tamil Nadu make up 34.5 per cent of the State's total labour force (India, 1991), their rate of employment is greater than 34.5 per cent in the occupation of agricultural labourers and household industry, highlighting the fact that women are being segregated into these occupations. The largest number of female agricultural labourers are found in Thanjavur district (73.3 per cent), which also accounts for high rate of agricultural

development. Linking female participation as agricultural labourers with the area under irrigation, the above study came to the conclusion that the districts which have highest percentage of area under irrigation are the districts, which have high rate of female agricultural workers. Thanjavur district has got the largest area under irrigation (4,15,230 hectares) vis-a-vis highest percentage of female agricultural workers — 73.3 per cent (Sundari, and Amaresh, 1995: 133-152).

According to eco-feminists (Shiva, 1988: 81-85; Sontheimer, 1991:3), the 'Green Revolution', which focussed on increasing yields of rice and wheat, entailed a shift in inputs from human to technical. Where earlier women played a significant role in managing the agricultural systems, their knowledge and inputs are now marginalised by technological interventions. Their role in agricultural production has shifted from being primary producers to subsidiary workers. The proportion of women as cultivators has decreased from 45.4 per cent in 1951 to 34.5 per cent in 1991, while their participation as agricultural labourers rose from 31.4 per cent to 44.2 per cent in 1951 to 44.2 per cent in 1991. For these women, the HYV rice technology may have increased employment opportunities, but particularly for women of poorer households, the results was also an increased workload without any improvement in their standard of living. (Agarwal, 1988:27).

The HYV have a low yield of fodder, which increases women's work in ensuring its supply. Further, they produce short and hard straw, which are useless as fodder for animals. The use of combined harvesters leaves virtually no crop residue. The HYV seeds have adversely affected our biodiversity, as their consumption of water, fertilisers and pesticides are also very high. Further, the Green Revolution has brought about dramatic changes in our land use pattern. More lands are now shifted from food to cash crops and this shift could jeopardise the very food security of the nation, as it has happened in other third world countries (Sundari, 1999: 149-154).

The above review points out that the impact of technology has been uneven across the regions and its impact on gender has been diverse. The subject of technological change and the issue of its impact on rural women is still a complicated area. This study is an attempt to assess the impact of NAT on rural male and female workers in the Thiruvaiyaru taluka of Thanjavur district in the state of Tamil Nadu.

OBJECTIVES AND HYPOTHESIS

The objectives of the study were to:

- study female work participation in Thanjavur district;
- measure the impact of the NAT used in paddy cultivation on rural males and females in the study villages of Maharajapuram and Karaikudi of Thiruvaiyaru taluka in Thanjavur district with regard to employment, wages and living conditions; and
- assess the economic status of rural households in the study villages.

The hypothesis of the study was that 'the technological change has increased the time span of different activities related to paddy cultivation, both for cultivators and agricultural labourers and for both males and females'.

METHODOLOGY

The study is based on both primary and secondary data. Out of nine talukas in Thanjavur district, Thiruvaiyaru taluka was purposively selected on the basis that industrial activity in this taluka is relatively lesser and about 73 per cent of the population directly depend on agriculture for their livelihood, either as cultivators or as agricultural labourers. Karaikudi, which is about one kilometre from Thiruvaiyaru (the district headquarters), and Maharajapuram (12 kilometres from Thiruvaiyaru), were purposively selected as more than 90 per cent of rice cultivation in these areas are under irrigated conditions and also account for large scale adaptors of HYV of rice in this district. Of the 50 sample selected at random from Maharajapuram village (which accounts for 88 cultivator households and 254 landless households), 12 were cultivators and 38 agricultural labourers. Among the 50 sample selected at random from Karaikudi (out of 115 cultivator households and 212 landless households), 18 were cultivators and 32 landless agricultural labourers. The survey covered about 15 per cent of the total households in the two villages. The villages selected will be referred in this study as M (Maharajapuram) and K (Karaikudi).

Secondary data were collected from the Taluka Office, Thiruvaiyaru; District Statistical Office, Thanjavur; records of village administrative officers of Karaikudi and Maharajapuram; and records of Block Statistical Office. Besides these records, Census Reports, season and crop reports, books and journal articles related to the subject were also consulted.

The period before NAT refers to the period before the kharif crop of 1966 and the period after NAT refers to the period after the kharif crop of 1966. The data analysed in this study refers to the year 1997 while the data on household income relates to the period 1996-1997. For information on agricultural situation before NAT, men and women who were economically active during the 1960s and were members of the sample households were contacted as there were no official records in this regard. About 31 men and 24 women are interviewed for this purpose. It is important to note here that the reliability of the data collected for the period before 1966 is subject to the limitations of the recall error and memory lapse on the part of the respondents.

GREEN REVOLUTION IN TAMIL NADU

No State is more closely identified with the gains of the Green Revolution than TAMIL NADU (after Punjab). With over 50 years of planned development, TAMIL NADU has achieved significant progress in the agricultural sector. Starting with the use of HYV seeds and fertilisers, the Green Revolution achieved an increase in the yield per acre. Within TAMIL NADU, no district is more enthusiastically advanced as a model for emulation by other parts of the region than Thanjavur, known as the 'Granary of the South'. An extensive irrigation system, together with fine alluvial soil in large parts of the Cauvery delta, marked Thanjavur as one of the districts with a highest potential for development when the IADP was first introduced in 1960-1961. The dramatic achievement of the 1966 kharif season provided the foundation for a projection of the Green Revolution in Thanjavur. The advent of ADT 27 presented the opportunity to convert most of the single cropped area into double cropped land.

FEMALE WORK PARTICIPATION IN THANJAVUR DISTRICT

According to the 1991 Census (India, 1991), female work participation (FWP) in Thanjavur district is 24.7 per cent whereas for males, it is more than double, that is, 57.4 per cent. Among the talukas, Pattukottai taluka accounts for the highest FWP (30.9 per cent) followed by Peravoorani taluka (28.6 per cent) and Orathanadu taluka (23.9 per cent). The lowest FWP is noticed in talukas such as Thiruvaidaimaruthur (14.5 per cent), Papanasam (17 per cent) and Kumbakonam (18 per cent). The FWP in Thiruvaiyaru taluka — the

geographical area of this study — is 18.5 per cent (as per the 1991 Census), which is much lower than the FWP rate in Thanjavur district (24 per cent) and TAMIL NADU State (30.88 per cent). The taluka-wise variation in FWP is due to the uneven patterns of development among the regions. The FWP is lower in agriculturally backward talukas (such as Thiruvaidaimaruthur, Valangaiman) and is higher in agriculturally well-developed talukas (like Pattukottai, Peravoorani and Orathanadu).

A depressing feature of female employment in Thanjavur district is the over crowding of women into the occupation of agricultural labourers. While women's participation in agriculture as cultivators have declined from 26.2 per cent in 1950-1951 to 14.5 per cent in 1990-1991, their participation as agricultural labourers have increased from 17.4 per cent in 1950-1951 to 72.8 per cent in 1990-1991 (Table 1). Thanjavur district is basically an agrarian region, with women's participation in industrial activities being as low as 2.7 per cent.

TABLE 1: Occupation-Wise Women's Work Participation in Thanjavur District

<i>Category</i>	<i>Percentage</i>				
	<i>1950-51</i>	<i>1960-61</i>	<i>1970-71</i>	<i>1980-81</i>	<i>1990-91</i>
Cultivators	26.2	33.4	10.2	12.9	14.5
Agricultural Labourers	17.4	48.5	71.6	66.7	72.8
Industry	7.6	2.4	2.4	5.3	2.7
Others	12.1	6.6	13.5	10.5	5.3

Source: Census of India, TAMIL NADU Series.

A World Bank Report of 1991 points out that, together with male migration into non-farm employment, agricultural modernisation appears to be an important factor behind the rising proportion of women in Indian agriculture. In at least one respect this may be considered a positive development, more rural women are finding paid employment in agriculture. At the same time, agriculture wage labour is generally viewed as the least desirable form of employment and is taken up only by the poorest. An increase in the share of the females in the workforce in this category, relative to men and relative to other possible female occupations, can also be considered a negative sign, an illustration of women's disadvantaged position in the economy and an indication of increased disparity and poverty.

IMPACT OF NAT ON EMPLOYMENT OF RURAL MALES AND FEMALES

The impact of NAT used in paddy cultivation is assessed in terms of:

- time spend (in hours) on different activities related to paddy cultivation by both cultivators and agricultural labourers and for both sexes; and
- return on farm investment before and after NAT and a comparison of cost of living index with agricultural wage index.

Time Spent by Male and Female Cultivators in Paddy Cultivation

Operations such as ploughing, preparation of nursery, transplantation, weeding, application of fertilisers and pesticides, harvesting, post-harvest activities (which includes shelling and winnowing) are taken into account for analysis. Table 2 highlights that while for male cultivators the average time spent in overall paddy cultivation has increased by 254 per cent, the increase for female cultivators is only 78 per cent.

TABLE 2: Average Time Spent by Cultivators on Different Activities Related to Paddy Cultivation in Sample Villages (Per Season* in Hours)

Activities	Before NAT		After NAT	
	Male	Female	Male	Female
Pre-sowing	20	Nil	44.48 (122.4)	Nil
Sowing	15	10	35.27 (140)	24
Transplantation	10	10	65.89 (558.9)	22.66 (176.6)
Weeding, Fertilisers and Pesticides Application	10	20	85.45 (754.5)	30.64 (53.2)
Harvest	30	15	69.76 (132.5)	19.17 (27.8)
Post-harvest	Nil	30	Nil	50 (66.66)
Total	85	85	300.85 (253.9)	151.47 (78.2)

Source: Compiled on the basis of the primary survey

Notes *Per season = 4 months

Figures in parentheses show the percentage change.

The total hours of work in pre-sowing operations, performed exclusively by males before and after the introduction of NAT, has more than doubled for men over the years 1967 and 1997. Pre-sowing activities include bunding and ploughing. Bunding requires physical strength and ploughing through tractors, requires training and skill. Thus, the pre-sowing activity is male-dominated.

Regarding sowing, it is observed that for female cultivators it has increased from 10 hours before NAT to 24 hours after NAT, thus accounting for about an increase of 140 per cent over the period. For men also, the hours of work has increased from 15 to 35, but the rate of increase is little less (135 per cent) in comparison to the rise in the number of hours for women cultivators. The reason for this trend is that, sowing is generally performed by male agricultural labourers, and women cultivators supervise them.

Though transplantation is performed exclusively by women, women's participation as cultivators shows an increase of just 18 hours per season, whereas for men the increase is 56 hours per season. As transplantation is an important operation, male cultivators actively engage themselves as supervisors and if the nursery is not prepared, they choose quality baby plants from agricultural outlets.

Regarding application of fertilisers and pesticides, it is seen that male cultivators have gained as the time spent by them has increased from 10 to 86 hours, thus recording the highest rate of increase of 755 per cent. For women, the percentage increase is just 53 per cent (that is, from 20 to 31 hours). It is important to note here that before NAT women's participation was two times more than that of men (that is 20 hours). This is because, before the introduction of NAT, natural manures such as neem seeds, dried neem leaves, cattle wastes, and so on were used largely and women's involvement was greater. But the introduction of chemical fertilisers and pesticides has displaced the requirement of women's labour and promoted male domination in this operation. Also, the hand sprayers which are widely used in for using the fertilisers and pesticides weighs about 30-35 kilograms. Since women lack the physical strength to carry the equipment on their backs for five hours, they are excluded from this operation.

Involvement of women in post-harvest activities has increased to the extent of 66 per cent. The use of mechanical threshers, which performs all operations of threshing, shelling and winnowing, is a labour-saving device. Male cultivators generally do not look into post-harvest activities; only women cultivators do that. As wages for

harvest is not paid in cash, but in kind, male cultivators engage themselves in measuring the produce for wages.

Overall, it can be concluded that for both sexes, the time spent on paddy cultivation has increased after NAT, but for women cultivators the increase is much as lower compared to men cultivators.

Time Spent by Male and Female Agricultural Labourers in Paddy Cultivation Before and After NAT

For both female and male agricultural labourers, the average time spent on different activities of paddy cultivation was 324 hours per season, before the introduction of NAT. After introduction of NAT, it increased to 470 hours per season, an increase of 45 per cent. Sex-wise changes show that while for male agricultural labourers the time spent accelerated from 149 to 221 hours (by 49 per cent), the increase for female agricultural labourers was from 175 to 249 hours (an increase of 42 per cent) (Table 3).

TABLE 3: Average Time Spent by Agricultural Labourers on Different Activities Related to Paddy Cultivation in Sample Villages (Per Season* in hours)

Activities	Before NAT		After NAT	
	Agricultural Male	Labourers Female	Agricultural Male	Labourers Female
Pre-sowing	48	Nil	25.4 (-47.1)	Nil
Sowing	10	10	33.99 (239.9)	9.11 (-8.9)
Transplantation	10	35	22.7 (127)	64.01 (82.88)
Weeding, Fertilisers and Pesticides Application	1	40	23.33 (2333)	72.88 (82.2)
Harvest	65	65	102.8 (85)	90 (38.46)
Post-harvest	15	25	12.81 (-14.6)	11.8 (-52.48)
Total	149	175	221.3 (48.5)	248.88 (42.2)

Source: Compiled on the basis of the primary survey

Notes * = Per season = 4 months

Figures in parentheses show the percentage change.

For male agricultural labourers, pre-sowing activity decreased from 48 hours to 25.4 hours — a decrease of 47 per cent. This is due to the use of tractors for ploughing; earlier it was done by bullock driven

ploughs. After the introduction of NAT, the time spent on the application of fertilisers and pesticides increased to 23 hours. Earlier it was just one hour per season. Dried neem leaves and powdered neem seeds were used as pesticides and sometimes ash was sprinkled over the plants to protect them from insects. A tremendous increase by 2333 per cent for male agricultural labourers exhibits the role of male agricultural labourers and the importance of pesticides and fertilisers.

Post-harvest activities has declined for male labourers from 15 hours per season to 12.8 hours (-14.6 per cent) purely due to the introduction of mechanical threshers. For female labourers, the sowing activity has marginally fallen from 10 hours per season to 9.11 hours (-8.9 per cent). This marginal decline is attributed to the fact that whenever the monsoons fails, cultivators go for direct sowing and only male workers are employed. Women are seldom employed for sowing though they may help the men in preparing the nursery. Post-harvest activities for women agricultural labourers has also declined from 25 hours to 11.88 hours (-52.48 per cent), which is also due to the introduction of NAT. Hand pounding was done to remove the husk; these days rice mills perform this task along with the polishing of grains.

Transplantation and weeding, where only women are preferred, show an increase of 82 per cent after the introduction of NAT. Harvesting of paddy is the only activity, in which both men and women work together. It has moved up to the tune of 38.5 per cent for women workers. This enhancement has to be related to an increase in yield per hectare. Higher yields demand more workers to harvest the produce, as the use of the harvester combine was uncommon in the study villages.

In general, it can be inferred that while the hours of work have increased for both male and female agricultural labourers, a negative trend is seen for male workers in pre-sowing and post-harvest operations. For women workers also, participation rate has declined marginally in sowing and significantly in post-harvest activities, thus implying that modernisation of agriculture has affected both men and women, particularly in post-harvest operations.

Number of Employment Days in Paddy Cultivation

On the basis of five hours being equivalent to one day, the employment days generated in paddy cultivation were calculated. For male cultivators, the number of days of employment has increased from 17 to 44 days, whereas for female cultivators it has increased from 19 to 31 days. For male agricultural labourers the number of days of

employment has increased from 30 to 46 days, while for female workers it has increased from 35 to 50 days. Taking both the cultivators and agricultural labourers together, the NAT seems to have generated more employment for males than females (Table 4).

TABLE 4: Average Number of Days Spent on Different Operations (Per Season)

Activities	Before NAT				After NAT			
	Male		Female		Male		Female	
	C	A	C	A	C	A	C	A
Pre-sowing	4	10	-	-	9	5	-	-
Sowing	3	2	2	2	7	7	5	2
Transplantation	2	2	2	7	13	5	6	13
Weeding, Fertiliser and Pesticides Application	2	-	4	8	17	5	6	15
Harvesting	6	13	5	13	14	21	4	18
Post-harvest	-	3	6	5	14	3	10	2
Total	17	30	19	35	74	46	31	50
					(335)	(53)	(63)	(42)

Source: Estimated on the basis of the primary survey

Notes: *~5 hours = 1 day

C-Cultivator, A-Agricultural Labour

Figures in parentheses show the percentage increase.

In the estimation of the number of employment days, there is a fundamental problem. Agricultural labourers are homogenous. Hence, the estimation of the average number of days employed per agricultural labour is not problematic. But the cultivators are not a homogenous group. The number of days employed in agriculture is a function of the size of land owned by a cultivator. Hence, the estimation of the number of days employed per cultivator is likely to be unrealistic.

An important aspect of NAT is the reduction in the length of the agricultural season. This has resulted in an increase in area sown more than once. For this reason, the annual employment of a worker before and after NAT is likely to be more meaningful, which is presented in Table 5.

Cropping Pattern

Cropping pattern refers to the proportion of area under different crops at a point of time. A change in the cropping pattern implies a change in the proportion of area under different crops. Cropping pattern of any

region depends upon physical characteristics such as soil, climate, weather, rainfall, and so on. For instance, in a dry area where the rainfall is scanty and where there is high uncertainty of monsoons there will be a greater dependence on *jowar* and *bajra* as these crops can be managed with a less rainfall. Water logging can lead to an increase in area under rice, for rice can stand the extra water better than other crops. Apart from soil and climatic conditions, the cropping pattern of a region will depend upon the nature and availability of irrigation facilities.

Thanjavur district has shown a significant change in cropping pattern over the period. While the area under paddy cultivation is showing a downward movement since 1970, the area under pulses and sugarcane cultivation is on the increase. While the acreage under the paddy has declined from 77.4 per cent in 1960-1961 to 23.1 per cent in 1990-1991, the acreage under sugarcane, which was just 0.2 per cent in 1960-1961, moved to 31.1 per cent in 1990-1991. Another crop which is showing a downward trend is groundnut, whose percentage share in total cropped area has fallen from 5.4 per cent in 1960-1961 to 3.6 per cent in 1990-1991. Overall, it can be stated that pulses and sugarcane are generating about 60-70 days of employment opportunities for women labourers in agriculture per annum.

TABLE 5: Annual Number of Days of Employment Per Worker

Worker	Paddy		All Crops	
	Before NAT	After NAT	Before NAT	After NAT
Male Agricultural Labourer	60	138	200-220	290-310
Female Agricultural Labourer	70	150	140-160	210-220

Wage Payment

The agricultural labourers in Thanjavur district are more assertive than in other districts of the State of TAMIL NADU (Desai, 1978: 64). In some parts of the district the labour is highly organised and to press their demands for higher wages, they boycott agricultural operations. In October 1967, representatives of labourers and landowners in and around Mannargudi taluka of the district, demanded a 10 per cent increase over and above the then prevailing wages. According to the Thanjavur Agreement (June 1968), landlords were permitted to

import labourers from other areas and employ them, provided they were efficient and active. But these steps have failed to bring about the needed peace in the agricultural front.

A one man commission appointed in 1968, suggested the need to revise and fix wages once in three years in order to safeguard the interests and welfare of the landless agricultural labourers. Accordingly the Government of TAMIL NADU had set up Karmikeyan Committee in 1972, an ad hoc committee in 1976, and Hari Bhaskar's Committee in 1982-83. As per the report of Hari Bhaskar's Committee, the Government of TAMIL NADU fixed monthly wages for labourers at Rupees 210/-. Table 6 shows the wage rates fixed by the Government of TAMIL NADU over the period.

TABLE 6: Wage Rate Fixed by the Government of TAMIL NADU (1960-1990)

<i>Type of Employment</i>	<i>1960-61</i>	<i>1966-67</i>	<i>1973-74</i>	<i>1976-77</i>	<i>1982-83</i>	<i>1995-96</i>
Ploughing (with own plough and bullocks)	—	2.42	5.50	9.00	15.00	28.00
Ploughing (without own plough and bullocks)	1.25	2.50	3.00	3.00	10.00	20.00
Sowing and Transplantation						
Adults Grade I (Men)	0.87	1.49	1.75	3.50	5.00	20.00
Adults Grade II (Women)	0.75	1.45	1.60	3.00	4.00	15.00
Other agricultural employment						
Grade I (Men)	0.87	2.08	1.75	3.50	4.75	35.00
Grade II (Women)	0.75	1.45	1.63	3.25	5.00	20.00

Source: Reports of various committees on agricultural wages.

Note: All figures are in Rupees

The stipulated wages are being paid to the respondents in the sample villages. During the peak seasons, snacks and tea are also supplied. There is discrepancy in the wages paid to male and female workers. Women, who are generally employed in transplantation and weeding, are paid lower wages (Rupees 15/-) than the men employed in ploughing, bunding, sowing, spraying of pesticides and fertilisers (Rupees 20/-). Harvesting is the only operation in which both men and women are paid equal wages (Rupees 20/-).

Impact on NAT on Income of Agricultural Labour Households

In order to measure the changes in income of agricultural labourers, before and after NAT, cost of living index and agricultural wage index were compared. As direct comparison of wage index and cost of living index is not possible because these indices are estimated on different base periods, the percentage change is calculated for periods 1960-1961 to 1970-1971 and 1980-1981 to 1990-1991.

Between 1960-1961 and 1970-1971, while the cost of living increased by 98 per cent, the agricultural wages increased by 100 per cent. During 1980-1981 and 1990-1991, the cost of living increased by 22 per cent, but agricultural wages increased only by 7 per cent. Thus, it is clear that though the wages moved up after NAT in favour of agricultural workers, the simultaneous rise in cost of living overtaking the rate of increase in money wages, has deprived the agricultural labourers of reaping the benefits from NAT (Table 7).

TABLE 7: Index of Agricultural Wage and Cost of Living: A Comparison

Year	Cost of Living		Percentage Increase	Wage Index		Percentage Increase
	Base	Index		Base	Index	
1960-61	1936	500	-	1950	109.8	-
1970-71	1936	990	98	1950	218	100
1980-81	1970	238	-	1970-71	277	-
1990-91	1970	292	22	1970-71	298	7

Source: Season and Crop Report, Thanjavur District, 1960-1961 to 1990-1991.

Impact of NAT on Income of Cultivators

Before the introduction of NAT, cultivators generally invested around Rupees 160/- and the returns was Rupees 210/-. But after the introduction of NAT, the investment has moved up to Rupees 4,995/- and the returns doubled to Rupees 10,125/- for a period of 120 days (Table 8).

TABLE 8: Investment and Returns per Acre (In Rupees)

	Before NAT	After NAT
1. Total investment including wages for harvesting	160	4995
2. Total returns	210	10125
3. Net gain	50	5130

Investment and Returns per Acre

After the introduction of NAT, ploughing operations cost Rupees 600/- to the cultivators. As all cultivators did not own a tractor, they were forced to hire one and also bear the cost of diesel. Fertilisers such as Urea, Sulphate, Potash and pesticides cost about Rupees 2,700/- (See Table 9). For harvesting before NAT was introduced two to three measures of harvest produce was given per worker. At present nearly 700-750 kilograms of paddy is given as wage for one acre of land. Before the introduction of NAT, the yield per acre was 450- 475 kilograms. With the introduction of NAT, the yield per acre stands at 3,500-4000 kilograms. But during the period of this study, due to excess monsoon, the yield per acre had declined to 2,500-3,000 kilograms.

TABLE 9: Value of Inputs Used Before and After NAT per acre (in Rupees)

<i>Activities</i>	<i>Before NAT</i>	<i>After NAT</i>
Ploughing	10	600
Sowing	10	160
Seedlings (10 kg)	-	5
Pesticides	-	330
Fertiliser	-	850
Spraying	-	50
Weeding Wages	20	300
Harvesting Wages	120	2,700
Total	160	4,995

Source: Compiled on the basis of the primary survey.

Hence, it can be inferred that NAT has doubled the return on investment on farm through an increase of yield per acre.

Household Income

The average annual household income from all the sources for the cultivators belonging to villages M and K was Rupees 75,819/- and Rupees 44,436/- respectively. The annual household income for agricultural labourers of villages M and K Rupees 19,028/- and Rupees 19,073/- respectively. The above figure suggests that while there is no significant difference in the annual household income of agricultural labourers belonging to the two villages, there is significant difference in the household income among the cultivators of the two villages.

This is because 50 per cent of the cultivators of village K belong to the marginal farmer category and hence their household income is much lower than their counterparts in village M. To estimate the incidence of the poverty among the sample households, the poverty line, as defined by the Planning Commission was applied here. The Planning Commission has fixed the poverty line at an income of Rupees 13,500/- per family of 5 members in rural areas. Based on the National Statistical Survey Organisation consumption expenditure data, the Planning Commission has defined the poverty line as Rupees 206/- per capita per month (1993-1994) for rural areas. On this basis, the sample respondent households are classified into two groups — those living above the poverty line and those below it. In terms of the per capita income, about two cultivator households and 12 agricultural labour households belonging to the village M are living below poverty line and one cultivator household and about nine agricultural labour households of village K are below poverty line. Thus, on an aggregate about 25 per cent of the sample respondents are living below poverty line.

In terms of per capita expenditure, about three cultivator households and 16 agricultural labour households of village M and three cultivator households and 14 agricultural labour households of village K are below poverty line. On the whole about 36 per cent of the sample respondents are living below poverty line. Tables 10 and 11 represent the per capita monthly income and consumption expenditure of sample households.

The following inferences are drawn with regard to poverty assessment:

1. Expenditure poverty line is greater than the income poverty line. While 1/4th of the rural households are living below income poverty line, 1/3rd of the rural households are living below the expenditure poverty line.
2. The incidence of poverty is larger among the landless agricultural labour households than the cultivator households.
3. The intensity of poverty is relatively higher in village M which is agriculturally well-developed when measured in terms of the percentage of irrigated to cropped area than village K.
4. On the basis of group average all the households covered by the survey are well above the poverty line both in terms of per capita income and expenditure.

TABLE 10: Per Capita Monthly Income of Sample Households

Class Interval (In Rupees)	Village M		Village K		Total		Total
	CH	ALH	CH	ALH	CH	ALH	CH+ALH
(1)	(2)	(3)	(4)	(5)	(6=2+4)	(7=3+5)	(6+7)
Less than 225	2	12	1	9	3	21	24
226-400	1	23	7	19	8	42	50
401-600	1	2	4	2	5	4	9
601-800	4	-	2	-	6	-	6
801-1000	4	-	2	-	4	-	4
1001-2000	2	-	2	-	4	-	4
Total	12	38	18	32	30	70	100
Average	753	262	579	285	666	274	-

Source: Primary Survey

Note: CH— Cultivator Households, ALH — Agricultural Labour Households

TABLE 11: Per Capita Monthly Consumption Expenditure of Sample Households

Class interval (In Rupees)	Village M		Village K		Total		Total
	CH	ALH	CH	ALH	CH	ALH	CH+ALH
Less than 210	3	16	3	14	6	30	36
211-250	3	7	6	5	9	12	21
251-350	2	5	5	5	7	10	17
351-450	-	5	1	4	1	9	10
451-550	-	4	1	3	1	7	8
551-650	3	1	-	1	3	2	5
651-750	1	-	2	-	3	-	3
Total	12	38	18	32	30	70	100
Average	340	248	318	251	330	249	-

Source: Primary Survey

Note: CH— Cultivator Households, ALH — Agricultural Labour Households

While the average per capita income of agricultural labour household in both M and K villages is Rupees 274/-, the per capita expenditure is Rupees 249/- indicating a surplus of Rupees 25/-. These figures for cultivator households are Rupees 666/- (per capita income) and Rupees 330/- (per capita expenditure) respectively, with a surplus of Rupees 336/- per head.

STATUS OF WOMEN ENGAGED IN AGRICULTURE

The status of about 100 sample women engaged in agriculture and belonging to the two study villages of M and K was analysed and the findings are detailed below:

- Majority of women respondents (68 per cent) belong to the age group 20-40.
- About 95 per cent of the sample respondents were Hindus; four were Christians and only one was a Muslim.
- Nearly 80 per cent of women belonged to the scheduled caste community, 13 per cent to other backward communities and the remaining 7 per cent, all belonging to cultivator households, fell under the category of 'forward' communities.
- About 79 per cent of the respondents were married; 15 were widowed; four unmarried; one a divorcee; and one a separated woman.
- Nearly 50 per cent of respondents' households belonged to the moderate family size group of four to six. The average household size worked out to four members.
- Majority of families had two earners — one male and one female. The average number of dependents per family was two.
- Around 85 per cent of families were found to be nuclear with 75 per cent of the families headed by men.
- Nearly 56 per cent of the women respondents were illiterate, which means that they did not possess the basic reading and writing skills. The incidence of illiteracy was more among agricultural labourers than cultivators.
- A little more than 40 per cent of men were found to be illiterate. Regarding children, about 38 per cent were dropouts while others were studying at the time of enumeration.
- About 70 per cent of the respondents were agricultural labourers and the rest are cultivators. Among the women who belonged to a cultivator household, 17 were marginal farmers (less than 2.5 acres); 11 were small farmers (2.5-5 acres); and the remaining two belonged to large farmer category (more than 5 acres). The average size of land holding in village M was 1.98 hectare and in village K it was 1.89 hectares, implying that there was more fragmentation of land in village K.
- The average monthly earnings of a woman from both main and supplementary employment were: Rupees 650-750 for cultivators and Rupees 480-550 for agricultural labourers.

- Nearly two-thirds of the respondents had the benefit of supplementary employment. While women cultivators supplemented their income through tuition, money-lending, tailoring, petty shops, and so on, women agricultural labourers worked as cooks, vendors, cleaning of pulses, sesame seeds, and so on.
- Women's contribution to the households income ranged between 80-85 per cent of their earnings, while the men's contribution was 60-65 per cent only. But for the earnings of the women, nearly 50-60 per cent of the sample households would have remained below poverty line. In this sense, women are by no means secondary bread winners.
- Nearly 60 per cent of the sample households in both villages had outstanding loans to the extent of Rupees 4,000/- and Rupees 7,500/- by agricultural labourer and cultivator households respectively.
- A study of the purpose of borrowing among sample households indicated that large proportion of borrowing by cultivator households were for purchase of farm equipment like tractors, pump sets, and so on, and also to meet medical, educational and house construction expenses. The agricultural labour households borrowed largely for food and marriage purposes. Hence, savings seemed to be nil among 48 per cent of the households.
- About 12 respondents of the two villages had taken loans under the animal husbandry project of the Integrated Rural Development Programme (IRDP) for asset creation. But their economic condition is in no way better than the non-beneficiaries of the IRDP. About four IRDP beneficiaries sold their livestock when they were in a financial crisis, and in the case of two beneficiaries, the death of the cattle resulted in the insolvency of the beneficiaries. While five respondents were beneficiaries of DWCRA scheme, four women were beneficiaries of TANWA, which is training of women in agricultural activities. Thus, there is only marginal utilisation of the government's anti-poverty programmes. As the burden of debt has increased among the beneficiaries, the utilisation rate is very low. Further, the high degree of illiteracy, lack of skills, confidence and motivation to take up self-employment, cumbersome administrative procedures, commissions to be paid at different levels, exploitation by middle men, frequent visits to be made to the Panchayat Union office at the cost of losing the daily wages, were a few rea-

sons for the low utilisation rate of the poverty reduction schemes by the sample households.

- About one-fifth of the respondents actively participated in the activities of the farmer's association like procession and protest march regarding the Cauvery river water sharing issue, free electricity for farms, increasing agricultural minimum wages, and so on. The dual role assigned to women as wage earners and household managers, limits their participation in the association's activities.

CONCLUSION

Overall, the study highlights that NAT in paddy cultivation has increased the time spent on different activities and has also generated additional employment for both sexes per season. Though the rate of increase in employment days is more for male agricultural labourers, in absolute terms, women's employment is about 50 days and that of men is only 46 days per season. The NAT has no doubt increased the money wages of the agricultural labourers, but there has been no increase in the real wages. While the net return on farm investment in paddy cultivation before NAT was only 31.25 per cent, after introduction of NAT, the net return was more than 100 per cent.

There is concentration of women in agriculture as labourers in the study area, which is an indication of increased economic disparity and large poverty. Even in an agriculturally prosperous district like Thanjavur about 25-35 per cent of the agricultural households are living below the poverty line. The utilisation rate of the anti-poverty programmes seems is poor. The fact that more than 50 per cent of rural women are illiterate is also a matter for concern. Further, a dropout rate of 38 per cent among children of the agricultural households is another crucial area demanding the attention of the government.

SUGGESTIONS

1. Unemployment and underemployment have been identified as the chief reason for poverty, hence adequate employment opportunities should be generated. As the government cannot provide employment for all job seekers, self-employment is encouraged. But self-employment has not been a very successful venture for poor rural women. Lack of skills, absence of motivation and limited access to resources are the major constraints in women taking up self-employment. Therefore, skill

formation, specially among rural, poor women is a critical input for women opting to self-employment as a means of livelihood.

2. In addition to other factors like sociocultural taboos, lack of education, enterprise, and so on, women are unable to develop themselves in individual terms. Formation of self-help groups (SHGs), which is currently being experimented and found to be successful in some areas of the country, should be extended to this region. It is important to form, strengthen and support SHGs where women in groups (of 10-15) take up a micro enterprise. This will provides them with a stable income through self-employment and also encourage small savings among its members.
3. Development of small-scale industries, cottage industries and handicrafts based on agro-products and local resources, will help tackle the twin problems of poverty and unemployment.
4. Setting up of small businesses like petty shops, vegetable and fruit stalls, and so on, should be popularised particularly among old rural women who are largely engaged as agricultural labourers and for whom training and skill development may be out of reach.
5. Most women engaged in micro enterprises require only a small sum of financial support. Hence, credit institutions should not insist on collateral security, as a woman owning no property would have nothing to offer. The Union Budget of 2000-2001, enhanced the limit for credit, without collateral security, from Rupees 1 lakh to Rupees 5 lakhs, solely to encourage and develop the tiny and small scale sectors.
6. Along with institutional credit facility, timely supply of raw materials and direct marketing and networking of marketing centres should be facilitated.
7. An integrated approach is necessary by the various agencies involved in rural development, like the District Rural Development Agency, District Industries Centre, Khadi and Village Industries Commission and village panchayats.
8. Education can alone contribute directly to the development of all human beings, particularly girl children. Formal education up to the 10th Standard should be made compulsory, to check drop out, which is significantly large among the rural girls.

9. Above all, the dependency syndrome prevailing in the woman's psyche should be rooted out. Confidence, self-esteem and self-worth are values which need to be inculcated in every woman.

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