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Focus : Women and Development

Women Work & Restructuring

Women and Managing Development

Inter-State Comparison of Women in Development

Women's Participation in Tanning Industry

Measurement of Research Productivity

Learning Organisation Perspectives

Functional Value of Plant Asset Base

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Issues of Women in Development— An Inter-State Comparison

S. Uma Devi

It has been realized that economic development has although improved the lot of a few nations but has led to large-scale gender bias, that is well over 70% of world's poor are women. With a view to decipher the socio-economic dimension of the bias, UNDP has assigned indices in relation to gender like GDI and GEM, besides the overall human development index (HDI). In the present paper, based on available data, the author has discussed the implication of GDI and GEM for 15 Indian states covering all regions of the country. Factors like food production, and crime against women which are not in the purview of these indices have also been analysed. Except in Kerala, the differentials between HDI and GDI tend to be more. The causes of such gender inequalities have been pointed out.

Economic development although has improved the lot of a few nations and a few people, it has left a large number impoverished. The impoverishment is also found to have a gender bias i.e., as about 70 per cent of World's poor are women. Although most women all over the world work for 16-18 hours a day, they are not reckoned in statistics as workers. This is because of the definition of work itself which leaves out unpaid work from its purview.

Hence, the major issues of women in development arise from the fact that economic development has a male—bias and leaves out women. It has been found that despite economic development, the wage differentials between males and females continues or women's share of income is rather low and unemployment position of women is worse than that of men. Studies have shown that whenever technology changes, women are adversely affected. For example, power driven machines; it is men only who operate this and prior to the introduction of machines these tasks were performed by women.

It has been found that despite economic development, the wage differentials between males and females continues or women's share of income is rather low and unemployment position of women is worse than that of men.

S. Uma Devi is Professor of Economics and Hon. Director, Centre for Women's Studies, University of Kerala, Kariavattom, Thiruvananthapuram.

That an increase in GNP alone is not sufficient to judge whether a country's welfare increased had been realised and that is why the concept of human development has come to replace economic development. Thus the UNDP carried out the exercise of constructing the Human Development Indices (HDI) and the Human Poverty Index (HPI). Furthermore, HDI alone is not

enough to indicate whether the position of women has improved. Hence the Gender-Related Development Index (GDI) has been constructed by UNDP, along with the Gender-Empowerment Measure (GEM). There are studies wherein the GDI and GEM for different states of India (Shiva Kumar, 1996; Seethaprabhu *et al*, 1996 and Kapur, 1996) have been calculated.

In the present paper the inter-state comparisons of the HDI, GDI and GEM taken from the aforesaid studies have been provided with a view to look into the factors which have been left out of these indices and to see as to what extent the consideration of these, affect the conclusions about gender related Development of the States in India. These indices have been examined for 15 states wherein basic data is available.¹

Development is defined by the UNDP Human Development Report (HDR) as 'a process of enlarging people's choices'. For measurement purposes they have confined themselves to three variables viz., life expectancy at birth, adult literacy and income. GDI takes the same three variables for women i.e. it takes into account the female expectancy at birth, the female adult literacy and income earned by females (adjusted real GDP per capita (in PPP dollars).

Development is defined by the UNDP Human Development Report (HDR) as 'a process of enlarging people's choices'. For measurement purposes they have confined themselves to three variables viz., life expectancy at birth, adult literacy and income.

The methodology used for computing GDI is worked out in such a way that it imposes a penalty for inequality such that the GDI falls when the achievement levels of both men and women in a country worsen or when the disparity between their achievements increase. Therefore, the greater the gender disparity in basic capabilities, lower will be a country's GDI compared with its HDI.

The computing of the GDI requires the following calculations: (i) equally-distributed index of life expectancy, (ii) the equally-distributed index of educational attainment and (iii) the equally distributed index of income. Thus GDI is the average of these three equally distributed indices and has a value ranging from 0 to 1. For

1. The computing of indices are outlined in Technical Notes 1 and 2 in Human Development Report, 1995.

The greater the gender disparity in basic capabilities, lower will be a country's GDI compared with its HDI.

the calculation of the equally adjusted indices, a weighting formula that expresses a moderate aversion to inequality, setting the weighting parameter equal to 2 has been adopted. This is the harmonic mean of the male and female values and is calculated by taking the reciprocal of the population weighted arithmetic mean of the female and male achievement levels (which are themselves expressed in reciprocal form). The harmonic mean value will be less than the arithmetic mean to the degree that there is disparity between female and male achievements.

Table 1: GDI & HDI for Indian States

	HDI	GDI	HDI-GDI	HDI Rank	HDI-GDI/HDI
Andhra Pradesh	0.400	0.371	0.029	9	7.3
Assam	0.379	0.347	0.032	10	8.4
Bihar	0.354	0.306	0.048	13	13.6
Gujarat	0.467	0.437	0.030	5	6.3
Haryana	0.489	0.370	0.119	4	24.3
Karnataka	0.448	0.417	0.031	7	6.9
Kerala	0.603	0.565	0.038	1	6.2
Madhya Pradesh	0.349	0.312	0.037	14	10.7
Maharashtra	0.523	0.492	0.031	3	6.0
Orissa	0.373	0.329	0.044	11	11.9
Punjab	0.529	0.424	0.105	2	19.8
Rajasthan	0.356	0.309	0.047	12	13.0
Tamilnadu	0.438	0.402	0.036	8	8.3
Uttar Pradesh	0.348	0.293	0.055	15	15.9
West Bengal	0.459	0.399	0.060	6	13.1
India	0.423	0.388	0.035		8.2

Source: A.K. Shiva Kumar "UNDP'S Gender-Related Development Index. A computation for Indian States, Economic and Political weekly, April 6, 1996.

On the basis of the above methodology, Shiva Kumar (1996) has constructed the GDI for 16 States in India for 1991-92. Seethaprabhu (1996) has gone a step further by using five alternative measures for proportional income shares of women and has constructed five alternative GDI rankings for the states of India. In the present paper, the data (table 1) from Shiva Kumar has been utilised to obtain

the difference between HDI & GDI. However, when one compares the GDI and GEM ranks, one resorts to Seethaprabhu's 5-point GDI ranking.

On the basis of the above table Shiva Kumar (1996) concludes that states like Haryana & Punjab which have high levels of income are states having severe gender inequalities; whereas in states like Kerala, Gujarat and Karnataka these inequalities are not that pronounced.

A disaggregated picture of the various indicators which have gone into the construction of the GDI for each state would also be helpful in undertaking a comparison. Consider the case of Punjab and Haryana which have the highest percapita income. There even though the life expectancy at birth of females and males is not that different, yet in the case of literacy, work participation rate, agricultural wage rates the difference between females and males are extremely marked. Again for a state like Kerala which has the highest GDI the difference between females and males with regard to the work participation rate and the agricultural wages (for casual workers) is quite high, as seen from table 2

States like Haryana & Punjab which have high levels of income are states having severe gender inequalities; whereas in states like Kerala, Gujarat and Karnataka these inequalities are not that pronounced.

adapted from Sethaprabhu et al, (1996). It is seen that Punjab & Haryana which have a high PCI are the States showing greater gender disparity, while Kerala, Karnataka, Gujarat and Maharashtra show the least gender disparity. For the former states, the differential between HDI and GDI are 19.8 and 24.3 per cent respectively while for the latter, the differential is about 6 per cent. Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh (BIMARU) also exhibit the highest gender disparity on all the scores.

Gender Empowerment Measure (GEM) has also been calculated for states of India by Kapur, 1996; the

Table 2: Statewise Indicators Used in GDI

State	1		2		3	4		5	
	F	M	F	M		F	M	F	M
Andhra Pradesh	62.20	59.10	27.32	46.06	4728	40.46	56.87	7.53	13.47
Assam	52.20	57.70	34.30	50.00	4014	15.28	51.02	16.52	17.25
Bihar	57.00	58.20	18.06	41.96	2655	17.74	49.04	9.23	14.11
Gujarat	61.50	58.30	40.62	60.99	5687	29.51	53.77	9.34	13.28
Haryana	62.00	63.40	32.73	56.08	7502	25.01	50.07	16.09	17.21
Karnataka	63.30	62.20	36.97	56.08	4696	31.90	54.74	7.65	11.84
Kerala	73.80	67.60	75.25	80.78	4207	26.81	51.05	10.99	25.79
Madhya Pradesh	54.70	56.20	23.07	46.99	4149	34.96	52.94	8.58	11.48
Maharashtra	64.30	62.00	43.30	63.55	7316	35.15	52.45	7.68	14.21
Orissa	55.20	57.10	28.83	52.41	3077	25.91	55.64	7.00	10.04
Punjab	65.30	65.60	42.22	54.92	8373	25.66	55.92	10.73	20.81
Rajasthan	58.70	57.80	16.31	43.96	4114	38.91	49.78	8.68	12.60
Tamilnadu	60.80	44.58	63.78	40.10	5047	37.88	57.91	6.77	13.46
Uttar Pradesh	49.60	54.10	20.03	44.72	3516	19.24	51.16	9.43	15.47
West Bengal	59.50	60.00	38.44	56.58	5753	17.81	54.54	8.02	14.62
Average	60.01	60.01	34.80	54.59	4989	28.15	53.13	9.22	15.05

Source: Seethaprabhu et al, "Gender-Related Development Index for Indian States: Metrological Issues", Economic and Political Weekly Oct. 26, 1996.

1. Life Expectancy (1988-91)
2. Literacy Rate 7 + (%) 1991
3. Per Capita State Domestic Product (Rs) (1990-91)
4. NSS (43rd Round) Usual Status (1987-88) Participation Rate (%) principle Subsidiary
5. NSS 43rd round (1987-88) Agricultural Wage Rate for Casual Workers.

GEM determines the degree to which women and men participate actively in economic, professional and political activity and in particular, decision-making. The relevant indices are: per capita income, share of jobs in the professional, technical, managerial and administrative category and share of parliamentary seats (legislation envisaged for about 33%).

Although GEM may reasonably reflect the level of relative disparities in empowerment in the West, it is inadequate in the context of the third world as it samples a very small subset of the population. Thus Kapoor has tried to compute three measures of gender empowerment based on the following indicators:

- (a) Representation in the Lok Sabha
- (b) Representation in the legislature
- (c) Representation in the Gram Panchayat
- (d) Representation in the Panchayat Samiti
- (e) Representation in the Zilla Parishad
- (f) Literacy rate
- (g) Exercising the right to vote
- (h) Life expectancy
- (i) Income

GEM index is inadequate in the context of the third world as it samples a very small subset of the population.

The scores and ranks obtained by the 15 states for each of these variables are given in Table 3.

GDI and GEM, some of the other factors not considered in the computation of these indices, are perhaps relevant. The position of women with regard to these factors state-wise may be looked into. This has a bearing on the overall welfare of women in each state.

One factor which needs to be taken account of is the state-wise per capita food grain production (This cannot be enumerated gender-wise due to lack of data). On this score, States like Kerala and Gujarat which have a high GDI rank, occupy a low position. In Kerala in 1993, the per capita food production was only 37 kg per annum, lowest among all the states of India (table 4). Since Kerala imports food grains and has a good Public Distribution System (PDS), the per capita availability is not so bad. Yet in the long run the state is vulnerable.

Table 3: Gender Empowerment Measure and Ranks for Indian States

	GEM	Rank
Andhra Pradesh	0.51	9
Assam	0.46	14
Bihar	0.45	15
Gujarat	0.56	3
Haryana	0.53	6
Karnataka	0.55	4
Kerala	0.63	1
Madhya Pradesh	0.48	10
Maharashtra	0.60	2
Orissa	0.47	12
Punjab	0.54	5
Rajasthan	0.48	10
Tamilnadu	0.52	8
Uttar Pradesh	0.47	13
West Bengal	0.53	6

Source: Asha Kapur Mehta, "Recasting Indices for Developing Countries: A Gender Empowerment Measure", Economic and Political Weekly, Oct. 26, 1996 P. WS-80.

Table 4: Per Capita Food Grain Production (1990-93)

States	Per Capita Food grains production (kg per annum) 1990-93
Andhra Pradesh	174
Assam	149
Bihar	121
Gujarat	109
Haryana	575
Karnataka	166
Kerala	37
Madhya Pradesh	246
Maharashtra	144
Orissa	230
Punjab	957
Rajasthan	224
Tamilnadu	142
Uttar Pradesh	252
West Bengal	177
All India	348

Source: Centre for Monitoring Indian Economy, Basic Statistics—States, September 1994.

On the basis of the ICMR norm of per capita requirement of 370 grams per day, Shah (1997) shows that states having below 150 kg. food grains production per capita pre annum are poor. Gujarat, Kerala, Andhra Pradesh and Assam are below average in this regard. Shah (1997) also examines the extent of landlessness in the States and finds Rajasthan, Kerala, Punjab, Haryana, Assam below the average for India (table 5).

Table 5: Poverty, Landlessness and Per Capita Food Production Across States

	Extent of Poverty	
	Above/Same Average	Below Average
(a) Extent of Landlessness Above (same) Average	Madhya Pradesh Maharashtra Orissa Tamil Nadu	Gujarat Andhra Pradesh
Below Average	Uttar Pradesh Bihar Karnataka W. Bengal	Rajasthan Kerala Punjab Haryana Assam
(b) Per Capita Foodgrain Production Above 150 kgs	Madhya Pradesh Orissa Uttar Pradesh	Rajasthan Punjab Haryana
Below 150 kgs	Maharashtra Tamil Nadu West Bengal Bihar Karnataka	Gujarat Kerala Andhra Pradesh Assam

Note: Calculated on the basis of the ICMR norm of per capita requirement of 370 grams per day.

Source: 1. Based on estimates prepared by NSSO, 48th Round
2. CMIE (1996)

Source: Amita Shah, "Food Security and Access to Natural Resources—A Review of Recent Trends", Economic and Political Weekly, June 28, 1997, Vol. 32.

Similarly, a look at the female unemployment position (table 6) in the various states of India picture is revealing. Here again Kerala with a high GDI is in the worst position with a rural female unemployment rate per thousand females being 26. Except for Assam all other states in India have a female unemployment rate of three or less per thousand. The urban unemployment among females is higher in all the states but it is the highest in Kerala being 47 per thousand persons and is higher than that for males.

The unemployment figures should be seen alongwith the number of females engaged in domestic duties in free collection of goods (category 92 & 93) and also the number given to beggary and prostitution (category 97 of NSS). As seen from table 7, a state like Kerala having the highest rate of unemployment is also

Except for Assam all other states in India have a female unemployment rate of three or less per thousand. The urban unemployment among females is higher in all the states.

the one having the largest percentage of women in the rural area engaged in domestic duties. However, the percentage engaged in free collection of goods is much less, which shows that the access to common property resources, is very low in Kerala. This in turn means that the marginalised section of women have nothing to fall back on. However, beggary and prostitution among females is considerably less in Kerala in the rural areas though it is quite high in the urban area.

Table 6: Unemployment among Females (Per thousand)

	Rural	Urban
Andhra Pradesh	1	7
Assam	13	32
Bihar	1	7
Gujarat	1	6
Haryana	2	5
Karnataka	2	11
Kerala	26	47
Madhya Pradesh	2	6
Maharashtra	2	8
Orissa	2	10
Punjab	3	5
Rajasthan	1	1
Tamilnadu	3	17
Uttar Pradesh	1	1
West Bengal	3	31

Source: NSS Fiftieth Round: Employment and Unemployment.

Some other social factors which have a direct bearing on the position of women like suicides, rapes &

A state like Kerala having the highest rate of unemployment is also the one having the largest percentage of women in the rural area engaged in domestic duties.

Table 7: Females Engaged in Domestic Duties, Free Collection of Goods, Beggary & Prostitution

	Rural			Urban		
	D.D.	F.C.G.	B. & P.	D.D.	F.C.G.	B. & P.
Andhra Pradesh	19.44	8.12	.12	22.71	45.62	.08
Assam	27.99	26.38	.08	38.81	8.03	Nil
Bihar	25.68	13.00	.07	41.19	10.67	.05
Gujarat	17.43	15.42	.01	46.91	6.58	NA
Haryana	11.72	43.75	00	26.79	31.56	00
Karnataka	22.85	12.85	.09	39.95	4.57	.02
Kerala	33.96	6.84	.01	38.14	5.27	.05
Madhya Pradesh	19.10	8.10	.12	44.23	5.72	.08
Maharashtra	16.49	5.43	.08	44.89	4.08	.15
Orissa	30.63	15.34	.14	46.20	5.36	.10
Punjab	8.81	56.37	.07	15.10	41.12	.02
Rajasthan	20.86	15.05	.06	40.45	10.88	.01
Tamilnadu	17.97	13.45	.05	42.15	5.72	-
Uttar Pradesh	29.53	24.26	.04	36.76	18.84	.04
West Bengal	27.48	28.69	.52	41.10	10.47	.31

DD - Domestic duties, FCG - Free collection of goods, B & P - Beggary & Prostitution

Source: Usual activity statistics, NSS 38th Round (1983) Vol. 14, No. Issue No. 45, Oct. - Dec. 1990.

number of female criminals have been examined. Although in every state the number of suicides among males is higher than among females, the suicide rate among females is highest in West Bengal followed by Kerala. A look at rape victims per lakh females across states further shows that Madhya Pradesh, Assam, Rajasthan & Maharashtra are the worst off. Number of female criminals per on lakh females is highest in the case of Maharashtra. The states must be ranked in respect of all these factors and the ranks added up. Lower the score better the position of women in the state concerned. On the basis of these ranks we find that while Kerala has higher GDI & GEM wherein women have a lower position with regard to unemployment, income, per capita food production and female suicides.

Kerala has higher GDI & GEM wherein women have a lower position with regard to unemployment, income, per capita food production and female suicides.

Thus when other factors are taken into consideration those states which have a higher GDI & GEM need not be the states whose welfare is higher.

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Women, Work and Economic Restructuring: An International Comparison

V. Upadhyay

Differences in male and female economic participation rates is an important aspect of gender inequality. During the last few decades developed as well as many developing countries have witnessed growing participation of women in economic activities. This, however, does not mean that women have won occupational equality in these countries. Economic restructuring is affecting women everywhere. Its effects are, however, much more severe in developing countries. In the present paper, these and other related issues are discussed.

Gender inequality is one of the most crucial disparities in almost all societies taking various forms. One important aspect of it is differences in male and female economic participation rates. During the last few decades, participation of women in economic activities have grown in both developing and developed countries. In many developed countries women have taken up most of the new jobs created in recent years, a development which is referred to as the feminization of the labour force. This, however, does not mean that women have won occupational equality in these countries. The circumstances of women in developing countries are very different from those in developed countries. Although economic restructuring is affecting women everywhere, its effects are much more severe in developing countries. In some developing countries, women in recent years have been losing some of the basic gains won by them during the 1970s and 1980s.

Characteristics of Women Workforce

The primary responsibility of women has traditionally been thought to be in reproductive activities. Men's traditional roles, in contrast, have been seen in breadwinning terms. 'The most important role for women, defining their entire life is portrayed as the bearing and bringing-up of children'. These specific tasks, based on the biological imperatives of sex, are thought both natural and universal (Kabeer, 1994, p. 24). This traditional division of work is however fast breaking down. The "idealized" male breadwinning model is not a dominant or universal form now. The past few decades have seen tremendous growth in women's participation in economic activities. Women are now entering labour market in increasingly large numbers. In some societies, the share of women in the labour force has reached very close to the 50 per cent mark. Outside work opens up many opportunities for women which had traditionally been denied to them. It allows them to develop their facilities, realise their potential in same way as men.

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Lewis while describing benefits of economic growth to women makes this point very effectively:

Women benefit from (growth) even more than men.... woman gains freedom from drudgery, is emancipated from the seclusion of the household, and gains at last the chance to be a full human being, exercising her mind and her talents in the same way as men. It is open to men to debate whether economic progress is good for men or not, but for women to debate the desirability of economic growth is to debate whether women should have the chance to cease to be beasts of burden, and to join the human race (Lewis, 1955, p. 422).

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Employment outside home makes women economically independent. Outside employment opportunity enhances 'the social standing of a woman in the household and the society. Her contribution to the prosperity of the family is, then, more visible, and she also has more voice, because of being less dependent on other' (Dreze and Sen, 1995, p. 160).

The European Union

The activity rate of women in the European labour market has increased drastically during the last two decades. Table 1 shows share of women in total labour force in EU member states for 1975 and 1993. In Denmark, the share of women in the labour force has reached a very high level of 46.9 per cent. Women's share in the labour force is quite high in France, Portugal and the United Kingdom. In the Netherlands, the share of women registered an increase from 24.2 per cent in 1975 to 40.6 per cent in 1993. The increase in women's activity rates has been accompanied by a slow decline of male activity rates.

There are many factors that are responsible for the rise in female labour force participation in industrial countries. On the demand side, the important causal factors are: (1) the general rise in the demand for labour, (2) the rise in labour demand in particular sectors, and (3) the rise in education of women (Jacobsen, 1994, pp.

Table 1: Share of Women in Total Labour Force by EU Member State

	1975	1993
Belgium	32.5	41.2
Denmark	39.2	46.9
(West) Germany	36.5	42.5
Greece	-	37.0
Spain	-	33.6
France	37.8	45.0
Ireland	26.3	36.5
Italy	27.0	36.7
Luxembourg	28.2	36.1
The Netherlands	24.2	40.6
Portugal	-	44.7
United Kingdom	38.3	43.7

Source: Plantega, 1997, p.86.

127-28). Economic output in industrialized countries has been expanding continuously (barring business-cycle fluctuations) for several decades. Since labour demand is derived from the demand for goods and services, expanding output has resulted in increasing demand for labour in these countries. With economic growth, composition of output has changed phenomenally over time. The changing mix of goods and services requires changes in the form of labour also. With the increasing share of services in GNP, demand for labour in "female occupations" (clerical and service occupations) has been growing faster than average. Increase in women's education over time leading to improvement in skills has also contributed to their increasing participation in economic activities. As skilled labour's wage in relatively higher than that of unskilled labour, skilled women find it more profitable to enter into market work.

In addition to the above mentioned demand-side factors, the important supply-side factors causing the increase in female labour force participation are: (1) rising wages for women, (2) changes in family composi-

There are many factors that are responsible for the rise in female labour force participation in industrial countries. On the demand side, the important causal factors are: (1) the general rise in the demand for labour, (2) the rise in labour demand in particular sectors, and (3) the rise in education of women.

tion and (3) lower male earnings (see Jacobsen, 1994, pp. 128-135). Increases in demand for female labour have caused increase in women's wages which has induced women to join labour market in large numbers. This is one of the most important factors explaining the rise in female labour force participation since World War II. Changes in family composition provide another explanation for the increase in women's participation rates. Effects of changing family size on female labour force participation are very important. For instance, participation rates increase with decreases in the number of children. Rising participation rates during the 1970s and 1980s can be explained by decline in fertility during this period. Another important determinant of female labour supply is their marital status. The proportion of single women increased in the 1970s and 1980s. For single persons, the possibility of division of work into market and non-market forms does not exist, they thus have no option other than to supply their labour in the market. Rise in female participation rates in the 1970s and 1980s can thus be partially explained by increase in the proportion of single women.

The feminization of the labour force in Europe and other industrialised nations does not mean that Women have won occupational equality in these societies. A significant proportion of women in EU member states participate in 'the labour market in "atypical" labour relations, such as part-time employment, temporary employment, unusual schedule employment, self-employment and subcontracting relations' (Meulders, Plasman and Plasman, 1997, p. 75). This type of employment often involves inferior labour conditions. The reasons why employers like part-time employment are rather obvious. Part-timers usually receive lower wages than full-time workers. This offers a direct cost advantage to employers. In some countries, legal provisions favour firms using part-time labour as under certain conditions, these firms can avoid social security contributions. Part-time employment, however, offers certain advantages to employees also that explains why a significant proportion of women willingly accept part-time work. The main advantage of part-time work is that it allows the possibility of reconciling work with family life. In part-time employment, one could choose working hours or working days in such a manner that family life does not suffer.

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It is therefore not unreasonable to argue that both supply and demand-side factors are responsible for the growth of part-time work. The labour force survey in the EU nations supports this hypothesis. With the exception of Irish male part-timers, 'the majority of part-time workers seem to be satisfied with this type of labour relations' (Meulders, Plasman and Plasman, 1997, p. 79). This would seem to imply that part-time employment is not an imposed condition but is a rational and positive choice.

One important aspect of part-time employment is that it is linked with particular segments of the labour market. Female employment in the services sector constitutes the core of part-time employment. In the European Union, northern countries such as Denmark, the Netherlands and the United Kingdom have high figures for part-time work.

In the European Union nations, temporary employment is less typically female than part-time employment and is mainly concentrated in the younger age groups (Meulders et al., 1997). Like part-time employment, this form of employment has also increased in the 1980s. From the employer's point of view, temporary employment is attractive as it allows for high degree of flexibility in labour use. Temporary workers constitute a reserve army from which employers can draw workers in expansionary phase. In the period of falling demand, these workers can be easily fired.

The increasing participation in the labour market has resulted in significant gains for women in the European Union countries. The old problems of segregation and low pay however show no sign of disappearing yet. Women are still severely underrepresented in industrial occupations and overrepresented in clerical and service occupations.

One interesting feature of the European labour market is that the countries with high female labour force participation also show a high degree of segregation by gender.

...the share of women in professional jobs is often higher in the Southern countries, which have lower overall rates of female participation, than in the Northern countries. Moreover, it is in the latter that the very high rates of feminization of lower-level occupations are found. Denmark and the United Kingdom, with the highest participation rates of all the member states, display as great a degree of segregation by gender as countries such as Greece and Spain with lower participation rates (Plantega, 1997, p. 92).

Table 2: Gross Earnings of Women as a Percentage of Gross Earnings of Men in Six European Countries, 1989

	Belgium	Germany	France ¹	Luxembourg ¹	Netherlands ¹	United Kingdom
Gross hourly earnings of female manual workers in industry as per cent of gross hourly earnings paid to men	75.1	73.4	80.8	63.2	75.9	68.8
Gross monthly earnings of female non-manual workers in industry, as per cent of gross monthly earnings paid to men	64.5	66.5	64.9	55.6	64.5	55.2

1: data for 1988

Source: Plantega, 1997, p. 94.

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One indicator that is used to gauge the progress of women across societies and over time is the gender earnings ratio. Women throughout Europe continue to receive wages lower than men. 'The principle of equal pay for work of equal value has not by and large been implemented in the European Union, and pay differentials within and between organisations are still likely to reflect the gendered nature of the employment structure' (Plantega, 1997, p. 92). Women's pay relative to men's in the 1980s remained stagnant in many countries and in some countries even suffered a decline. Table 2 reveals the gender disparity in earnings in six European countries in 1989.

The United States

The share of women in the labour force grew from 37 per cent in 1970 to 45 per cent in 1990 (UNDP, 1997). It is interesting to note that the most striking rise in labour force participation has been among married women with young children. Table 3 shows female labour force as a percentage of adult female population by marital status and age of youngest child. As can be seen from the table, while there has been an increase in labour force participation in all categories, the rise has been much greater among married women, especially among married women with youngest child under 6.

A significant proportion of employed women (above one fourth) are part-time workers; whereas in case of

men, this proportion is only about 10 per cent. Part-time rates are, however, declining gradually for women and rising for men.

Table 3: Female Labour Force as a Percentage of Adult Female Population in the United States by Marital Status and by Age of Youngest Child

	1960	1991
Single, never married	58.6	66.5
Divorced, Separated, Widowed	41.6	46.8
Married	31.9	58.5
No child under 18	34.7	51.2
Child 6-17	39.0	73.6
Child under 6	18.0	59.9

Source: Jacobsen, 1994, p. 44

The gender earnings ratio in the United States as measured by median annual income ratio, women to men, for year-round full-time workers, increased from 0.59 in 1970 to 0.70 in 1991 (see Jacobsen, 1994, p. 52). This shows that although there has been progress towards equality, the gender earnings gap (one minus the gender earnings ratio) still remains substantial.

An analysis of participation rates by educational attainment shows that participation tends to rise with educational attainment. Over time there has been a steep decline in participation among men who did not

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Canada

There has been a fairly drastic increase in women's labour force participation since World War II. Women now account for about 45 per cent of all workers. The share of women in labour force was 32 per cent in 1970. The increasing participation of women in the labour force however has had no significant impact on the level of segregation of work by gender in Canada which still remains quite high. 'More women working for pay has meant the intensification of the feminized character of occupations which have been important for women: teaching, nursing, clerical, and service work' (Bakker, 1994, p. 111). This is despite the fact that in almost all occupational categories women's share of the workforce has increased gradually over time. In the category of managerial and administrative jobs, there appears to be a significant change. In 1991, these jobs accounted for about 12 per cent of total female employment. 'Women now hold 40 per cent of all managerial and administrative positions, which represents substantial increase from 1984 when they held 31 per cent'. Some analysts however argue that rather than being an indication of feminization of a traditionally male field, it is largely a result of new occupational definitions instituted in 1984. A comparison of wage data changes from 1984 to 1990 supports this hypothesis. 'The wage gap between men and women in these occupations had widened substantially. For full-time/full-year work, women earned, on average, 63.3 per cent of what men did, in 1984. This figure dropped to 60.9 per cent in 1990' (Bakker, 1994, p. 111).

One important development in the Canadian labour market is the intensification of the non-standard forms of work (part-time and temporary work) in which women have typically predominated in past. Linked with these are changes related to age differences. As Bakker quotes, 'the growth in non-standard work for young women has been fairly dramatic, so that in 1991 over 43 per cent of all young women in the labour force did not have full-time jobs'.

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Japan

In comparison to Western Europe and North America, Japan has a lower female labour force participation rate. The female labour force participation rate has remained virtually unchanged at around 40 per cent level since 1970. Japan has one of the lowest gender earnings ratios in the developed world: nonagricultural hourly earnings ratio, women to men, was 0.51 in 1990; manufacturing earnings ratio was even lower (0.41). In comparison to their Western counterparts, Japanese women experience more extreme forms of discrimination. There are strong forces in Japanese society which keep female labour force participation and gender earnings ratio low. There is strong pressure on women to stop working during child-rearing period. When women re-enter the labour market after being out for several years, they find it hard to get relatively well-paying work in large Japanese firms because of their peculiar lifetime employment system. Institutions combating sex discrimination are relatively new in Japan. In recent years both economic and social pressures for more opportunities for women have been growing which are expected to bring about fundamental changes in Japanese society (Jacobsen, 1994).

Eastern & Central Europe

These countries have abandoned few years ago, the socialist path in favour of market-based decision making. During the socialist phase, women had made tremendous gains in many fields because states in these countries had explicit commitment to gender equality. Although these gains were not without qualifications, important ideas from them still continue to inspire feminists all over the world. These include the views that it is liberating for women to work outside, and that household duties including childcare can be assumed by society.

In Eastern Europe and Soviet Union labour force participation rates for women were already quite high in the early 1960s. In 1970, in most of these countries, female labour force participation rates were between 45 and 51 per cent, much higher than in Western European nations. As a result of high labour force participation, female representation in various economic sectors including industry is higher in Eastern Europe than in the European Union countries. The occupational concentration of women in services (education, health etc.) and light industry is however quite high, more or less comparable to that found in the European Union nations.

Eastern and Central European countries tend to have high gender earnings ratios. In Soviet Union, the gender earnings ratio was already as high as 0.70 in the

early 1960s. Several other countries such as Czechoslovakia and Poland also have gender earnings ratios of about 0.70.

The notions of openness and democratization due to the reforms initiated by Gorbachev in the mid-1980s generated a lot of enthusiasm in Soviet Society including among Soviet women. The reforms promised women many benefits. Deterioration of the economy in 1980s intensified, rather than relieved, women of every day responsibilities, longer lines, food shortages and price hikes left women with little time to enjoy their new found freedoms' (McMahon, 1994, p. 63). Women during this period also faced conservative backlash which sought to force them out of their jobs and return them to home, with their children.

In Romania, female labour force participation rate was 44 per cent in 1970, it remained at the same level during the 1970s and 1980s. During this period there was a considerable decrease in segregation of work by gender: Traditionally male-dominated sectors such as industry, construction and forestry all showed considerable increases in the proportion of employees who were females. Education and health became even more female-dominated over this period (Bacon and Pol, 1994, p. 52.).

In Romania, traditionally male-dominated sectors such as industry, construction and forestry showed considerable increases in the proportion of employees who were female.

Developing Countries

From the very beginning of the Communist rule in China established in 1949, the Communist party has been committed to gender equality. Most policies regarding women aimed at increasing their employment as work outside was seen to be the most effective way of achieving gender equality. The proportion of women in the workforce increased rapidly during the 1950s and 1960s. In 1970, the female labour force participation rate in China was 42 per cent, one of the highest in the world. In 1982, the female labour force as a percentage of the adult female population was 70 per cent in China, compared to 52 per cent in the United States. Rural-urban migration was strictly controlled in China. Urban women found jobs in cities without much difficulty as they faced no competition from women migrants from rural areas. Rural women

had good job opportunities in agriculture. They were given a share of land during the land reforms in the beginning of the 1950s. Agriculture was later organised into collectives and communes. Like men, women worked in the field and shared the produce on the basis of work points. Although women made tremendous gains during this period, they did face, to some extent, discrimination based on sex: the number of work points a women typically could earn in a day were usually less than the number a man could earn (Summerfield, 1994, p. 113).

On the negative side, rapid industrialization in South Korea during the 1960s and 1970s resulted in segregation of women in the less desirable jobs.

During the period of rapid industrialization (i.e. between 1965 and 1980) in South Korea, female workforce participation increased while male participation fell. In the early 1980s there was a drop in overall participation. However when economic growth picked up again in 1986, workforce participation increased, the increase for women being relatively more than for men. With growth in number of women in paid employment, the percentage of women holding longer-term, regular paying jobs also increased. However, on the negative side, rapid industrialization in South Korea during the 1960s and 1970s resulted in segregation of women in the less desirable jobs: 'women were concentrated in agriculture and tended to work in menial jobs in the manufacturing sector' (Fuess and Lee, 1994, p. 157).

In India, representation of women in the labour force is quite low. According to the Census data, the work participation rate (defined as the proportion of employed or total workers to population) of females increased somewhat from 14.22 per cent in 1971 to 22.27 in 1991 (see table 4). Most of the increase in work participation rate is due to rise in work participation of rural females over this period. Work participation rate of urban females showed only marginal increase during this period.

Women's employment in the organised sector increased from 1.9 million in 1971 to 4.0 million in 1993; women workers constituted 14.6 per cent of the employment in the organised sector in 1993. Of the total employment of women, the organised sector employment forms only 4 per cent, whereas, the corresponding figure for men is 10 per cent. Nearly 78 per cent of all

Table 4: Female Work Participation Rates (India 1971-91)

1971	Total	14.22
	Rural	15.92
	Urban	7.18
1981	Total	19.67
	Rural	23.06
	Urban	8.31
1991	Total	22.27
	Rural	26.79
	Urban	9.19

Source: Govt. of India, 1995, p. 20

economically active women are engaged in agriculture as compared to 63 per cent of men. The report submitted by the Government of India at the Beijing Conference admits that women have not benefitted much from development process. 'Paradoxically women's contribution to agriculture as well as in food processing and marketing, however, does not entitle them to be included as beneficiaries in major sponsored programmes in these sectors. This is due to a certain gender-blindness that permeates much of development thinking. Access to resources such as land, credit, appropriate technology and training has always been difficult for them' (Govt. of India, 1995, p. 60).

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In a study (Singh, 1996) on the period 1966-88, rising trend in female agricultural worker's earnings in terms of both nominal and real wages has been indicated. Female workers' wages however continue to be lower than male workers' wages, a trend that holds in most of the states in India. Although the overall male-female earnings gap has declined over time, quite large differentials continue to exist across the major agricultural regions of the country. The study shows that 'some of the regions with relatively high levels of yield and agricultural development are also characterized by a combination of relatively lower female agricultural workers' wages and higher male female wage differen-

tials than the poorer states with comparatively low agricultural yields' (Singh, 1996, p. 89).

Gender & Economic Restructuring

The current restructuring of global economies has had profound effects on social and economic life in both developed and developing countries. The ongoing process of structural reforms is however not gender-neutral: economic restructuring is affecting men and women differently. 'For example, economic policies of trade liberalization and greater flexibility in shifting resources from one sector to another are premised on a commensurate mobility of individuals. But, in analysing this type of strategy, it is rarely, if ever, asked if the sexual division of labour makes it more difficult for women, relative to men, to switch from employment in non-tradeable production sectors to tradeable production' (Bakker, 1994, p. 1).

Gender implications of economic restructuring in industrialized countries are not usually considered very serious. It is argued that increased global competition as a result of global restructuring will lead to feminization of the workforce. 'The demand for labour will increase with new competition from low-wage countries. This low-wage competition will be instrumental in weakening the bargaining position of labour in industrialized countries and ultimately depress wages. As low-wage employment spreads, women's employment will increase and women will be increasingly substituted for male workers' (Cohen, 1994, p. 105). This argument however cannot be said to be valid for all circumstances. 'It seems equally plausible to argue that intensified international competition could bring about a sufficient regression of wages in general so that the cost advantage of hiring women over men would not be sufficient to change the gender-typing of jobs'.

Intensified international competition could bring about a sufficient regression of wages in general so that the cost advantage of hiring women over men would not be sufficient to change the gender-typing of jobs.

Countries in Eastern and Central Europe have recently undergone radical economic and political change. These formerly socialist countries have repudiated decades of central planning in favour of market based decision-making. These countries are now on course towards becoming capitalist systems.

After the break-up of the Soviet-Union in 1991, Russia became an independent state. The Russian state under the leadership of Yeltsin intensified the process of Russia's transition to a free market economy. It is possible, as argued by some, that Russian women could gain from transformation in the long term, but for the present, women do not appear to be enthusiastic about the marketization of the economy. During the last few years there has been a significant growth in unemployment and most of the unemployed workers are women. Job situation in particular for middle-aged educated women has become quite difficult in recent years (McMahon, 1994, p. 69).

In the post-communist Romania, there are several competing forces affecting the workforce status of women. Like Russia, rising unemployment over the last few years has affected women far more than men. More and more women are being pushed into informal sectors of the economy where skill and wage levels are very low. The effects of marketization on the workforce status of women in Romania so far have by and large been negative. However, with the abolition of the pronatalist policies of the 1960s, 1970s and 1980s, there has been a decline in fertility since 1989, which is likely to have positive effects on the status of women in the workforce in the long term (Bacon and Pol, 1994, p. 57).

Discussions of gender and economic restructuring generally focus on what is happening in developing countries. Economic reforms pursued by developing countries in recent years, unusually under pressure from the IMF and the World Bank, involve trade liberalization, privatization, and fiscal restraint. The costs (or benefits) resulting from the economic transformation are not shared equally by men and women. It is observed that generally women bear a disproportionate share of the costs whereas men generally are the gainers.

The costs (or benefits) resulting from the economic transformation are not shared equally by men and women. It is observed that generally women bear a disproportionate share of the costs whereas men generally are the gainers.

The main aim of economic reforms is to generate higher rates of economic growth. However, on its own, economic growth does not necessarily lead to a rapid reduction in gender inequalities. 'Achieving greater quality involves a process of active social change which has no obvious link with economic growth' (Dreze and Sen, 1995, p. 159).

South Korean economic reforms (since 1980) have had mixed impact on the economic status of Women. There has been an increase in the number of women performing low status, unpaid work. However, the growth of female paid employment in the service sector has been greater than the increase in the number of women in unpaid family work and paid manufacturing employment (Fuess and Lee, 1994, p. 157).

In China, the post-Mao economic reforms put greater emphasis on efficiency and markets, promoted international trade through the opening of the Special Economic Zones, and privatized agriculture. At present, China has one of the highest of economic growth rates in the world. Economic reforms have provided many new employment opportunities for women. 'In the Special Economic Zones, as in most export-processing zones, young women (18-23 years old) hold average of 70-80 per cent of the newly created production jobs'. It is true that women are generally employed at the lowest level, in assembly-line work where chances of promotion are very low. But wages in the Special Economic Zones are much higher than wages outside the zones (Summerfield, 1994, pp. 117-118).

Agricultural work, which is now centred on family farming, however, still provides employment to most Chinese women. The share of women in the agricultural workforce has grown in the post-Mao period. Employment opportunities for urban women have also increased, 'especially in foreign-funded enterprises and through self-employment' (Summerfield, 1994, p. 119). The female labour force participation rate in China was 45 per cent in 1990, compared to 42 per cent in 1970 (UNDP, 1997).

In India, the economic reforms that were introduced in 1991 consist of both stabilization measures and the Structural Adjustment Programmes (SAP). The gender implications of new economic policies are difficult to assess at this juncture as many of the policies, especially with respect to the SAP, are still unfolding.

As stabilisation policies involve measures to curtail budgetary deficits, they are basically contractionary in nature. As argued by some analysts, the stabilisation policies may lead to increase in unemployment, with women being affected more adversely than men.

The Structural Adjustment Programme which is aimed at a fundamental restructuring of the economy consists of policies of globalisation, privatization and liberalisation. The gender implication of the SAP have been the subject of an ongoing debate. As a result of the economic transformation, employment opportunities for women increase in export oriented industries and in

private sector. These gains in employment may, however, be offset by reduction in employment in the traditional sectors, which employ women in large numbers (Govt. of India, 1995, p. 55). Reduction in public spending also has a direct impact on women's employment due to the relatively high representation of women in some redundancy-prone public sector occupations.

Conclusions

Unless conscious efforts are made to improve women's condition, the negative effects of economic restructuring may far outweigh the positive effects. To see that women do not end up losers as a result of economic restructuring, what is needed is to give economic policies a distinct gender perspective.

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Gender & Structural Adjustment: Exploring the Connections

Pradeep Kumar Panda

The paper reflects on the absence of explicit attention to gender in macroeconomic analysis and policy formulation in general, and designing structural adjustment programmes in particular. It is argued that unless gender relations are taken into consideration, gender-neutral development will continue to persist, leading to inequity and inefficiency. Drawing on the themes emerging from the feminist economic literature, the paper also examines gender-biased effects of structural adjustment as well as a framework for analysis to engender adjustment.

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Introduction

Since 1980s, in many developing countries macro economic stabilization and structural adjustment programmes (hereafter SAPs) have been introduced. Consequently, there is a need for exploring gender implications in them. Firstly, a feminist critique of macroeconomic theory in general and SAPs in particular is provided. Secondly, empirical linkage between gender and SAPs has been studied in the paper. Finally, a framework for analysis to engender adjustment has been suggested.

Structural adjustment programmes and policies, essentially a response to economic crisis, are intended to improve the incentive structure, the trade regime, allocation of resources, and efficiency in the use of resources to stimulate growth-enhancing impulses in the economy. Gender relations are defined as those socially constituted relations between men and women which are shaped and sanctioned by norms and values held by members of a given society (Young, 1993). The joint interaction of gender relations and processes of SAPs has been extensively investigated (Beneria and Roldan, 1987; Cornia, Jolly and Stewart, 1987; Sen and Grown, 1987; Commonwealth Secretariat, 1989; Elson, 1991a, 1991b, 1995; Palmer, 1991; Haddad, 1991; Gladwin, 1991; Afshar and Dennis, 1992; Beneria and Feldman, 1992; Haddad, Richter and Smith, 1992; Collier, 1993; Bakker, 1994; Sparr, 1994). These reflect on how gender relations may have implications for efficiency and equity. Recently, feminist economists have attempted to develop theoretical and empirical macroeconomic models that incorporate gender as an analytical category (Cagatay, Elson and Grown, 1995).

Conceptual/Theoretical Issues

Gender Bias in Economic Analysis and Policy: Since men and women play different roles, have dif-

ferent needs and face different constraints, the distribution of costs and benefits of structural adjustment will be different for men and women. These differences are a result of asymmetrical rights and obligations of men and women as reflected in differential property rights, human capital endowments, access to, use of, and control over economic resources (land, labour, capital, technology), and factor mobility (Moser, 1989; Palmer, 1991; Agarwal, 1994). This provides a conceptual rationale for considering gender as a critical dimension in economic analysis and policy prescription, as well as in SAPs to make them gender-responsive. However, as is well known, macroeconomic policies as well as SAPs tend not to consider gender explicitly, making them gender-neutral (Elson, 1987, 1992, 1995; Feber and Nelson, 1993; Bakker, 1994; Nelson, 1995).

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According to Elson and McGee (1995), there are at least three important gender-based distortion in resource allocation: (i) the discrimination against women in access to resources and services; (ii) the unpaid work that women are obliged to undertake in social reproduction and family maintenance (which Palmer terms as "reproduction tax"); and (iii) the unequal exchange within households in terms of patterns of work and income distribution, reflecting conflict as well as co-operation.

Given the extent of market incompleteness and market failures, the "invisible" segment of the economy—the household production of nonmarketed goods and services—is more important in developing countries (Beneria, 1992). Macroeconomics includes household production of marketed goods and services but excludes the nonmarketed goods and services. It is the failure to include the "unpaid economy", and the corresponding failure to recognise the strong dependence between the paid and unpaid economy, that reveal the gender bias in macroeconomics (Elson, 1993). Furthermore, macroeconomics becomes a "bearer of gender" even though not intrinsically gendered (Elson, 1991, 1994).

As against this, microeconomics, more specifically the theory of household economics is consistent with observable patterns of gender differentiation, but that does not make it a valid explanation of how such dif-

ferences comes about, nor does it justify the treatment of households as unities for policy purposes (Folbre, 1985, 1986).

Gender Division of Labour: This division critically defines women's and men's economic opportunities, constraints, and incentives, have important implications for SAPs. The theoretical conceptualisation and perception that some work is socially constituted as "women's work" and some as "men's work" is unrealistic. Addison et al (1990) argue that socially determined constraints on the time allocation of women have two important effects. First, these constraints induce allocative inefficiency within the system. Thus, insofar as the labour resources of the household are not allocated in accordance with its member's respective comparative advantages, output, and thus household income, is lower than it would otherwise be. Such inefficiencies may be an important source of female poverty, as well as a contributor to the overall poverty of the household. Second, the low substitutability of male and female labour time in specific activities reduces the ability of women to reallocate their time in accordance with changes in market and non-market opportunities. This has important effects on the welfare and economic outcomes of adjustment, again for women individually and for the household unit.

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This gender-based distinction cuts across both the formal and informal sectors. Much theoretical work about the informal sector associates it with low-paid, low-skilled casual work, in contrast to the formal sector which is seen as a source of high-paid, high-skilled stable employment protected by trade unions and government legislation. This conceptualization ignores gender as an axis of segmentation. In manual occupations, female employment, whether in the formal or informal sector, tends to have the characteristics that theorists have associated with the informal sector; and male employment, whether in the formal or informal sector, tends to have the characteristics associated with the formal sector. Gender difference cuts across the informal/formal distinction. The quality of employment depends on whether it is "women's work" or "men's work", not just on whether it is formal or informal sector (Elson, 1991b).

The micro-level analysis of economic behavior and welfare focuses on households. The welfare of individual is mediated through the household (Jockes, 1988). However, many simplifying assumptions are made about the nature and functioning of households in conventional neo-classical economic analysis and much of household economics. For instance, there are still many shortcomings in the assumptions of household economics. These are:

- a household functions as a socio-economic unit;
- there is perfect substitutability of factors of production in the household division of labour;
- the household is seen as a unified entity of consumption and production;
- the household has a joint utility function;
- the household head serves as a proxy for the collective utility maximization of the household;
- the relations within the households are characterised by pooling and sharing of income and resources.

These issues have been discussed at length (Agarwal, 1994; Elson, 1989; Evans, 1989; Palmer, 1991; Folbre, 1986; Dwyer and Bruce, 1988; Sen, 1990; Kabeer, 1991). Since households are characterised by considerable diversity as to size, composition, dependency ratios, location and headship, it is important to redefine the economic literature on households. A feminist approach incorporating gender relations can be seen from some recent work (Sen, 1990; Agarwal, 1992; Seiz, 1991; Lockwood, 1992; Beneria, 1995; Feber and Nelson, 1993).

Empirical Evidence

There is now considerable empirical evidence linking SAPs and feminization of the labour force. Using cross-country data pooled for 1985 and 1990, Cagatay and Ozler (1995) analysed the relationship between women's share of the labour force and the process of long-term economic development, and macro economic changes associated with structural adjustment. They found that the relationship between long-term development and women's share of the labour force is U-shaped. Controlling for the feminization U, they also found that structural adjustment policies have led to an increase of feminization of the labour force via worsening income distribution and increased openness. Standing (1989) also has attributed the global feminization of the labour force since the early

1980s, to supply-side macroeconomic policies and structural adjustment. However, there are critiques to Standing's study as it does not separate out the impact of the long-term feminization U from the impacts of the particular policies of the 1980s, and the assumption that women are being substituted for men (Berik and Cagatay, 1992; Elson, 1995). The feminization of the labour force often takes place within the informal sector through, for instance, homeworking (Beneria and Roldan, 1987; Moser, 1996) where gender gaps in earnings are even more pronounced than in the formal sector due to the relative difficulty of organizing for collective action in this sector (Cagatay, 1997).

As regards feminisation of women's work in the reproductive sphere in the context of SAPs, the literature suggests that women have tended to make up for falling family incomes by expanding and intensifying their reproductive activities performed in the form of domestic or community level unpaid labour (Beneria and Roldan, 1987; Moser, 1992, 1996; Floro, 1995; Beneria, 1996). The combined effect of productive and reproductive activities demand increased women's time leading to many unfavorable consequences such as increased bias against girl's education, increased mental and physical stress and in extreme cases disintegration of families and communities (Beneria and Roldan, 1987; Commonwealth Secretariat, 1989; Beneria and Feldman, 1992; Moser, 1992, 1996; Folbre, 1994; Elson 1995b; Floro, 1995; World Bank, (1995). Other studies examine the strategies of poor rural and urban households for surviving the adverse impacts of adjustment (Sen, 1991; Elson, 1995; Gladwin, 1991).

Engendering Adjustment: A Framework for Analysis

The SAPs affect household in the following four ways:

(i) changes in incomes, through changes in wages and level of employment for employees, and through changes in product prices and product demand for self-employed; (ii) changes in prices of important purchases, especially food; (iii) changes in levels and composition of public expenditure, particularly those in the social sector, including possible introduction or increase of user charges for services; and (iv) changes in working conditions, through changes in hours of work, intensity of work, job security, fringe benefits, and legal status; this applies to unpaid as well as paid work.

There is reason to believe that the distribution of costs and benefits of SAPs at the level of household will fall unequally between men and women. For instance, when households have to reduce food consumption be-

cause of rising prices and falling incomes, available evidence suggests it is very likely that the consumption of women and girls will be reduced by more than that of men and boys. If charges are introduced or increased for education for education and health services, there is strong possibility that the access of girls will be reduced. When attempts are made to compensate for reductions in purchased resources by increases in unpaid labour (e.g., buying cheaper food that requires more preparation time), it is likely to be women who bear the main burden (Elson, 1987).

The framework discussed above on the impact of adjustment at the micro/household level incorporating gender dimension is extremely useful. However, it is

Box 1: Engendering Macro Modelling

First, alternative models should not assume that people have an infinite capacity to bear the costs of adjustment—human hardship resulting from high cost of pain, suffering and depletion of human resources. Alternative policies, therefore, should aim at preventing these human hardships and avoiding class, gender and ethnic biases. Second, more specifically, alternative policies should take into consideration the hidden costs of adjustment documented by different studies, such as the deterioration of infrastructure, discontinuities and interruption in schooling of children-girls in particular—with the corresponding long-term losses in productivity, intensification of domestic work, and increase in crime and violence. Third, from a gender perspective, adjustment policies need to be accompanied with two types of social policy: short-run compensatory measures dealing with the most urgent needs and negative effects of adjustment; and transformative measures that generate long-term change, such as distributive policies focusing on property rights and income, changes in the division of labour in paid and unpaid production, the participation of the women in paid labour force, educations and retraining programmes to prepare women for the requirements of technological change, and productivity increases in the nonpaid sectors of the economy. Fourth, one basic objective of macro models should be a clear recognition of the links between the paid and unpaid sectors of the economy or between productive and reproductive activities, rather than just setting the prices right or maximising efficiency and economic growth. Fifth, macro models need to take into consideration that technological change stimulated by structural adjustment may not be neutral with respect to gender. Sixth, micro and meso studies have provided much evidence about the lack of choice facing individuals and women in particular, and about the limited horizons and possibilities associated with poverty and with patriarchal norms and traditions. Thus, alternative models should not assume that people face a wide range of choices associated with their maximising behavior. Finally, it is important to discuss how in some cases feminist concerns might interact with macro objectives. For example, anti-discriminating policies such as enforcement of equal pay for equal work laws, social investment funds, employment schemes targeting women, or investment policies fostering export promotion in predominantly female industries are examples of policies that, if properly applied, can achieve both macroeconomic goals and feminist objectives, pointing out the possible compatibility between the two.

Source: Beria, 1995.

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also equally important to consider to opposite to engender macroeconomics. In this respect, Beneria (1995) provides various suggestions for macro modelling and policy making. (See Box 1).

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UNIFEM & Development of Women: A Global Overview

Chandni Joshi

The scope and activities of a specialised global agency for upliftment of women especially in developing countries, viz. UNIFEM is presented in the paper. This agency, created to mitigate gender bias, has been the outcome of several UN conferences during the past decade. Besides delineating the ongoing projects for women development in several developing nations, the paper highlights significant achievements. These mainly concern economic progress, removal of gender inequalities, improving educational status and prevention of oppression and violence against women. The role of regional coordinating agencies of UNIFEM in Asia, Africa and Latin America is pointed out.

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Introduction

The United Nations Development Fund for Women, (UNIFEM) has been established as a Fund within the United Nations System to help improve the living standards of women especially in developing countries and to address their concerns. It functions as an advocate for women of the developing world and to give them voice and visibility. UNIFEM provides direct support to women and for the promotion of women in the decision-making process of mainstream development programmes. It serves as a bridge between global policy makers and grassroots women in the developing world and is a key institution for bridging micro-voices of women to macro-policies.

While drawing inspiration from the international women's movement, UNIFEM's strategy is the outcome of six major UN Conferences during the last decade from Rio to Vienna to Cairo to Copenhagen, to Beijing, and the Habitat II Conference in Istanbul in 1996. The common thread running through these UN conferences, so far, has implicitly been the empowerment of women, having the common goals of sharing power equally, obtaining full access to the means of development, overcoming poverty, promoting peace and defending women's rights, inspiring a new generation of women to work together for equality and equity. It also advocates for the participation of women in development at global, regional and national levels, with political and economic empowerment, and the promotion of women's rights, to eliminate all forms of violence against women.

Activities of UNIFEM

Firstly, UNIFEM seeks to strengthen women's economic capacity as entrepreneurs and producers, especially in the context of the new trade agendas and the emergence of new technologies, which present both new threats and new opportunities to women's

livelihoods. The objective is to encourage women to become powerful economic forces in the context of regionalization and globalization. As key economic players they will be able to address simultaneously the feminization of poverty, shape the direction of market forces, increase their participation in economic decision-making, bargaining power in both the household and the marketplace, and access to and control over economic resources.

The objective is to encourage women to become powerful economic forces in the context of regionalization and globalization.

In operation, UNIFEM has projects in 93 countries, ranging from those addressing globalization and economic restructuring to those promoting women's entrepreneurship and supporting sustainable livelihoods. In November, just prior to the meeting of the WTO in Singapore, UNIFEM and the Centre for Environment, Gender and Development (ENGENDER) organized a strategy meeting for 30 representatives of governments, NGOs and the private sector to share the analysis of the impact of trade on women in Southeast Asia. Supported by CIDA, the International Development Research Centre and UNDP, participants drafted a declaration with specific recommendations to increase women's opportunities to benefit from new trade policies and agreements. An electronic network has been set up by ENGENDER to facilitate the availability of information on women and trade. A primer to demystify the trade process will be produced by UNIFEM. Since home-based workers remain dangerously unprotected, UNIFEM, S. Asia and UNIFEM, Asia with SEWA, a 200,000 member women's trade union, organised a regional high-level consultation of policy-makers from 10 Asian countries to sensitize them to the needs of home-based workers. This aided in no small measure in the passing of the historic Convention on Home Work at the ILO Conference in June 1996. In Vietnam and Laos, UNIFEM is working in partnership with women's unions to raise awareness of the impacts of government macro-economic policies on women and increase opportunities for women to join the paid labour force.

Investing in a series of small-scale business, the projects in West Asia UNIFEM initiatives include developing business services within national institutions, establishing networks of credit programmes and supporting training sessions for several hundred women entrepreneurs in Gaza, Jordan, Lebanon and Syria on

business and financial management. In a region where women have limited economic power, this has led to an increase in women's business networks. UNIFEM supports new and better ways for women to become economically active in trades that benefit them, often building on women's traditional knowledge. For example in Nepal, in UNIFEM supported "Janakpur Women's Art Project", traditional Maithili art was revived and strengthened and women were trained in management and leadership, as well as on product development, quality control and market expansion for Maithili art. Similarly, UNIFEM is supporting indigenous Tawakha craftswomen in Honduras to improve their business skills through training in leadership, marketing, accounting and design.

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The New Delhi office for South Asia has started a regional process of gender sensitizing the censuses of member countries. UNIFEM is assisting the census processes to reflect more gender-sensitive records of women's contribution in the economic sphere, as in work participation and unpaid work. In India, UNIFEM is leading a UN system intervention and the government has already accepted the proposal that the 2001 census needs a gender lens to improve the visibility of women. In Nepal too initial gender sensitizing work will be starting for the 2001 census. In Pakistan the government has expressed a willingness to involve NGOs and women's groups in carrying out the census operations. In Sri Lanka, the census authorities have agreed to work towards the development of a satellite accounting system.

Likewise, UNIFEM is strategically involved in the Trade Related Entrepreneurship Assistance Development Programme for Women (TREAD). And in Nepal it is supporting an NGO in the project *Building Capacity and Autonomy Through Cotton Farming*, which stems directly from the women of Jamuni, who wanted to improve their irrigation systems for increasing agricultural productivity. Simultaneously, it aimed to arrange a nexus of cooperation between the local farmers, the Cotton Development Board and the Rashtriya Banijya Bank, for development that is sustainable, democratic and efficient. The specific goals have been to improve people managed irrigation systems; promote cash crops which will augment women's income and access to land; provide the needed link between the people and the external agencies; and

buttress local autonomy through initiatives based on control and decision making.

Working to enhance networking and establishing social and economic market links, UNIFEM in New Delhi co-funded an initiative, strategically timed to coincide with the India International Trade Fair. Again Cultural Festival in Nepal provided a forum for the ethnic communities and NGOs to display/exhibit, build networks for the establishment of market links, and share experiences and information leading to further collaboration. The UNIFEM/GOI supported Directory of Women Entrepreneurs entitled 'Women in Business', provides comprehensive information for establishing a marketing network and linkages from different stages of marketing of products manufactured by women.

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Political Strategy of UNIFEM

UNIFEM's focus on governance and leadership is a direct response to the challenge for every country to break down the barriers that keep women from participating fully in the political decisions that control their lives. The prevailing figure show a dismal picture with only 12 per cent of parliamentary seats being held by women, and only 5 per cent cabinet seats worldwide. Additionally, there is the shattering figure of 80 per cent for the world's 23 million refugees being women and children. UNIFEM supports women's organisations to increase leadership opportunities for decision-making and advocacy for women working towards new formations of governance. The objective is to strengthen women as a political force to bring about development that addresses the issues of poverty, equality, and social and ecological sustainability.

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Politics is one field where the incidence of increasing participation by women is still not very impressive in most of the countries of the region. In India the 73rd and 74th Constitutional Amendments in 1992 to the Constitution have been pioneering affirmative actions in favour of women. It has been a piloting mechanism to enhance women's participation into decision-making bodies at the grassroots level. This has paved the way for participation of women (reservation of 1/3rd of seats) at all the three tiers (village, block, and district level) of the Panchayati Raj system with the Act providing for direct election to all the seats at the different tiers with a fixed tenure of 5 years. The proposed 81st Amendment legislation reserving one third seats in the Parliament and State legislatures for women is currently under process for adoption. The other countries of the region like Bangladesh are also lobbying for a similar reservation policy for women.

For making the Ninth Five Year Plan of India more gender responsive, UNIFEM created an Alternative Development Module, an example of a participatory bottom-up exercise. Women from the grassroots, academicians, researchers, activists and NGOs were partners alongwith the Planning Commission and the Government of India in this exercise. These were the links in the chain formed for coalescing the many and varied voices of women from equally diverse backgrounds and regions to the policy planners.

A network has been established through a Think Tank which lobbied with key partners altogether involving 240 women. Through their research and sectoral studies, Think Tank probed for and identified the gaps that need to be addressed. UNIFEM, alongwith the Think Tank, interacted in the planning process in four stages, which chronologically were with (i) Department of Women and Child Development, (ii) Members of the Planning Commission, (iii) the grassroots women in the four regional consultation groups of UNIFEM and (iv) the Think Tank in Calcutta (with the Eastern and North Eastern states), Pune (with the western states), Bangalore (with the southern states) and Chandigarh (with the northern states). Respectively, the themes were: Economic Empowerment, Basic Needs, Technology and Laws; the Elimination of Violence, Women's Health and Development; Urbanization, the Urban Informal Sector, Shelter and Specially Disadvantaged Groups and Agriculture, Environment and Political Empowerment. In the last stage, the deliberations of UNIFEM were presented to policy bodies like Planning Commission, representative ministries, etc.

As the process of plan implementation through annual plans, projects and schemes, resource allocation

and plan review continues, the gender process sensitizing the processes will also continue on an ongoing basis. It has been a step towards making human development truly sustainable by facilitating women's inputs into a system and process that strengthens women's agenda for change.

As the process of plan implementation through annual plans, projects and schemes, resource allocation and plan review continues, the gender process sensitizing the processes will also continue on an ongoing basis.

Women's Machineries in the South Asia region are keen to have a replication of the Model, with national adaptations in their respective countries. The Governments of Maldives, Sri Lanka, Nepal and Bangladesh have requested UNIFEM SARO's assistance for the formulation of a similar mechanism for gender auditing the national policies, modified to meet their own specific needs. There is now an added dimension to UNIFEM's rich culture of partnerships with NGOs and activists by the forging of this new enriching alliance with the Ministries of Women of the National Governments of the region.

Other Initiatives

UNIFEM is currently working to promote the realization of women's rights and the elimination of all forms of violence against women to facilitate women's full participation in the societies. Its Human Rights Programme works in partnership with women's groups, governments and the UN System in the three main areas of: mainstreaming women's rights into the policy and practice of the UN human rights machinery; combating and eliminating violence against women; and strengthening women's knowledge of their rights and use of existing instruments to promote and protect them, with particular focus on the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW).

For this purpose UNIFEM has established a Trust Fund for Actions to Eliminate Violence Against Women which became operational in 1997, and supports innovative initiatives in the areas of: awareness raising and advocacy, capacity building, legal literacy, training, prevention and deterrence of violence and action-related research. In 1996, UNIFEM supported projects undertaken at the government and grassroots level (for instance, educating through school curriculum) to bring

the issue of violence against women—often invisible—directly to the public. To quote a few instances, in Trinidad and Tobago, UNIFEM has funded the Rape Crisis Eliminate Society (RCS), an organisation that has pioneered innovative ways of dealing with the issue of violence against women. In India, Pakistan, Nepal, Bangladesh and Sri Lanka, it is supporting a project aimed at the gender sensitization of the judiciary with the help of a sensitized regional team of Supreme Court/High Court judges.

UNIFEM and UNICEF Regional Office of South Asia are collaborating in three initiatives to counter violence against women. In the project Gender and Laws, involving India, Pakistan, Sri Lanka, Nepal and Bangladesh, there is an effort to look at the effectiveness of the legal system, identifying critical areas requiring reform. With the objective of building a regional alliance of women and men drawn from different spheres and professions, there is a project Showcasing Effective Strategies for Countering Violence Against Women (VAW). This regional network will act as a pressure group within and across countries and professionals to work towards a gender based violence free society and advocate and disseminate new role models of masculinity and femininity.

UNIFEM co-chairs the Inter-Agency Working Group on Gender and Development along with UNICEF. The three Inter-Agency Sub-Working Groups on Advocacy, Poverty Alleviation and Economic Empowerment, and Data Collection and Sex Disaggregated Data have been very active with UNIFEM participating in all the 3 Groups, leading the group on Advocacy. The Advocacy Group has now been substituted by the formation of the Sub-Group on Violence Against Women and Girl Child. The main activity of the Sub-Group on Advocacy has been to influence the Ninth Five Year Plan, influencing the Government towards a non-traditional process of policy-making, through the Department of Women and Child Development and other sectoral Ministries, including the National Planning Commission. The Sub-Group on VAW and Girl Child comprising of UNIFEM, UNICEF, ILO Area Office, WHO, UNFPA is focusing in the areas of: documentation on violence against women in Panchayati Raj Institutions; research study on the unnatural deaths of women in Delhi Hospitals; study on effectiveness of measures to prevent crime against women cells and all-women police stations in the country; and developing appropriate communication strategies on Procedural Norms relevant to women victims of violence seeking support from law enforcement authorities. The Sub-Working Group is utilizing the data support from its India 2001 Census project besides data from international organisations. An analysis of the existing status of collection, compilation and utilization of

Sex Disaggregated Data by the Registrar General of India and various major Government Departments, has been undertaken, and a report on this analysis has been shared with the DWCD (GOI) which has shown a keen interest in collaboration with the Sub-Groups efforts. The Sub-Group has proposed to initiate a programme in collaboration with the GOI. Its three major components are collection, compilation and publication of Sex Disaggregated Data, improvement of the 2001 Census and development of national Gender Development Indicators (GDI) and Gender Empowerment Measures (GEM).

UNIFEM is an active member of the WID Donor Inter-Agency Group, which meets regularly to share information on policy and specific initiatives of the member agencies (multilaterals, bilaterals and funding NGOs) and Governmental/NGOs of India. Working towards follow-up to the Beijing Conference, it promotes inter-agency collaboration in specific joint activities,

avoiding duplication of initiatives, and creating an enabling environment for Donor Coordination in India. Developing into an effective learning and knowledge-based organisation, UNIFEM integrates its activities in a feed-back process of pioneering, learning, information-sharing and advocacy. The corporate world view built by it allows for intra-organisational exchanges along thematic lines across countries and regions.

Forging new synergies and effective partnerships between women's organisations, governments, the UN System and the private sector, UNIFEM leverages political and financial support for women from a range of stakeholders in the development process, and its commitment goes beyond career or organisational commitment. It encompasses commitment to changes needed in the larger world. Essentially, it is a vehicle for catalysing systematic change to eradicate feminized poverty, violence against women, to engender governance and leadership and to promote gender equality. □

Women & Managing Development

Nada Šišul

An analysis into the tasks and results of the development management function in relation to the female labour force resource and its active approach to development has been made in the paper. The analysis has shown the role of interaction between the market and the management component of development. Also the advantages and limitations of the specific types of the state interventionism in the possibilities of activating the female labour resource, have been pointed out.

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Introduction

At the outset, two aspects in the development of the society are:

- The first one is the primary importance of human resource in the development in which women account for 42 per cent of the world labour force. Therefore the status of women, their orientation in life and work, their passive or active approach in overcoming the obstacles to recognition of their personality has a significant impact on achieving a certain development level.
- The second fact concerns the management component which has definitely been affirmed in the development besides the traditional market component.

In the present paper, how tasks and results of the management function are reflected on the resources female labour force and their development have been studied. In this context it may be mentioned that the motivation for studying the problem "women and managing development" is two-sided: Firstly, because modern development promotes entrepreneurship and the firms envisage new possibilities for economic and social recognition of human potentials. Secondly, due to the realization of the importance of women's developmental problems since the UN women decade 1976-1985—in particular the world conference for the survey and assessment of the decade achievements inaugurated in 1985 (United Nations, 1995).

This UN document, as is well known, comprehensively elaborated the problem of the women status, particularly in developing countries within the international and national framework. The document also indicated the direction towards an active and development approach in overcoming the obstacles to enhancement of the women's position. All this has given impetus to special UN institutions, e.g. INSTRAW which streamlined the concrete actions of the inaugurated strategy.

In terms of its objective and motives the research undertaken has two dimensions:

- characteristics of the female labour resource and
- development management function and women.

Characteristics of the Female Labour

The female labour resource is characterized by the complex and complicated social ambience, viz, the woman is a strong queen-bee around which the world revolves and is continually being reborn. The woman breast-feeds, swaddles, loves, caresses, washes and lulls the child to sleep. So when a woman goes out to work, it represents a troublesome, painful and complex process of her emancipation seen through a prism of the paid and unpaid work. Is a woman more useful as a worker or as mother? It seems that the "either-or" relation cannot be applied here, but rather the relation "also-and". Namely, by education and industrial operation the woman has been offered a new alternative and economic basis. For her work, she is given economic and public appreciation in remuneration, income. For the public, the employed woman is not any more a kept person. Therefore income and employment for a woman have not only economic significance but also civilizational advantage and justification of her existence and freedom.

In that sense the first characteristic of the female labour resource is derived from the woman's ambivalent position. That means on the one hand from her natural function in biological reproduction of the society and on the other hand from her position in the economic work of the society (employment).

In any case the woman's recognition in economic work depends on the level of the society organisation and its economic basis. It also depends on the conscious efforts of the society to consider the problems of the whole complex of biological reproduction (health, educational, social and institutional standards for the young and the old) primarily as the public and not the personal issues of the woman and the family. After all, the social security for the young and the old reflects the civilizational and not only the income level in meeting the people's needs.

The second characteristic is derived from the fact that the regular and increasing number of girls in education improves the quality of the female labour resource. With that the contingent of the offered female labour becomes not a temporary but a regular and constant

Woman's recognition in economic work depends on the level of the society organisation and its economic basis. It also depends on the conscious efforts of the society to consider the problems of the whole complex of biological reproduction.

phenomenon. Nowadays, considering the primary importance of human resource for development, the female labour resource is included parallelly with the issue of (un)employment.

The third characteristic of female labour is the asymmetrical deployment of female labour force as regards the level of income. Of the world female labour force that totals 1.120 billion, 59 per cent live in the countries with lower income (GNP \$ 725 and less per capita), 26 per cent in the countries with medium income (GNP \$ 726-8,955 per capita), and 15 per cent in the countries with high income (GNP \$ 8,956 and more per capita – World Development Reporter, 1996). All this points to the conclusion that the conditions under which it is generally possible to reach a higher level of female employment are considerably different. Namely, in the countries with GNP over \$ 10.000 per capita (approx. 20 per cent of the world population) employment is based on maximum economic efficiency (high level of productivity, economic growth with 75 per cent work share in the tertiary sector, total industrialisation and urbanization) so that economic growth means also the expansion of employment basis. Unemployment under such conditions is connected to cyclical trends in economy, the crisis phase of such a trend and higher or lower supply of female labour. But in other countries, particularly those with lower income with 60 per cent of the world population (and the proportional share of female labour) employment is connected to the development basis, to development level. And it means that for over the half of total human resource, conditions are not created for such industrial and urban way of life in which work, labour force (including female) could show its potentials through economic efficiency and economic, paid work.

It must be emphasized that younger generations in both developed and underdeveloped countries are particularly hit by economic inactivity. The unemployment rate with the young surges even up to 25 per cent. These generations differ considerably from the generations of the first half of this century. A completely new world has been created marked by substantially new movements. These are: Women and men in the world

nowadays are politically more emancipated, better educated and they are more demanding. New generations, especially women, are more aware of their rights. Luckily, they have more and more of them. But they want their rights to be met unquestioningly and without delay. Among these rights, there is naturally also their fundamental human right—the right to work. The fundamental rights for women include equality of sexes in employment, remuneration and freedom in the choice of maternity and family life.

New generations, especially women, are more aware of their rights. They want their rights to be met unquestioningly and without delay. Among these rights, there is naturally also their fundamental human right—the right to work.

For these reasons, managing development today is a very complex and complicated field of activity. Now, at the end of this century, development management is of vital importance in sustaining not only natural but also the world human resources.

Development Management

The basis of development managing component continues to be linked with market, capital, wage, firm and entrepreneurship. And the management function is subordinate to it. Its three major tasks can be identified as follows:

- First task is achieving the economic equilibrium situation
- The second one supplementary and complementary to the first one, is the task of attaining certain development;
- The third one, linked to the previous ones is the task of social stability with various elements.

These tasks really comprise many goals that cannot be attained by market operation alone. Which means from the socio-economic aspect that the firm and entrepreneurship (microeconomic structure) are oriented towards the direction in which the mode of organising the society necessitates certain social consensuses. They do not hinder spontaneity of the market mechanisms in creating dynamic equilibrium situations of supply and demand (especially in the factors of production-labour, capital, natural resource, organisation) but with the help of that spontaneity they keep

adaptability to development or sustainable development. In that, primary social consensuses refer to economic-social conditions of labour (the employed, unemployed, retired), educational and health standards of people and eco-standards.

Thus the management function in a certain sense represents a rational relation to economic reality, to arranging and changing that reality. Such a management function normally includes implicitly also the interests by which they are guided. Among these values, equality of sexes is deemed to be of primary importance for modern civilizational development of a mature person (woman and man) and a mature society. Everything contrary to it would mean degradation not only of the man but also of the society development.

The management function is mainly considered in the framework of the state interventionism. But since that interventionism must be submitted to the market function, then to understand the development itself and the position of female labour within it, it is important to consider what is happening with the agent of the market function, the agent of development i.e. the micro-economic structure. How does such a structure change and grow; what is its position in relation to the state interventionism; what are the prospects for female labour force?

State Interventionism

In Developed Countries

The state interventionism originated in 1930s because of the need to support the economy's traditional market component when it was growing weary. On that basis the issue of unemployment became of utmost importance. The more so since female labour with all its natural and acquired characteristics and demands was increasingly being included in the contingent of the labour force supply.

However, the nature of unemployment has substantially changed nowadays under the conditions in the developed countries. Generally speaking, the higher standard of living has enabled social and economic security with a widespread network of special services. They offer help and various other services in re-training and enabling mobility of unemployment female labour force with the aim of finding new employment more rapidly and successfully. With the benefits of insurance in case of unemployment, the new moment that exists is looking for and choosing a better employment, a part-time job or shorter working week. Besides, by growth of

the tertiary (service) sector, nowadays in the developed countries, a number of institutions service the needs of families, children and the elderly. That enables the woman, being less burdened with the family and motherly duties, to enter the world of labour, and through the work she is paid for, she can meet the needs for goods and services.

The nature of unemployment has substantially changed nowadays under the conditions in the developed countries. The higher standard of living has enabled social and economic security with a widespread network of special services.

Moreover, the developed countries during the crisis cycles have the advantage of being rich and have something to redistribute in order to reach a higher development level but with social and economic stability. These countries absorb strong innovative and investment waves by a higher level of decentralisation in microeconomic structure (small, medium and large enterprises), by a high level of economic and social organisation, by a developed system of the employees sharing in managing companies and by the mechanism of local and regional self-government. In that way, in the microeconomic organisation of the society, the entrepreneurial organisational basis for economic, paid work has been considerably widened. Indeed, the importance of the proactivist entrepreneurial behaviour as the basic determinant of economic and social development has been explicitly emphasized.

Among traditionally "hard" hierarchic organisations such as the state, the church, the army, the entrepreneurial business organisation is distinguished by flexibility. And that apparently suits the woman's talent so that the new "entrepreneurial" situations accompanied by education open for women, new fields of recognition including MANAGEMENT (Adler, 1996).

Furthermore, it can be concluded that the state interventionism helped to restore the traditional market component of development in such a way that the entrepreneurial (and not the ownership) function of capital was established as the primary development force. Also the relatively high autonomy of development in microeconomic structure (the firm and entrepreneurship) is accompanied by a multi-member network of not only the state but also the social control in the development management function. And that means that the modern society has been able to manage the

mechanism of distribution of economic power and society democratization. Thus, besides other things, women are given opportunity to overcome in an active and direct way, the obstacles to their recognition in the work and life.

In Underdeveloped Countries

In these countries most of which only in this century created the economic basis for industrial operation, building the economic structure with the domination of the secondary sector of activity, the state interventionism had and is having another position. For example, in the Central and East European countries (ex-socialist countries), the industrialisation and material production in general start from the state. The microeconomic structure (the firm) as the agent of development is organised and functions by the out-side, administratively imposed political stipulations, state laws, and not by the "hardness" of the production integration of the society (technical and economic). The state, that is the bureaucracy, represents the total capital, manages and controls the economic reproduction. The microeconomic complex is dominated by state-public companies organised as large systems. The economic initiative is formed according to the authority of the state-political hierarchy which is the only one that disposes of economic and political power.

Although that state administrative way of managing development does not attain a significant level of productivity and economic efficiency, nevertheless it enables a certain industrial and urban way of life, ensures comparatively equal education and health for population of both sexes and social groups. All that is gained by relatively high level of economic activity (employment) including also female labour force. That refers to the period 1960-1980 when the rate of economically active female population was 35-49 per cent (Demographic Yearbook, 1993). It was more a distributive than a market economy type.

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The state management function has a dominant significance in the social and economic promotion and

The domination of the state interventionism in managing development during evolutionary processes in

in transition with special reference to Croatia and Yugoslavia", *Ekonomski pregled*, Zagreb, No. 9-10.

□

stability of the society with a relatively limited range between specific levels of the employee skilled labour. The mechanism of the human resource economic and social security has comparatively successfully been built in the whole economic and social system (through relatively high public consumption and public services that meet the health and educational needs of the population) with all the components which favour the promotion of female economic work. And they are: increase in

tively small number of the wealthy and large number of the impoverished.

The society's diminished production basis causes the narrowing of general educational and health programs. And that impairs the family economic and social security.

Focus

Status of Women's Participation in the Tanning Industry: A South Asian Perspective

Jürgen Hannak

The issue of women participating in the tanning industry in the South Asian region has been under discussion at various forums of UNIDO for several years. The present paper is a summary of the UNIDO Report by the author and his investigation team for the tanning industry in China, Nepal, Indonesia and India. Besides focusing on the problems of women's participation factors like effective employment, status and training programmes, environmental problems like pollution are dealt with.

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Background

For a long time, the importance of women's participation and their contribution in the economic life was undervalued. Recent reviews of the status of women and their actual contribution to the industrial growth in many countries in South-East Asia as conducted by various international and national organisations, showed that today women play an important role in the economic activities of these countries.

UNIDO has, for many years, been actively engaged in the promotion of increased participation and contribution of women in the industrial development process of the developing countries. In particular UNIDO started the Regional Programme for Pollution Control in the Tanning Industry in South-East Asia covering Indonesia, India, China, Nepal in November 1995. This Regional Programme takes an integrative approach when directly assisting the tanning industry in the participating countries, by simultaneously looking at productivity, environmental soundness and worker friendly production.

Particularly, under the workforce oriented component of the Regional Programme, national experts were engaged in each participating country to make a survey of the current status of women's participation in the tanning industry and allied activities. At the same time, these experts also looked at the prevailing occupational safety and health standards at work in this industry.

Objectives of Regional Programme

The integrated regional programme for pollution control in the tanning industry in South-East Asia, comprises the umbrella project "Assistance in pollution control in the tanning industry in South-East Asia" and the national projects in each participating country. The principal

methodology below is through "show-how", that is by setting up pilot and industrial scale plants in operational tanneries of effluent treatment plants. The objectives of the Regional Programme are:

- Containment of environmental degradation emanating from the tanning industry in selected countries in South-East Asia.
- A significant reduction in the amount of pollutant generated in the process of leather manufacture in a number of tanneries existing in the selected countries in South-East Asia.
- Increasing women's contribution and their effective integration in the activities of the leather sector in the region, with particular emphasis on environmental aspects.
- Improving the health and safety of workers employed in the tanning industry in the region.
- Promoting consultation on global Eco-labelling concept.

To co-ordinate and synchronize the activities under the regional and the national projects within the region, the Regional Programme Office (RePO) was set-up in November 1995 in Madras, India.

Preparatory Activities for WID

Following the successful launching of the Regional Programme and the establishment of RePO as administrative nucleus at the regional level, UNIDO appointed an international expert as co-ordinator for the activities under objectives III, IV and V, under the overall supervision of the Programme Co-ordinator. During the first co-ordination and planning meeting of the Regional Programmes in March 1996 in Madras, India the basic strategy and approach for objective III were discussed and agreed upon.

As per the conclusions of this meeting, in each of the participating country a national expert, to co-ordinate the Women in Development (WID) related activities at the country level was engaged. Based on a review of secondary data and information and collection of primary data through visits to tanneries and meetings with tanners, women workers, non-governmental and governmental organisations, the experts compiled country surveys and made recommendations to increase women's participation in the tanning industry and allied activities at different levels of management hierarchy.

At the same time, RePO appointed an international expert on women's participation. The expert, with pre-

vious experience in women's participation in the leather industry, particularly in India and other countries of the region, was expected to provide direct guidance to RePO and the national experts in each country in the implementation of activities to achieve the objective of enhanced participation of women.

Results & Discussion

During the fourth quarter 1996 and the first quarter 1997, the national experts in China, India, Indonesia and Nepal conducted detailed surveys. The national experts compiled their findings and recommendations in separate country reports based on the approach described. Each national expert was requested to follow a participatory approach, involving concerned parties such as tanners, tannery associations, workers (of both sexes), non-governmental and governmental organisations as closely as possible.

The Tanning Industry Employment Status

The survey in each country revealed significant differences in the ratio of women's participation in each sector. Table 1 provides an overview of the results. It is seen that:

- The survey revealed that there were significantly less women working in the production stage as from raw to semi-finished leather than in the stages of semi-finished leather to finished leather production in tanneries.
- Except in China and to a certain extent in India, only few women occupy positions at higher and middle management level. Similarly, it is very common to find women operating machines or holding workforce supervisory charges in tanneries.
- The number and type of women employment differs significantly between small-and medium/large-scale tanneries. Small tanneries tend to employ women for job-work activities, on piece/daily rate and informal basis. Large-scale tanneries were found to employ more women in the finishing operations.
- The concept of common or individual effluent treatment plants is rather new in countries such as Indonesia and Nepal, while countries such as China and India have CETPs and ETPs in operation for an already longer period. In India, three CETPs in Tamil Nadu are reported to employ between 3-5 women in various managing and technical positions (on average the CETPs employ 25 persons).

Table 1: Overview of women's participation in each country and sector

Country Sector/Area	China	India	Indonesia	Nepal
Tannery (raw to semi-finished)		5%		
Tannery (semi-finished to finished)	35%	15%	5%	8%
Leather conversion (C)ETP	50%	85%	30%	70% ¹
R&D Laboratory	40%	5%	n.a. ²	n.a. ³
Environmental consulting	45%	25%	50%	80%
	not available	1%	not available	0
Estimated total number of women employed in the tanning/leather industry	400,000	10,000	600	519

Note: 1. Nepal has only one large shoe manufacturing unit, employing around 100 women.

2. Only one ETP employs two women.

3. There are no tannery effluent treatment plants in Nepal.

Legislative Framework

- In most countries covered under the regional survey, separate legislation or specific regulations pertaining to women's employment are available. (Table 2) These refer to limitations of employment of women during night times. Usually, the relevant regulations are contained in the legislative framework governing occupational safety and health in industry.
- The legislation in all countries includes provisions allowing maternity leave and other special leave in connection with child birth and nursing. In Indonesia, the law also grants special two-days "menstruation" leave every month.
- With regard to welfare regulations for female employees with children, the employer is obliged by law to provide crèche facilities. In most cases, the provision of such facilities is bound to specific criteria such as number of women employed in the factory etc. In most countries, the law does not specify whether these facilities have to be provided on individual or common basis, for example, in case of several factories/tanneries located in the same area. Such an alternative is not offered under the Factory Act in India which requires the employer to provide crèche facilities in case more than 50 women are employed. The law does not differentiate between women with and without children.

- Equal pay and equal career opportunities are presumed or specified as part of the national policy on women. However, these principles are not explicitly specified in the factory related provisions. Non-compliance and alleged breaches can be pursued through corresponding legal means as stipulated under the national policy.

Table 2: Selected legal provisions pertaining to women's employment

Country Legal provision	China	India	Indonesia	Nepal
Limitation of night time work	✓	✓	✓	✓
Restriction of women working in specific jobs	✓	x	x	x
Maternity leave	✓	✓	✓	✓
Menstruation leave	x	x	✓	x
Provisions of separate hygienic facilities	✓	✓	✓	x
Provisions of crèche	✓	✓	✓	x
Equal work—equal pay principle laid down in national policy	✓	✓	✓	✓

Factors Affecting Employment of Women

Socio-cultural Perceptions

- The most crucial factor generally influencing employment of women in industrial activities pertains to perceptions in the respective socio-cultural context. On the one hand the tanning industry as such is considered an employment opportunity with low social standing, usually reserved for certain communal or religious minorities or groups (table 3).
- On the other hand, many traditional perceptions within societies in the countries covered under the survey, discourage women's social and economic mobility outside the family house or village community. However, significant regional and geographical differences could be noticed in these countries.
- The latter group of society's perceptions also plays a crucial role when it comes to recruitment of women for work in tanneries for specific jobs other than auxiliary or unskilled ones.

Table 3: Society's perceptions about women's employment

Country Perceptions	China	India	Indonesia	Nepal
Tanning done by a specific group of society	x	mainly Muslim community	mainly by Chinese origin community	mainly by Indo-Aryan group
Low standing of tanning industry	√	√	√	√
Poor image of tanning industry	√	√	√	√
Social and economic mobility of women limited	x	particularly in Northern India	particularly in rural community	particularly in rural community

Image of Tanning Industry

Many women, at the point of starting a vocational career, consider work in tanneries an unattractive option. This is due to prevailing poor working conditions in this industry, the limited scope of career and promotion as well as the general image of the industry. In case women are willing to pursue a career in the leather sector, they usually prefer employment in the leather conversion sector or, if at all, in the finishing operations of the tanneries.

Women try, and sometimes are pressured by their families, to combine their professional career with their traditional role of housewife and mother. For lack of alternative arrangements, women shy away from positions which will require intensive travelling outside their home towns. This particularly affects the employment of women in companies such as consulting and chemical suppliers which usually require visits to clients in remote areas. Employment such as in laboratories, R&D and teaching institutions are preferred by such women.

The need of supplementing of family income is an important reason why women take up work as unskilled workers in the "semi-finished" sectors of tanneries. In many cases this is done for lack of an alternative.

Employers' Perception on Women's Qualifications

Employers, on the other hand, feel that women are not fit to take up work which is physically demanding or is to be done under difficult work conditions such as widely found in beam house, tan yard and wet finishing processes (table 4). However, in most countries, employers are convinced that women are capable of carrying out activities more diligently, accurately and with a higher level of self-discipline than male workers. With regard to equal career opportunities and taking up

supervisory and management positions, employers cite lack of experience and know-how as main reasons. However, in many cases cultural attitudes play a more important role denying women access to such positions. In many cases objections to women being engaged in machine operation were raised by male co-workers. In order to avoid labour conflicts, the management does not pursue such plans further.

Table 4: Employer's perception about women's employment in tanning

Country Employer's perceptions	China	India	Indonesia	Nepal
Women not fit for work in tanneries since work physically demanding	√	√	√	√
Women cannot operate machines	x	√	√	√
Women not suitable for supervisory positions due to lack of experience	x	√	√	√
"Feminisation" of jobs taking place	x	√	x	x
Men and women cannot/should not work together	x	x	√	√
Women employment adds costs	√	√	√	√
Women better and more accurate in leather finishing and leather conversion	√	√	√	√

Productivity & Cost Implications of Women's Employment

The existing legal provisions pertaining to women's employment, are perceived as obstacles by many employers. Tanning being a continuous process would require women to work at late hours and during night. However, the laws do not permit it.

Tanners claim that frequent absence of women workers due to family obligations, maternity as well as additional infrastructure requirements (separate wash-room, toilets, change room, health care, etc.) result in lower productivity of workers and higher cost. If at all, tanners prefer to employ unmarried women until their marriage. Since these women tend to drop out of the labour market after marriage, the employers only invest little in their training and skill up-gradation. This again has an adverse effect on the career opportunities of women, giving feed to the perception of lack of

qualification of women employees for higher levels of employment. Thus, investment in training of women is considered wasted money.

Labour Market Conditions

Even if tanners had been ready to employ an increased number of women in the tanneries, they were not able to find any women willing to take up employment. Aside from the reasons mentioned earlier, the labour market did not provide sufficient number of candidates. The tanning industry often faces local competition for women labour from within and outside the leather industry (tanning—leather conversion, tanning - textile industry, etc.).

In Indonesia, women constitute more than 70% of the employees in the service sector (banking, insurance, hotel, etc.) while men tend to take up employment in the manufacturing sector.

In Tamil Nadu, India, the concentration of leather conversion industries (shoes, garments, leather goods) in some geographical regions, with women employment rates up to 95 per cent, were found to drain the respective labour market of women workers.

Initiatives for Promoting Women's Employment

Tannery Sector

Except for a few progressive tanners, no concerted and structured efforts to increase women's employment in the tanning industry have been put up by the national tannery associations. However, the good experience with employment of women as gained by these few tanners— is usually widely known within the tanning community.

Government Organisations

As mentioned earlier, the governments in the participating countries actively promote increased women's employment and participation in the industry as such. This was attempted through national women oriented policies, women quotas and various incentive schemes, which should motivate employers to increase the number of women in their industries, partly with the assistance of bi-and multi-lateral organisations. Unfortunately, in some cases, this has resulted in number-wise increases of women's employment only, without any corresponding development in women's quality employment. For example in China, women employment quotas—as prescribed by the government for state-owned tanneries—were reported to be met. The assessment of the ground reality in some tanneries revealed that this had been achieved

with the result of underemployment of women for sake of fulfilling the quota.

Several state and semi-state organisations could be identified in most participating countries, completely devoted to women's issues. However, in many cases these appeared to be engaged in mere academic endeavours, with little impact on actually increasing women's employment in the industry. As a matter of fact, in many countries, tanning industry has not been considered a focal area for such activities so far.

In few cases, these organisation provided gender sensitization training at the enterprise level. However no such training was reported from the tanning industry, except in China.

Non-governmental organisations (NGOs)

Current activities implemented by NGOs target the lower strata of society promoting self-employment and entrepreneurial initiatives through skill up-gradation, training, credit schemes, etc., particularly at cottage and small-scale enterprise level. Several NGOs are engaged in community level orientated gender sensitisation activities.

Training Institutes

Except for Nepal, all participating countries have training institutes for training the workforce of the tanning and leather industry. Relatively few female students were found to have enrolled in courses on tanning. Most female student opted for courses in finishing and leather conversion, since these sectors were perceived to provide better employment alternatives.

At present, many such training institutes do not undertake any efforts to encourage more women to join the available training courses on tanning.

Conclusions

- In most countries, women have gained a good reputation as hard and diligent workers in the leather conversion sector. Similar qualities are assumed, but not yet proven, for work in tanneries.
- Positive experiences of individual tanners with employment of women are shared through formal and informal communication within the tanning community, particularly in countries such as India, Indonesia and Nepal.
- The attractiveness of a possible employment,

e.g. in terms of working conditions, plays an important role for women to decide on different industrial employment options. In countries such as China, India and Indonesia attractive alternative options for women are available. The poor working conditions, as prevailing particularly in raw to semi-finished leather production steps, discourage women from taking up employment in tanneries, unless economically compelled.

- In countries/regions, where basic perceptions of society only allow a limited social and economic mobility of women, further promotional activities under the Regional Programme may not be productive, unless these perceptions are overcome.
- Many WID interventions e.g. government incentives or women quotas have led to a number-wise increase of women employment, but not in actual quality employment and better career opportunities of women.
- Cost implications of women's employment play an important role for tanners when deciding on possible employment of women.
- Women do not have equal promotional and career opportunities in tanneries mainly for lack of their experience and know-how. Many tanners are reluctant to invest in training of their women workers, since many women usually quit employment after getting married.

Recommendations

Strategy & Approach

The Regional Programme is not in a position to indulge into a broad based national sensitisation of prevailing socio-economic perceptions. In cases where the national perceptions towards social and economic mobility of women are not conducive, only a focus approach with limited activities in co-operation with positively inclined employers, NGOs and the government should be pursued.

Keeping in mind that there is an intensive formal and informal exchange of ideas taking place between tanners in most countries, the strategy for increasing women's participation in the tanning industry and allied sector will be mainly based on an advocacy and lobbying with the key counterparts in the respective countries.

Under this approach, positive experiences as gained by both employers and employees in the tanning

industry and CETPs should become role models. RePO-UNIDO will provide the suitable forum and platform for a wider dissemination of such experiences. This could be in form of articles, round table discussions, national workshops and presentations in training institutes. Such good examples should be adequately documented and shared within the country and region. The emphasis in all endeavours should be on the promotion quality employment.

At the same time, the detailed training needs of both "freshers" and women on the job should be mapped in consultation with employers, based on which specific training modules could be elaborated for both target groups. Available in-country training sources should be identified for providing these specific training courses. RePO-UNIDO will lay-down specific guidelines under which such training could be sponsored by the Regional Programme in each country. After completion and evaluation of each training, the national expert will take necessary steps in co-operation with the respective training source to institutionalise the training into a regular annual training syllabus. Such annual training syllabus will have to be administered by the national counterpart organisation.

The national expert will, in co-operation with the existing training institutes of the country provide a placement service of qualified women graduates from these institutes, particularly vis-à-vis existing counterparts under the national project. In addition to the above, further country-specific activities will have to be initiated as recommended by the international and national experts.

Action Programme

Advocacy

- Motivating selected tanners and CETP managers, who have had positive experience with women employment, to share their experience with other tanners and CETPs.
- Identifying women already engaged in tannery and CETP work to share their positive experiences with other women, particularly young graduates in existing training institutes.
- Organising round tables and national workshops as forum for such sharing of experience.
- Preparing articles on positive experiences with women employment to be circulated through suitable media.

and free market forces are the surest ways to prosperity of individuals and societies. This belief of system free market credo has, of course, a lot of pitfalls.

Characteristics of micro-enterprises

While the trend is to focus more on entrepreneurship development and enterprise creation at all economic levels, there is no great clarity about how the terms women entrepreneur or micro-enterprise are used or are to be understood.

In this context, it is necessary to explain the terminology of micro-enterprises in relevance to women entrepreneurs.

As mentioned before, it is important to recognize and acknowledge the entrepreneurial spirit and approach which lies behind poor peoples' survival and livelihood strategies. Also it is important to foster and promote this spirit of self-reliance by directing entrepreneurial support services, programmes and policies to those who live at the edge of economic survival. Thus, deliberately, distinctions between income-generating activities or self-employment activities in the informal sector and entrepreneurship are underplayed and not attempted, so as not to detract from the main message: the masses of people economically engaged in the informal sector are to be looked at as entrepreneurs, and entrepreneurial support activities, policies, programmes should be targeted at this large section of the population. An understanding of entrepreneurship at the micro-enterprise level would include for example: Street hawkers on bicycles selling baskets and simple bamboo-furniture; small eateries at the road side; fruit & vegetable vendors who sell their produce from a cart; people who sell roasted corn-on-the-cob at the road side; scavengers and scrap-dealers; and people who sell goods such as pan and cigarettes at pavement stalls, etc.

Again there are very definite distinctions between many forms of income generating activities and certain forms of self-employment in the informal sector on the one hand, and true entrepreneurship on the other, and in order to arrive at useful policies and support programmes which can lift poor people (women and men) to a level of real entrepreneurship (including such elements in the economic activity as ownership and control, decision-making, choices and options, profits, investments, expansion and growth, etc.), these distinctions have to be identified and understood by policy-makers and planners.

The features which are generally associated with true entrepreneurship and identified as the distinguish-

ing characteristics of entrepreneurship in contrast to many informal sectors and all kinds of income-generating activities are as follows: ownership and control (over capital, production processes, etc.); decision-making; choices and options; risk-taking behaviour (including personal financial risk); innovation and problem solving; opportunity seeking; motivation and opportunity for growth and expansion (in contrast to the struggle for survival without opportunities to expand and grow); in general, entrepreneurship is seen as the whole process of finding opportunities, mobilizing and acquiring resources, organising and managing production or service process, marketing product/service, making profit or losses, reinvesting capital for expansion or diversification, interest in business expansion and growth, employing self and others.

The features of true entrepreneurship are as follows: ownership and control (over capital, production processes, etc.); decision-making; choices and options; risk-taking behaviour; innovation and problem solving.

Women's enterprise

There is no clearcut definition of what constitutes a micro-enterprise and in particular relevant for women. For instance: tiny enterprises, the small-scale sector, village and cottage industries, rural enterprises, marginal enterprises are quite often used almost interchangeably.

A recent ILO-India study of women entrepreneurs gave the definition of women's enterprise as "a small unit where one or more women entrepreneurs have not less than 51 per cent financial holding" (Mishra, 1996). Thus, here the women's enterprise is measured in terms of size and financial holding. Sometimes a women's enterprise is understood to mean not only majority ownership by one or more women, but also the comparative numbers of female employees. Thus, elsewhere women's enterprise is defined as "an enterprise owned and administered by women entrepreneurs having a minimum of financial interest of 51 per cent of the share capital and giving at least 50 per cent of the employment generated in the enterprise to women" (Iyer, 1991).

A very practical problem appears when organising events specifically targeted at or meant for women entrepreneurs: for lack of good networks and outreach, we often resort to including as entrepreneurs

any kind of successful woman, be it an academician, be it a high level bureaucrat, or be it a high profile politician.

Rather than going into the semantics of a true women entrepreneur, in relation to a micro-enterprise, it may be understood that different people understand very different things by these terms and that it is necessary perhaps to come to more commonly agreed definitions and understanding of these terms. This is because *good data on women entrepreneurs is few and far between*, and if this dearth of data is to be overcome more conceptual clarity and more precise definitions are needed and for *more effective outreach and impact of policies, programmes and support activities*, a more precise definition and more commonly agreed upon understanding of the *target group* is needed.

Rather than going into the semantics of a true women entrepreneur, in relation to a micro-enterprise, it may be understood that different people understand very different things by these terms.

Problems of Women Entrepreneurs

Some of the key problems and stumbling blocks which are most commonly mentioned by women entrepreneurs or prospective women entrepreneurs in studies and research about women entrepreneurs are:

Access to material resources/capital:

- Credit/Financial services
- Land/Property/Assets
- Collateral/Security for accessing credit
- Technologies: Know-how plus Machinery, Tools, Equipment
- Raw materials: regularity of supply, quality, infrastructural links etc.

Access to markets and market information: Marketing strategies/Feasibility of a product in the market/trade-links/competing effectively.

Access to a variety of technical and skills training: technical/vocational/managerial/organisational, financial, personnel, production process, self-confidence building, negotiation skills, assertiveness.

Access to business related services: Business counselling, Follow-up & Escort services after training or counselling.

Access to information in all aspects: marketing, credit facilities & financial services, technology, training & education.

Technological problems and difficulties: technology sourcing, technology choice, technology assessment or evaluation, technology absorption and adaptation.

Problems of poor women:

- Access only to a limited range of over-competitive occupations
- Exhausting workloads
- Limited availability and access to basic social services: (i) health care facilities (ii) basic schooling & education and (iii) needs based child care

Legal issues

- Discriminating laws, e.g., property rights, inheritance laws which deprive women of capital or collateral/securities
- Police harassment on grounds of certain regulations exist (e.g., licence requirements); restrictions to operate in certain areas (e.g., residential versus commercial areas)

Gender issues:

- Mixed with socio-cultural factors, these concern women's place and role within family and society; also perception of family and society's and expectation of women.

The role expectation vis-a-vis women is: she is the care-taker of the family, not the bread-winner. Her primary role is in the family sphere, not in the public sphere. Even if the reality is often different, these social norms and expectations limit women's options; they limit women's mobility and acceptability in the business world; they determine the approach of bankers/credit institutions to women; they determine the support or approval by family members; they affect the self-esteem and self-confidence; they influence the nature and quality of work experience which women "are allowed to" acquire; they influence the educational level & level of professional experience women acquire as compared to men; etc.

Results & Discussion

To study the relationship between antecedent variables and entrepreneurial behaviour and its dimensions, the data were subjected to correlation analysis, as per following scheme:

Innovativeness

Table 1 indicates that out of 11 different antecedent variables, eight variables namely; family education status, attitude towards self employment, attitude towards income generation, herd size, milk production, milk marketing, income from dairy enterprise and extent of facilities available were found to be positively and significantly correlated with innovativeness. Further age, milk consumption and credit availability were not found to be significantly associated with innovativeness. John (1974) also found that age had no significant relationship with the adoption of innovations.

Decision making

It is evident from table 1 that different antecedent variables including age, family education status, attitude towards self employment, attitude towards income generation, herd size, milk production, milk consumption, milk marketing, credit availability, income from dairy enterprise and extent of facilities available had shown good correlation with decision making but were statistically non-significant.

Achievement motivation

Family education status, attitude towards income generation, milk production, milk marketing, income from dairy enterprise and extent of facilities available were found to have significant and positive effect on achievement motivation of farm women indicating that the degree of achievement motivation increases with the increase of these parameters (table 1). Milk consumption had negative but significant relationship with achievement motivation. Variables such as age, attitude towards self employment, herd size and credit

Family education status, income generation, milk production, milk marketing, income from dairy enterprise and extent of facilities available were found to have significant and positive effect on achievement motivation of farm women.

availability had insignificant relationship with achievement motivation. These findings suggest that achievement motivation of successful and progressive entrepreneurs is not affected by their age, attitude towards self employment, number of dairy animals owned by them and credit sources.

Knowledge of dairy farming enterprise

Table 1 also points out that family education status, attitude towards self employment herd size, milk production, milk marketing, income from dairy enterprise and extent of facilities available were found significantly and positively correlated with knowledge of respondents in dairy farming enterprise. Age, attitude towards income generation, milk consumption and credit availability did not have significant correlation with knowledge of dairy farming enterprise. It was thus concluded that the variables affecting positively and significantly the knowledge of dairy farming enterprise were closely associated with overall entrepreneurial behaviour of rural women in dairying. Sharma *et al* (1977) reported that knowledge of related enterprise helped entrepreneurs to shift to new lines and methods of production. De (1986), however, found that entrepreneurial characteristics of farmers were significantly affected by age and educational status. Further, educational level of farmers significantly affect the adoption of improved practices and entrepreneurial behaviour. Reddy and Reddy (1984), reported that psychological factors influenced farmers behaviour in the adoption of new practices. Nandapurkar (1982) and Mahipal (1983) observed that knowledge of dairy enterprise affected the entrepreneurial performance of farmers. Extensive research has also showed positive significant association between knowledge level and milk production (Sindhu, 1980; Srivastava 1988; Tripathi, 1991).

Information seeking

Data in table 1 indicates that 7 variables viz., family education status, attitude towards income generation, herd size, milk production, marketing, income from dairy enterprise and extent of facilities available were found to be significantly and positively correlated ($P < 0.01$) with information seeking. Milk consumption, however, was found to be negatively but significantly correlated ($P < 0.01$) with information seeking indicating that families more conscious in increasing nutritional status of their families had less information seeking behaviour regarding dairy farm technologies. Age, attitude towards self employment, credit availability did not affect significantly the information seeking behaviour of the farm women. Patil (1981) and Tripathi (1991) reported that higher the information seeking behaviour higher would be the milk production.

Table 1: Correlation analysis between antecedent variables and dimensions of entrepreneurial behaviour

N = 150

Variables	Entrepreneur Dimensions										Entrepreneurial behaviour
	Yi [r]	Yii [r]	Yiii [r]	Yiv [r]	Yv [r]	Yvi [r]	Yvii [r]	Yviii [r]	Yix [r]	Yx [r]	
Age	-0.03	0.05	-0.02	0.13	-0.04	0.07	-0.03	0.04	0.01	-0.10	0.01
Family education status	0.42**	0.07	0.34**	0.27**	0.39**	0.31**	0.37**	0.28**	0.38**	0.27**	0.50
Attitude towards self employment	0.19*	-0.11	0.11	0.16*	0.10	0.16*	0.20**	0.17*	0.05	0.12	0.20**
Attitude towards income generation	0.22**	-0.03	0.16*	0.08	0.25**	0.21**	0.31**	0.22	0.17*	0.28**	0.29
Herd size	0.40	0.03	0.12	0.42**	0.38**	0.55**	0.32**	0.39**	0.38**	0.21**	0.50**
Milk production	0.51*	0.02	0.21**	0.43**	0.43**	0.43**	0.38**	0.45**	0.35**	0.21**	0.58**
Milk consumption	-0.09	-0.03	-0.17*	0.13	-0.47**	0.14	-0.28**	-0.17*	0.35**	-0.38**	-0.23**
Milk marketing	0.54**	0.01	0.31**	0.39**	0.63**	0.40**	0.50**	0.53**	0.49**	0.37**	0.67**
Credit availability	0.07	-0.08	0.08	0.07	0.13	0.16*	0.10	0.14	0.04	0.11	0.13
Income from dairy enterprise	0.05**	-0.05	0.25**	0.16	0.35**	0.54**	0.33	0.38**	0.33**	0.23**	0.55**
Extent of facilities available	0.26**	0.03	0.21**	0.41**	0.30**	0.10	0.27**	0.13*	0.17*	0.11	0.28**
	Innova-tiveness	Decision making	Achieve-ment moti-vation	Know-ledge	Infor-mation seeking	Risk taking ability	Ability to coordinate	Assis-tance of manage-ment	Leader-ship ability	Cosmo-politeness	

* Significant at 0.05 level ** Significant at 0.01 level

Risk taking ability

Again from table 1 we observe that family education status, attitude towards income generation, herd size, milk production, milk marketing and income from dairy enterprise had positive and significant relationship ($P < 0.01$) with risk taking ability. Attitude towards self employment and credit availability were found significantly and positively correlated with risk taking ability at 5 per cent level of significance (Srivastava, 1988).

Ability of farm women to coordinate dairy farm activities was positively and significantly influenced by family education status, attitude towards self employment, attitude towards income generation, herd size, milk production, milk marketing, income from dairy enterprise and extent of facilities available.

Coordination of dairy farm activities

Ability of farm women to coordinate dairy farm activities was positively and significantly influenced by family education status, attitude towards self employment, attitude towards income generation, herd size, milk production, milk marketing, income from dairy enterprise and extent of facilities available. Thus from table 1, these variables while influencing ability to coordinate dairy farm activities had also affected entrepreneurial behaviour of the farm women. Milk consumption had negative but significant correlation with

ability to coordinate dairy farm activities, while age and credit availability did not influence.

Assistance of management services

It is evident from table 1 that 8 independent variables viz., family education status, attitude towards income generation, herd size, milk production, milk marketing and income from dairy enterprise were found positively and significantly correlated ($P < 0.01$) and attitude towards self employment ($P < 0.01$) was positively

and significantly correlated with assistance of management services.

Leadership ability

It is seen that out of 11 different independent variables, 8 variables were found to be significantly correlated with leadership ability of milk producers. The variables, namely, family education status, herd size, milk production, marketing and income from dairy enterprise were positively and significantly correlated ($P < 0.01$) whereas attitude towards income generation and extent of facilities available were found to be positively and significantly correlated ($P < 0.05$) with leadership ability. Milk consumption was found significantly but negatively correlated with leadership ability. Age, attitude towards self employment and credit availability did not have any significant relationship with leadership ability. Thus, it was concluded that the variables found significantly correlated with leadership ability were closely associated with the entrepreneurial behaviour.

Cosmopolitanness

It was inferred from the table 1 that family education status, attitude towards income generation, herd size, milk production, milk marketing and income from dairy enterprise were found significantly and positively correlated with cosmopolitanness ($0 < 0.1$) whereas milk consumption was found significantly but negatively correlated with cosmopolitanness. Age, attitude towards self employment, credit availability and extent of facilities available however showed insignificant relationship with cosmopolitanness. Cosmopolitanness has been reported as one of the important characteristics of entrepreneurial behaviour (Nandy, 1973; Nandapurkar, 1982).

Entrepreneurial behaviour

Out of eleven different independent variables, 8 variables viz., family education status, attitude towards self employment, attitude towards income generation, herd size, milk production, milk marketing, income from dairy enterprise and extent of facilities available were found positively and significantly correlated with entrepreneurial behaviour ($P < 0.01$). Milk consumption, however, was found to be negatively and significantly associated ($P < 0.01$) with entrepreneurial behaviour. Further, age and credit availability did not affect significantly the entrepreneurial behaviour of the rural women.

The family education status was found to be highly, positively and significantly correlated with the entrepreneurial behaviour indicating that with the increase in the family education, the entrepreneurial per-

formance of women also increases (table 1). Comparable studies were not traceable in the field of dairying, but similarly significant relationship has been reported between family education status and entrepreneurship in other enterprises (Shah, 1985; Singh and Gupta, 1985). Pandya (1985) also reported the educational background of respondents influenced the entrepreneurial behaviour.

The family education status was found to be highly, positively and significantly correlated with the entrepreneurial behaviour indicating that with the increase in the family education, the entrepreneurial performance of women also increases.

Table 1 further reveals that attitude towards income generation were positively, highly and significantly correlated ($P < 0.01$) with entrepreneurial behaviour of milk producers. Researchers have shown that favourable attitudes significantly contributes towards ultimate adoption of improved farm practices and increases performance of the women entrepreneurs (Singh, 19975; Gupta, 1976; Tripathi, 1991).

Herd size was found to be significantly and positively correlated with entrepreneurial behaviour indicating that as the number of dairy animals per family increases, the entrepreneurial performance of the women also increases. Further, milk production and marketing were found positively and significantly associated with entrepreneurial behaviour. This indicates that entrepreneurial behaviour increases with the augmentation of milk production and its marketing to the dairy operative. The findings were not different from those reported earlier and are in consonance with the findings reported by Kalogi and Anand, (1985), Kaushik (1988) and Verma (1993).

Herd size was found to be significantly and positively correlated with entrepreneurial behaviour indicating that as the number of dairy animals per family increases, the entrepreneurial performance of the women also increases.

It is also inferred that entrepreneurial behaviour declines with the increase in the quantity of milk con-

sumption at home which was in contrary to the findings of previous works. It was perhaps due to the fact that women of this area were more inclined towards increasing the nutritional status of the family rather than earning regular income through selling milk to dairy cooperatives (Tripathi 1991; Verma, 1993).

A significant relationship between income from dairy enterprise and entrepreneurial behaviour has been noticed (table 1). As the income increases there is betterment in the entrepreneurial performance. Pandya (1995) also reported that income has a positive correlation with entrepreneurial behaviour. Extent of facilities available within the village also had positive influence on the entrepreneurial behaviour of respondents. The entrepreneurial behaviour was not significantly affected by the age of the respondents and credit available to them. Similar trend was reported by Malik (1978).

Multiple Regression Analysis

Regression analysis was used in order to determine the degree to which the dependent could be predicted with the help of antecedent variables. Only those variables which were found significant with the dimension of EB were studied through regression analysis, as per following scheme:

Innovativeness

Table 2 points out the variability in the innovativeness employing eight independent variables i.e. family education status, attitude towards self employment, attitude towards income generation, herd size, milk production, marketing, income from dairy enterprise and extent of facilities available. Total explained variability in the innovativeness was found to be about 43 per cent. The model explained maximum variability of the dependent variable on account of the extent of facilities available followed by marketing of milk. Attitude towards self employment, attitude towards income generation, herd size, milk production and income from dairy enterprise contributed insignificantly in explaining variability of the innovativeness.

Achievement motivation

Twenty per cent variability in the achievement motivation was due to family education status and extent of facilities available, which indicated that high family education status and provision of more number of facilities increases the achievement motivation of rural women (table 2). Attitude towards income generation, milk production, milk consumption, milk marketing and income from dairy enterprise did not contribute sig-

nificantly in explaining the variability of achievement motivation of milk producers.

Knowledge of dairy farming enterprise

Seven independent variables i.e. family education status, attitude towards self employment, herd size, milk production, milk marketing, income from dairy enterprise and extent of facilities available were selected to fit in the regression model to predict the variability in the knowledge of rural women about dairy farming enterprise.

The model explained 27 per cent variability on account of the herd size followed by the extent of facilities available. The remaining five variables viz., family education status, attitude towards self employment, milk production, marketing and income from dairy enterprise did not contribute significantly in predicting the variability in the knowledge of dairy farming enterprise of milk producers in women dairy cooperative societies (table 2).

Information seeking

Eight variables viz., family education status, attitude towards income generation, herd size, milk production, milk consumption, milk marketing, income from dairy enterprise and extent of facilities available were fitted in regression model to explain the variability of information seeking behaviour of rural women in dairy cooperative system. The model explained about 63 per cent variability in the studied variables.

To isolate the independent variables, contributing significantly in explaining the variability of dependent variable, 't' test was applied. The result in table 2 indicated that herd size, milk consumption, milk marketing and extent of facilities available were contributing positively and highly significantly ($P < 0.01$) in explaining the variability of information seeking behaviour. It was concluded that positive impact of these variables led to proportional increase in the information seeking potential of milk producers.

Risk taking ability

Eight variables viz., family education status, attitude towards self employment, attitude towards income generation, herd size, milk production, milk marketing, credit availability and income from dairy enterprise were fitted in the regression model to predict variability in the risk taking ability of farm women in dairy enterprise (table 2). The model explained about 39 per cent

Table 2: Multiple regression analysis between antecedent variables and dimensions of entrepreneurial behaviour

N = 150

Variables	Entrepreneurial Dimensions									
	Yi	Yiii	Yiv	Yv	Yvi	Yviii	Yviii	Yix	Yx	EB
Age	-	-	-	-	-	-	-	-	-	-
Family education status	1.994*	2.4624*	0.6428	1.1735	0.3526	1.3136	0.3491	2.3667*	1.63422	2.8767**
Attitude towards self employment	0.611	-	1.0070	-	0.6109	0.4765	0.2697	-	-	0.0158
Attitude towards income generation	0.719	0.7401	-	1.2625	1.6252	1.9593*	1.5749	0.3328	2.2357*	1.7577
Herd size	0.891	-	2.5679**	2.5553**	3.7111**	1.5946	1.5534	2.58225	0.5214	2.5196*
Milk production	0.253	1.3713	1.3799	2.7503**	0.7099	1.3248	0.8246	1.3883	1.21592	1.5529
Milk consumption	-	-0.1748	-	2.2812*	-	-0.4993	0.2844	-1.8243	2.21628*	-0.0931
Milk marketing	2.498*	1.7205	0.1562	4.5691**	-0.0468	2.4496**	2.5547*	2.17774*	1.708007	3.8624**
Credit availability	-	-	-	0.0292	-	-	-	-	-	-
Income	1.803	0.8848	0.5423	0.3913	2.0283*	0.4439	0.4815	0.0086	0.52170	1.2503
Extent of facilities available	3.146	2.2274*	2.0128*	4.3665	-	2.2175*	-	1.9218	-	3.77319*
'F' value	13.15**	4.51**	7.50**	23.66**	10.08**	9.40**	8.42**	9.06**	6.43**	21.91**
100 R ²	42.73	20.36	27.00	62.99	39.32	45.15	32.33	39.46	28.23	63.59
	Innova- tiveness	Decision making	Achieve- ment moti- vation	Know- ledge	Infor- mation seeking	Risk taking ability	Ability to coordi- nate	Assis- tance of manage- ment services	Leader- ship ability	Cosmo- politeness

* Significant at 0.05 level ** Significant at 0.01 level

variability of all the variables studied. It is evident from table 2 that herd size contributed highly significantly ($P < 0.05$) in explaining the variability in the risk taking ability. It means that an increase in the herd size and income from dairy enterprise results in the proportionate increase in their risk taking ability. Other variables subjected to regression analysis failed to contribute statistically significantly in explaining variability in the risk taking ability of farm women.

Ability to coordinate dairy farm activities

Nine variables viz., family education status, attitude towards self employment, attitude towards income generation herd size, milk production, milk consumption, milk marketing, income from dairy enterprise and extent of facilities available were utilised for the regression model to explain the variability in the ability of rural women in coordinating dairy farm activities (table 2). The model explained about 45 per cent variability in the ability to coordinate dairy farm activities due to the extent of facilities available followed by milk marketing and attitude towards income generation.

The remaining six variables did not contribute significantly to influence the variability in the ability to coordinate dairy farm activities.

Assistance of management services

Family education status, attitude towards self employment, attitude towards income generation, herd size, milk production, consumption, marketing and income from dairy enterprise, were subjected for regression analysis. The model explained about 32 per cent variability on account of quantity of milk to be marketed which was found to be positively and significantly ($P < 0.05$) contributing to the assistance of management services (table 2). The other variables in the model did not contribute significantly in predicting variability in the assistance of management services.

Leadership ability

Eight variables viz., family education status, attitude towards income generation, herd size, milk production, consumption, marketing, income from dairy enterprise

and extent of facilities available were fitted in the regression model to explain the variability in the leadership ability of rural women in dairy cooperative. About 39 per cent variability in the leadership ability could be explained by the model. To isolate the independent variables contributing significantly in explaining the variability of dependent variable 't' test was applied. The results in table 2 showed that family education status and milk marketing contributed significantly at 5 per cent ($P < 0.05$) and herd size contributed significantly at 1 per cent level of significance in explaining variability in the leadership ability.

Cosmopolitanness

The regression model was applied to predict variability in cosmopolitanness using seven independent variables viz., family education status, attitude towards income generation, herd size, milk production, consumption, marketing and income from dairy enterprise. The regression analysis explained about 28 per cent variability of the studied variables. A critical look at the table 2 indicates that attitude towards income generation and milk consumption contributed significantly ($P < 0.05$) in explaining the variability in the cosmopolitanness. The remaining variables viz., family education status, herd size, milk production, milk marketing and income from dairy enterprise remained statistically non-significant in explaining overall variability in cosmopolitanness of milk producers in women dairy cooperative societies.

Entrepreneurial Behaviour

Nine variables, namely, education status, attitude toward self employment, attitude towards income generation, herd size, milk production, consumption, marketing, income from dairy enterprise and extent of facilities available were subjected to the regression analysis to explain the variability in the entrepreneurial behaviour of milk producers.

The regression model explained the occurrence of about 64 per cent variability in the dependent variable ($P < 0.01$) i.e. EB (table 2). It was observed that out of nine independent variables studied and included in the

It was found that family education status, herd size, marketing of milk and extent of facilities available contributed significantly in explaining the variability in entrepreneurial behaviour.

model, four contributed significantly in explaining the variability of dependent variable. Further, to isolate the independent variables contributing significantly in explaining the variability of dependent variable, 't' test was used. It was found that family education status, herd size, marketing of milk and extent of facilities available contributed significantly in explaining the variability in entrepreneurial behaviour.

Conclusions and Implications

Since age did not yield substantial association with entrepreneurial behaviour, it is not considered an impediment in acquisition of entrepreneurial trait and thus entrepreneurship can be inculcated to the rural women of all age groups. High family education status of married women with more positive and favourable attitude towards income and self employment, more income from dairy enterprise and high extent of facilities available in the village help in improving entrepreneurial attributes due to the existence of women dairy cooperatives. Thus, there is a need to develop small entrepreneurship among rural women through establishment of women dairy cooperatives to generate more employment and income. The entrepreneurial traits can further be developed through well structured training and entrepreneurial development programs.

High family education status of married women with more positive and income from dairy enterprise and high extent of facilities available in the village help in improving entrepreneurial attributes due to the existence of women dairy cooperatives.

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The Job Stressor in Banks: The Gender & Hierarchical Differences

Shyam Lal Kaushal

The paper examines level of job stress among bank employees and in particular makes a comparative analysis of stresses among male and female employees (officers and clerks). The data have been collected from 100 employees through a questionnaire prepared as per the stressors viz., inter-role distance, role stagnation, role expectation conflict, role erosion, role overload, role isolation, personal inadequacy, self-role distance, role ambiguity and resource inadequacy. The findings of the study revealed that while job stress perceived by employees is not much, female employees felt more stress in comparison to their counterparts. The role stagnation for female and role erosion for male employees have been identified as major stressors. In general, the major stressors identified are role erosion, inter-role distance and role stagnation, which all are inter related with each other, one giving way to another.

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Introduction

Stress is becoming a global phenomenon affecting all countries, professions and all categories of workers. Technological and information revolution, fast and materialistic life, innovations and growing competition have generated in man a feeling of powerlessness, helplessness, meaninglessness and in turn a source of consequent stress. As a result, today man experiences unprecedented turmoils, traumas and psychological conflicts. Stress is being labelled as one of the major factors of lagging productivity and performance of individuals and organisations. Studies have often shown that individuals experiencing excessive stress make errors, abstain more and shift jobs frequently.

Job stress is a condition of work interacting with workers leading to disrupted psychological and physiological homeostatis. The causal situational conditions are job stressors and the disrupted homeostasis is job related strain (Mougolis and Kroes, 1974). There is growing body of evidence from studies in various organisational settings suggesting that occupational stress and anxiety have been increasingly implicated in the etiology of poor mental health and psychosomatic diseases e.g., gastric ulcer, coronary heart disease (Sharma, Ghosh and Spielberger, 1995). By occupational or job stress is meant negative environmental factors (e.g., role erosion, work load, inter role distance, role stagnation and role conflict etc.) associated with a particular job (Cooper, 1983). It is any characteristic of the job environment which poses a threat to the individual in terms of efficiency and performance on the one side and health on the other.

Several classifications of job stress are given by different authors but the most comprehensive categories of job stress have been suggested (Kahn and Quinn, 1970), which are in particular: role ambiguity, role conflict, role overload, personal inadequacy and resource inadequacy among others. Pareek (1976) has identified self role

distance, inter role distance, role stagnation, role expectation conflict and role isolation. Ganster, Fusillier and Mayer (1968) reported that job stress resulted in low self-esteem, depression, job dissatisfaction and low productivity. Shah (1978) identified organisational stressors as divergent goals of individuals and organisations, lack of communication and poor interpersonal relations. Deshpande (1978) pointed out that for senior executives, stress has been caused by management policies, manpower planning, appraisal system, promotions, work routines, interpersonal relations and lack of co-ordination. Kumar (1981) highlights the harmful consequences of such stressors for the individual and the organisation. Natha (1980) showed that role conflict is experienced more frequently among managers than workers. Surti (1983) observed that nurses and bank employees experience less role stress than university and college teachers. However, the author concluded that role stress and job satisfaction are negatively related. Therefore, whatever may be the stressors, it is certain that job stress has direct impact or inverse relationship with efficiency and performance of the employee. Recent globalisation and liberalisation of Indian economy has further emphasised competition and quality service as basic tenets of survival and success.

Whatever may be the stressors, it is certain that job stress has direct impact or inverse relationship with efficiency and performance of the employee.

Job Stressor in Banks

Bank plays a key role in development of an economy. However, banking is one of the sectors where employees have constant pressure, repetitive nature of job and need to be tension free for their sensitive dealing with money and public. The case study pertains to State Bank of India (SBI), which is one of the leading banks with spanning variety of activities having been in existence since 1806, though changing its name, from time to time. In Himachal Pradesh, the bank is servicing since the beginning of twentieth century.

The objectives of the present study are: to find out the level of job stress among employees of SBI, Shimla; to make a comparative analysis of the job stress among officers and clerical staff, female and male employees; and to identify the major stressors.

Keeping these objectives in view the following hypotheses have been tested:

- (i) The level of job stress among employees of SBI, Shimla is high;
- (ii) The job stress is more among female employees than their male counterparts; and
- (iii) The job stress is more among the officers as compared to the clerks.

Methodology

A primary survey was conducted to gather opinions from bank employees, through a questionnaire, which was prepared as per the comprehensive classification (Pareek, 1982) of role stresses as enumerated below:

Inter Role Distance: This refers to when an individual occupies more than one role. There may be conflict between the two roles one occupies, leading to stress.

Role Stagnation: An individual's role changes with advancement and becomes an acute problem especially when one has occupied a role for a long time and enters another role in which one may feel less secure. The demand for the new role is that the individual has to outgrow the previous role and occupy the new role effectively. This produces stress.

Role Expectation Conflict: When there are conflicting expectations/demands by different role senders (the persons who have expectations from this role), the role occupant may experience this stress. There may be conflicting expectations from the boss, subordinates, peers and clients.

Role Erosion: A role occupant might feel that some functions which he would like to perform are being performed by some other role. The stress felt may be called role erosion.

Role Overload: It refers when the role occupant feels that there are too many expectations from the significant roles in his role set. He experiences role overload.

Role Isolation: In a role set, the role occupant may feel that certain roles are psychologically near to him while other roles are at a distance. The main criterion for this is frequency and ease of interaction.

Personal Inadequacy: When a role occupant feels that he is not prepared to undertake the role effectively, he may experience this stress.

Self Role Distance: Stress due to conflict between the self concept and expectations from the role as perceived by role occupant.

Role Ambiguity: When the individual is not clear about the various expectations people have from his role. One faces conflict called role ambiguity. It may be due to lack of information available to the role occupant.

Resource Inadequacy: This refers to two types of feelings that the role occupant does not have adequate resources to perform effectively and that he is not fully equipped for effective performance of the role.

Sampling

100 employees were selected randomly from four branches of SBI in and around Shimla, out of which only 81 responded to the questionnaire. Scoring of the responses was done on a 5-point (0-4) scale according to ORS scale (Pareek, 1982). Adding the scores of each role stress (row-wise) gave the score for that of role stress. The summation of the scores on every type of role stress gave the overall role stress. The higher score on a particular type of role stress indicated the higher degree of that type of stress and lower score indicated the lower degree of that role stress. There were 50 items in the questionnaire and the score of each role may range from 0 to 20 and the total role stress may range from 0 to 200. As Pareek has suggested, a comprehensive classification of 10 roles stresses, was made.

Statistical Analysis

For the purpose of analysing collected data mean, standard deviation, *t*-values and correlation (*r*) values have been used. In order to find out reasons for prevalence of different patterns of the types of stress perceived by employees of SBI, some of the demographic factors like educational qualifications, work experience, work load, marital status, background and salary have been taken into account.

Results & Discussion

The findings of the study are summarised below:

It is clear from table 1 that the mean score on role erosion ($M = 6.56$) was the highest and on role ambiguity ($M = 3.59$) was the lowest. The score on total role stress was 49.21 which showed that the general level of job stress perceived by the employees of SBI, Shimla was low. Hence, hypothesis-I that level of job stress among employees of SBI is high, has not been accepted.

Table 2 indicates that the female and male employees of the bank differed significantly in their mean scores on role ambiguity ($t = 2.77, P < 0.05$), role

stagnation ($t = 2.06, P < 0.05$), role expectation conflict ($t = 2.04, P < 0.05$), inter-role distance ($t = 1.56, P < 0.05$) as well as on total role stress ($t = 1.71, P < 0.05$). Male employees on an average scored lower on these types of role stress as compared to female employees probably due to latter having additional responsibilities at home. Hence, the job stress is apparently more among female employees than male counterparts.

Table 1: Means and Standard Deviation for various types of Role Stress (N=81)

Role Stress Types	Mean	S.D.
Inter Role Distance	6.33	4.74
Role Stagnation	5.99	3.95
Role Expectation Conflict	4.11	3.54
Role Erosion	6.56	4.17
Role Overload	4.48	3.89
Role Isolation	4.38	3.43
Personal Inadequacy	4.26	3.39
Self Role Distance	5.19	3.89
Role Ambiguity	3.59	3.43
Resource Inadequacy	4.38	3.76
Total	49.21	28.64

Table 2: Significance of Difference between Mean Scores on various types of Role Stress for Female (N=37) versus Male Employees (N=44) of SBI, Shimla

Role Stress Types	Males		Females		Differ-ence	t' Value
	Mean	S.D.	Mean	S.D.		
Inter Role Distance	7.19	5.12	5.61	3.96	1.58	1.56
Role Stagnation	6.95	3.94	5.18	3.81	1.77	2.06*
Role Expectation Conflict	4.92	3.94	3.43	2.60	1.49	2.04*
Role Erosion	6.59	4.63	6.52	3.78	0.07	0.07
Role Overload	4.65	3.23	4.34	4.17	0.31	0.37
Role Isolation	4.81	4.10	4.02	3.19	0.79	0.97
Personal Inadequacy	4.70	3.71	3.89	2.93	0.81	1.09
Self Role Distance	5.73	4.55	4.75	3.39	0.98	1.10
Role Ambiguity	4.89	4.68	2.50	3.00	2.39	2.77**
Resource Inadequacy	4.73	4.67	4.09	3.43	0.64	0.71
Total	54.56	30.01	44.45	24.95	10.41	1.71

** P < 0.01; * P < 0.05

It is seen from table 3 that the mean scores obtained by officers and clerical staff of the bank differed significantly on role stagnation ($t=2.45$, $P<0.05$), role ambiguity ($t=1.92$, $P<0.05$), inter-role distance ($t=1.55$, $P<0.05$) and self-role distance ($t=1.15$, $P<0.05$). However, the difference between the mean scores was insignificant in case of role erosion, personal inadequacy, role overload, role expectation conflict, resource inadequacy, role isolation and total stress ($t=0.54$). It has been observed that role stagnation, role erosion, inter role distance and self role distance are the major stressors among clerical employees. The mean total role stress score for officers was 46.85 and for clerks it was also nearly the same (51.03). Thus hypothesis that job stress is more amongst officers as compared to the clerks is not tenable.

Table 3: Significance of Difference between Mean Scores on Various Types of Role Stress for Officer (N=20) versus Clerical Staff (N=61) of SBI, Shimla

Role Stress Types	Officers		Staff		Difference	't' value
	Mean	SD	Mean	SD		
Inter Role Distance	7.75	3.66	5.89	4.93	1.86	1.55
Role Stagnation	4.20	2.47	6.64	4.21	2.44	2.45*
Role Expectation Conflict	3.75	3.28	4.25	3.69	0.50	0.54
Role Erosion	7.40	3.44	6.07	4.37	1.33	1.24
Role Overload	4.95	3.37	4.33	3.91	0.62	0.63
Role Isolation	4.50	2.89	4.48	3.86	0.02	0.02
Personal Inadequacy	4.45	3.28	3.90	3.01	0.55	0.69
Self Role Distance	3.80	2.80	5.29	4.08	1.49	1.51
Role Ambiguity	2.10	1.92	4.08	4.41	1.98	1.92
Resource Inadequacy	4.05	2.13	4.44	4.07	0.39	0.41
Total	46.85	18.38	51.03	32.81	4.18	0.54

* $P<0.05$

Concluding Remarks

Thus, it can be concluded that: the job stress perceived by employees of SBI, Shimla is generally low. This is because the employees feel content with their job. The organisational climate is congenial for work. The employees are underworked because of overstaffing and the wage and salary package is also good.

The role stress perceived by female employees is higher as compared to their male counterparts. The

reason for this is that the women have to work both in house as well as in the office, therefore they feel more stressed. For women employees role stagnation and for male employees, role erosion, have been identified the job stressors. These can be checked by timely promotions and providing training and development facilities accordingly.

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The role stress perceived by clerks is higher as compared to the officers. The cause for this is that the officers are given more benefits as compared to the clerks. It is ventilated that the officers are provided accommodation by the banks whereas the clerks do not get this facility. However, for both type of employees the role erosion has been observed to be a role stressor which can be controlled by clearly defining the role and responsibilities.

In addition, job stress has been found more among post graduates than graduates and employees who have 10-20 years service experiences have the highest role stress. It has been noted that role stagnation among post-graduate employees and role erosion in 10-20 years experience service group are the stressors. It is a matter of fact that role erosion emerges as the biggest stressor which in turn leads to inter role distance for others resulting further to role stagnation and self role distance etc. But it is certain that these stresses have direct impact on performance of bank employees and may be the cause of many health problems.

Job stress has been found more among post graduates than graduate ones and in employees who have 10-20 years service experiences the highest role stress.

Because of globalisation and liberalisation, a need has been felt in the banking sector to check these stressors in particular and job stress in general in order to perform well compete in the market. Frequent stress audit will help to identify the organisational stressors and consequent their resolution. Hopefully, it will help

banks not only in checking irregularities and errors involved but also going to make bank services better.

Frequent stress audit will help to identify the organisational stressors and consequent their resolution.

Quality of Worklife needs to be improved through more job involvement and enrichment programmes, participatory management and quality circles. Stress free life will ensure organisational efficiency and individual psychological well being.

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Productive Integration of Manufacturing Constraints & Customer Voice in Product Design

Nesa L' abbe Wu

Over the last thirty years we have seen dramatic changes in the approach to the design of products and services, not only in the US, but throughout the world. This paper stresses the successful productive integration of product design with manufacturing constraints and customer desires. It captures the evolution from CAD to CAD/CAM and QFD. It also reflects on the percentage productive cost savings of these methods in major areas such as process planning, tooling, scrap and rework, direct labor, work in process, material cost, design cost, design time and others.

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Introduction

The basic function of product design is to convert the general specifications of a product into its technical specifications. The general specifications of a product describe its functional requirements (i.e., its intended use), its performance quality, its reliability, its maintainability, as well as its market image. The general specifications are based on information supplied by the marketing function. A well-defined general specification should accurately reflect the customer's needs and the market requirements. The general specifications do not necessarily reflect the actual production capability of the system through which the product is made or through which the service is rendered.

The technical specifications of a product define the production requirements which will satisfy the product's general specifications and which can be achieved at a minimum cost under specific production conditions. Cost and productivity are the major concerns when converting the general specifications of a product into its technical specifications. The technical specifications may be expressed under different forms, including engineering drawings, engineering bills of materials, engineering data bases, service contracts, insurance policies, course curricula, restaurant menus, or physician's medical prescriptions.

Technically and economically, it is not always possible to satisfy all the general specifications desired by

Cost and productivity are the major concerns when converting the general specifications of a product into its technical specifications.

the market. The product design decisions usually result from a rational trade-off among marketing requirements, engineering concepts and production capabilities. Therefore, the product design will meet the general specifications with some modification. The technical specifications, as determined by the product design function, dictate most of the productive activities of a firm including manufacturing processes, facility layout, material handling, production control, inventory control, quality control, as well as transportation. In fact, the product design decisions set the basic tone for the entire organisation.

Product Design Procedure

Product design in the US normally consists of the following six steps:

- Recognising the market needs for either a new product or a modification of an existing product based on market information.
- Defining the general specifications which may satisfy the market needs.
- Synthesising all relevant information and conceptualizing the overall system and the individual elements of the product in order to come up with a preliminary design.
- Analysing the feasibility of the preliminary design wherein, one determines whether any improvement or adjustment need to be made, whether the preliminary design is acceptable or should be rejected.
- Evaluating the design against its general specifications and production requirements by the use of scale models, prototype models, or computer simulation models and
- Documenting and presenting the design to the shop floor and other production supporting functions. The commonly used product design documents include engineering drawings, electrical and electronic circuit diagrams, bills of materials, engineering and material specifications, design data bases, and others.

The synthesis and analysis (step 3 and 4) in product design are often iterative procedures which consume a great amount of engineering time. These two steps may generate a series of preliminary designs through trial and error, during which sophisticated engineering calculations for each iteration are performed. These two activities are traditionally considered to be highly creative and are manually performed by well-paid design engineers. The documentation and presentation step of the

final product design also often consumes a great amount of time in drafting, tabulating and checking of standards.

Interestingly in Japan, product design goes beyond the abovesaid six steps. Documents presented to the shop floor contain prints that specify materials and dimensions critical to safety performance and reliability. Selection of exact fasteners or non-critical parts may await negotiation with suppliers.

Details of the non-critical parts may not be determined until plant production starts. A new model start-up takes place with design engineers living in the plant and working out the changes. Several pilot production runs may be necessary to work out necessary changes. For instance, in the Japanese auto manufacturing companies, several thousand minor design changes may occur during the start up of a complete redesigned model.

Computer Aided Design (CAD)

Basically, computer aided design (CAD) is performed by a computerized system that involves man (the designer), machine (the computer hardware), and their interface (the software). The earliest application of the CAD system is for the preparation of engineering drawings, viz., drafting. However, preparation of engineering drawings alone does not take full advantage of the modern computer capabilities and often proves to be uneconomical. Consequently drawings are all together eliminated if feasible. In particular the entire design information can be efficiently stored in digital form that can be conveniently retrieved, manipulated and integrated with other production information. In short a modern CAD system is a man-computer interactive system.

In CAD the computer communicates with its user through a cathode ray tube (CRT), and the user (designer) sends data and commands through a keyboard, function buttons and a light pen/mouse. The keyboard is used to enter design data, users' programs and/or program commands. The function buttons are used to select hard wired machine functions for creating, scaling, rotating, erasing or reversing graphical images based on stored geometric information. The light pen/mouse provides a very convenient means for the designer to respond directly to the computer or the image displayed by the computer on the CRT.

The high speed and high storage capacity of the modern computer, together with a powerful CAD software package make it possible for modern CAD systems to perform an enormous amount of detailed computations with extreme accuracy within an incredibly

short period of time. The computer is able to generate a series of design alternatives and the designer is able to manipulate these alternate designs on the CRT in search of an optimal solution dividing visual or conceptual errors at every stage. Thus, the synergistic effect of the CAD system may immensely improve the productivity of the product design function. Clever capabilities, such as multiple views, or spatial relationships among parts in an assembly, or moving objects, are continuously expanding as more and more new CAD softwares become available.

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Besides generating geometric relationships in product design, the CAD system may also get involved with such engineering analysis as stress and strain analysis on a machine member, thermometer distributions, heat-transfer calculations, and dynamic system behavior simulation. In fully taking advantage of the synergistic effect, it is important to understand the relative strength between the human and the computer during the system and job design function. While the computer gradually takes over all of the memory and calculation tasks of the design process, the creative aspect of the design will continue to remain in the human domain for the foreseeable future.

Group Technology (GT)

This is a manufacturing philosophy whereby similar parts are identified and grouped together to take advantage of their similarities in manufacturing and design. When GT is applied, the parts used by a manufacturing firm are classified and coded based on their geometric shapes, sizes and/or manufacturing processes. Based on code assigned to each part, similar parts can be quickly identified and grouped together as a part family.

Group technology has been practiced in various forms since the beginning of this century, especially in Europe. The Germans used it in World War II while the Swedes began applying it around 1948. Currently GT is a technique of rapidly growing popularity in the Japanese industry under the sponsorship of the Japanese government.

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In USA, though GT has been practiced for a long time under different names in various forms, it is only since the early eighties that GT has received formal recognition and has been practiced as a systematic scientific technology applied to small lot production which is most common to small and medium industries.

Before the use of GT, General Dynamics' Pomona Division, for example, came across a case where a virtually identical nut and coupling unit had been designed on five different occasions by five design engineers and then drawn by five draftsmen. These parts were purchased from five suppliers at prices ranging from \$22 to \$7.50 each. The company also investigated 2,891 parts with different part numbers and discovered that the number of distinct shapes leveled out fairly quickly to comprise a population of only 541 shapes. Such design proliferation occurs because, without the existence of a system such as GT, the designer finds creating a new part easier than being patient in finding or looking up previously designed similar parts. Each time a new part is created, a new part number must be assigned to it, a new process plan made up for it, and new tools designed.

Thus, GT coding of parts is useful for the efficient retrieval of previous designs as well as for design standardization, and avoids design proliferation. During the preliminary design stage, the designer can determine the appropriate code number for each new part required. For a typical new product design reports show that about 40 per cent of the parts already exist, another 40 per cent need only some modifications, and only about 20 per cent need new designs.

Though GT is not a computer-dependent technology, the combination of GT and CAD can further increase the productivity of product design. The retrieval and alteration process as required by GT can be accomplished easily at the CAD terminals within a small fraction of the time required by traditional design methods. The application of GT can also facilitate standardization. Without special effort, the superior design features will be easily retained with family part design, for improved design quality.

Integrated Product Design with CAD/CAM

Designing for Production

This concerns with the design of a sound product for economical manufacturing, and in particular with the design and selection of tools, equipment, methods and technology for its production [Foston *et al*, 1991]. Designing for production provides an important linkage between the product concept and production reality. Since the primary concern of the product designer is the performance and appearance of a product, the designer often tends to over-design a product at the expense of productivity and production cost. In other instances, cost control and cost reduction have dominated management thinking. The design quality of the product may suffer and result in an inferior product. To keep check and balance among the different factors, designing for production function integrates and takes all the design and production factors into consideration.

Designing for production provides an important linkage between the product concept and production reality.

Once a product is released to production, the process planning function will continuously scrutinize the product design in light of the availability of current resources and the updated technological information. For a manufacturing firm, the process planning function would trigger a change or modification to product design in case of, for example, a change of a raw material supplier, a persistent quality problem of one specific manufacturing process, or the availability of more productive equipment or new production technology. If the change affects the product design, then it is considered to be an extension of the designing for production and is often documented and released in the form of engineering change. Once the design and manufacturing databases are integrated, this change should be recorded automatically and should trigger a series of changes in product design, facility layout, material planning, maintenance planning and many other areas. Group technology can enable this integration through GT based CAD/CAM systems.

CAD/CAM Integration via Group Technology

The codes and classification for the integration has become, however, more extensive when the philosophy of GT got extended to manufacturing. The codes consequently grew from 5 to 15, to 25 and even more digits. The development of such extensive codes, in order to

integrate design and manufacturing characteristics, coincided with the introduction of the computer to GT. Together with the development of new extensive codes, interactive programs were written whereby both the design—and the manufacturing engineer could communicate with the computer in an attempt to develop the code by answering simple questions. A natural result of capturing both design and manufacturing information in one single code number was the development of a comprehensive database which contained both design and manufacturing information. Standardization in both design and manufacturing became essential in the construction of manageable GT coding systems and databases.

In a fully implemented system, a design engineer could sit at a computer graphics terminal, linked with a common database, to quickly code a part, search the file, and find the optimal standard design for it. Likewise, the manufacturing engineer could use the manufacturing information of the same database and with standardization find the "best", "optimal" manufacturing method and detailed process plans and routings. With such standardization it becomes possible to use the computer to generate appropriate process plans, which is termed computer aided process planning (CAPP).

A classification and coding system serves as the hub of CAD/CAM systems. When used with group technology, it also provides the standardization essential for the optimal utilization of computer assisted process planning, a major asset in computer aided manufacturing and computer graphics, the leading edge of computer aided design today.

An integrated CAD/CAM database system or manufacturing database is capable of producing parts from the designer's computerized specifications. This significantly reduces the time it takes to bring new products to the market place because the manufacturing database contains the product model data (as generated during the design phase) and the common data for production planning, control and shipping.

CAD/CAM database systems allow for concurrent engineering of design and manufacturing, because its technology links the design studio with the processing and the manufacturing environment.

Customer-oriented Integrated Product Design

Quality Function Deployment (QFD)

Basically this is a technique for translating the wants and desires of customers into a language and specifica-

tions that can be used by marketing and engineering to develop a product that the customers want. Quality function deployment is a literal translation of the Japanese name for the methodology as developed in the Kobe Shipyards in the late 1960's: hin shitsu (quality) ki no (function) ten kai (deployment).

QFD decreases the total amount of time it takes to define the product. QFD defines customer requirements using data taken from customers, rather than using opinions and speculation and goes beyond product requirements. Thus QFD is a fully computer integrated system that links product requirements to product design (technical specifications); product design to process planning; and process planning to process control or control planning.

QFD is a fully computer integrated system that links product requirements to product design; product design to process planning; and process planning to process control or control planning.

The House of Quality

The house of quality is a product planning matrix. It is used to relate customer wants and needs to key enablers, the "How's" that allow a product to fulfill customer needs. Figure 1 shows a typical house of quality and its parts.

There are two matrices which are important in the house of quality. They are the relationship matrix and the correlation matrix. The relationship matrix, located in the center of the house, defines the relationship between the customer wants, the "Whats", and the enablers, the "Hows". Symbols are used in the house to illustrate whether the "Whats" and the "Hows" have a positive, negative or no relationship, and how strong that relationship is. By completing this matrix one can determine if we are focussing on the correct "Hows" to achieve the customer wants. The "How Much" section is used to determine what levels of each "How" are appropriate to satisfy each "What". The correlation matrix is referred to as the roof of the house of quality. It maps the interactions between all the "Hows". The same symbols are used in the roof as in the house to indicate the relationship amongst the "Hows". This matrix keeps the whole house in check. In this way the roof of the house will allow to balance all requirements and come up with a product that best satisfies all the customer requirements.

Competitive assessment is reflected in two graphs that are part of the house of quality: the customer assessment graph and the technical assessment graph. The customer assessment graph is constructed by asking the customers how well the company is doing fulfilling each one of the "Whats" identified by the customer. The customer is also asked how the competition is doing with respect to the same "Whats". The technical assessment graph is completed by benchmarking the company's product against the competition. By plotting both graphs, conflicts can surface. A conflict occurs when the technical assessment says that the product is better than the competition, but the customer's assessment says that the competition is better. If this is the case, the "How" has not been properly defined and more research is needed.

A sample example of the house of quality for the best Cola is shown in Fig. 2.

Four Phased QFD System

As mentioned previously the four phases of QFD are product planning, product design, process planning and control planning. Figure 3 shows how the house of quality is used in all phases and rolled down from one phase to the next phase.

The first phase, viz., *Product Planning Phase* takes customer requirements and turns them into technical specifications through brainstorming or group discussion. The discussion helps to generate ideas and technical characteristics which may satisfy the customer desires. The requirements are then prioritized.

In the *Product Design Phase* technical requirements that were developed in the previous phase are turned into part characteristics. This is done by using the house of quality method, where the "Whats" are the technical requirements and the "Hows" are the part characteristics which are going to be derived. This assures that the voice of the customer has been rolled down to the design of the part characteristics.

The third phase of *Process Planning* takes the part characteristics developed in the previous phase and determines the manufacturing process which best produce the part. Again, since the voice of the customer has been rolled down from phase two and from phase two to phase three, the voice of the customer is also part of the process planning phase.

Finally the *Control Planning Phase* involves taking the process planning characteristics necessary to produce a good part as identified in the previous phase and determine what process control methods will be

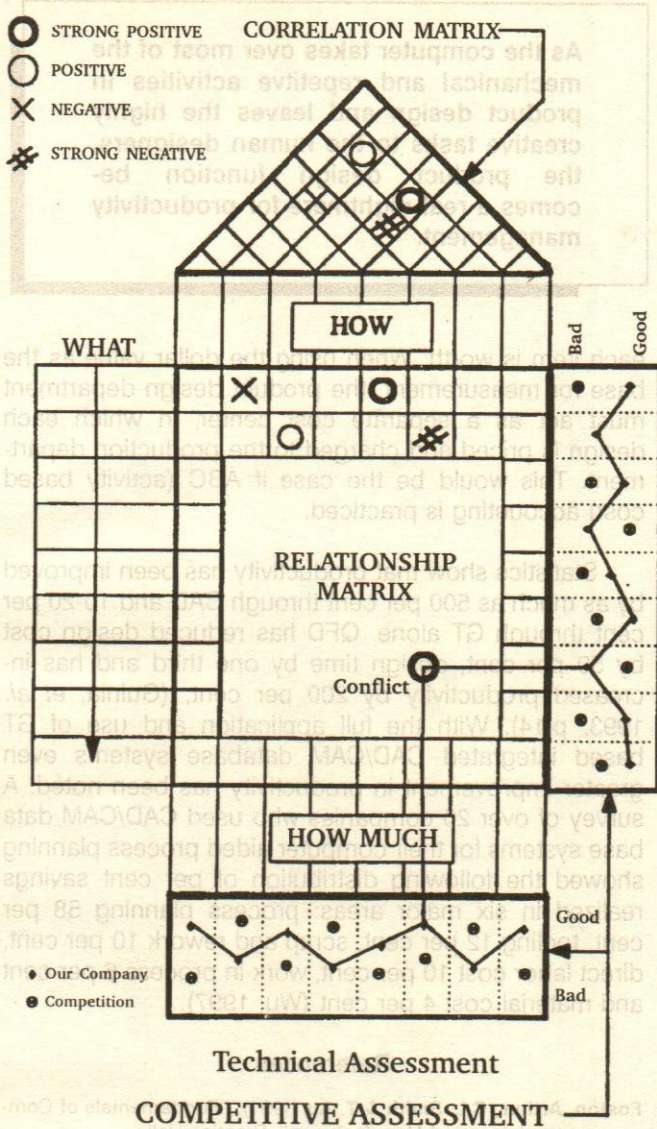


Fig. 1. The House of Quality

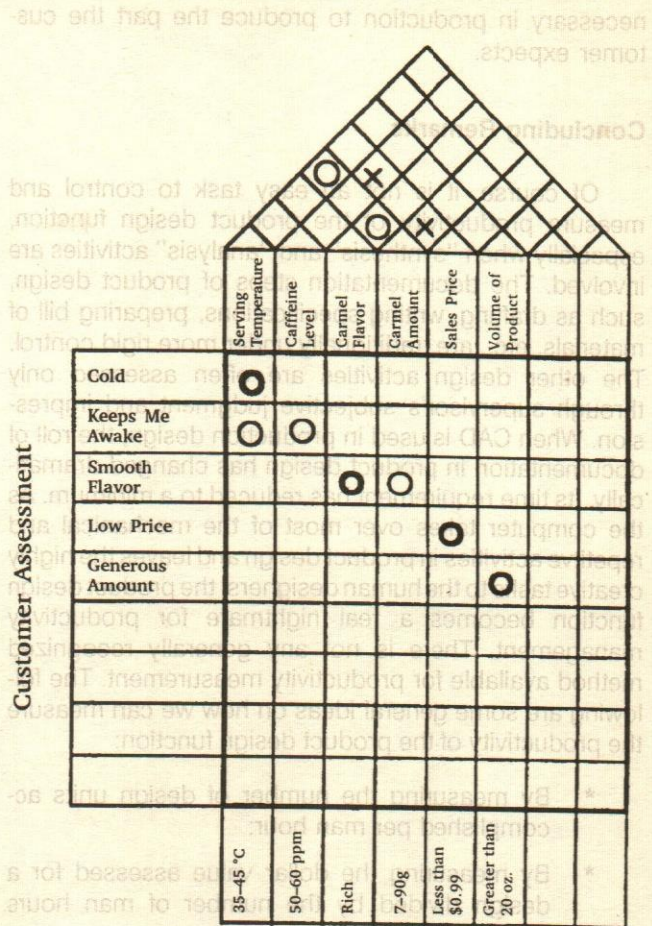


Fig. 2. Cola House of Quality

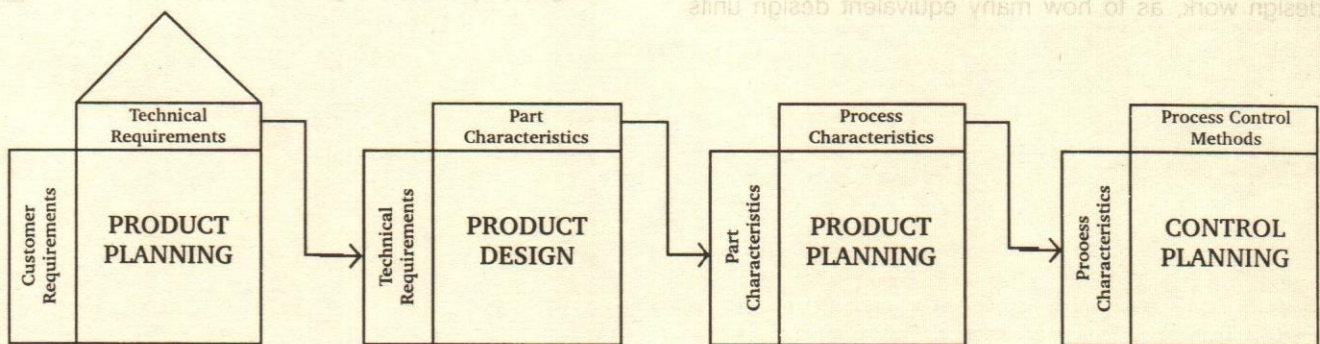


Fig. 3. Rolling Down the House of Quality: Four Phases of QFD

necessary in production to produce the part the customer expects.

Concluding Remarks

Of course, it is not an easy task to control and measure productivity of the product design function, especially when "synthesis" and "analysis" activities are involved. The documentation steps of product design, such as drafting, writing specifications, preparing bill of materials, etc., are traditionally under more rigid control. The other design activities are often assessed only through supervisor's subjective judgment and impression. When CAD is used in production design, the roll of documentation in product design has changed dramatically. Its time requirement has reduced to a minimum. As the computer takes over most of the mechanical and repetitive activities in product design and leaves the highly creative tasks to the human designers, the product design function becomes a real nightmare for productivity management. There is not any generally recognized method available for productivity measurement. The following are some general ideas on how we can measure the productivity of the product design function:

- * By measuring the number of design units accomplished per man hour;
- * By measuring the dollar value assessed for a design divided by the number of man hours spent on the design.

The first method gives a quantitative measure with respect to how much work the design function has accomplished for a given amount of time. The second method measures not only the amount of work accomplished, but also the quality of the work accomplished. A design unit can be defined as the average time required to produce a typical design item, starting from receiving the design order to releasing the design documents. All design items are pre-assessed, based on historical records and the complexity of the design work, as to how many equivalent design units

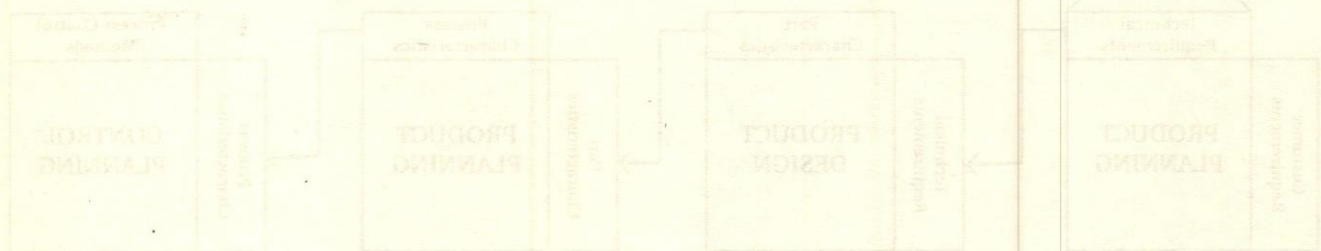
As the computer takes over most of the mechanical and repetitive activities in product design and leaves the highly creative tasks to the human designers, the product design function becomes a real nightmare for productivity management.

each item is worth. When using the dollar value as the base for measurement, the product design department must act as a separate cost center, in which each design is priced and charged to the production department. This would be the case if ABC (activity based cost) accounting is practiced.

Statistics show that productivity has been improved by as much as 500 per cent through CAD and 10-20 per cent through GT alone. QFD has reduced design cost by 50 per cent, design time by one third and has increased productivity by 200 per cent, (Guinia, *et al.* 1993, p.14). With the full application and use of GT based integrated CAD/CAM database systems even greater improvement in productivity has been noted. A survey of over 20 companies who used CAD/CAM database systems for their computer aided process planning showed the following distribution of per cent savings realized in six major areas: process planning 58 per cent, tooling 12 per cent, scrap and rework 10 per cent, direct labor cost 10 per cent, work in process 6 per cent and material cost 4 per cent (Wu, 1997).

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Functional Value of Plant Asset Base – A Surrogate Measure

M.K. Kolay

A surrogate measure for the functional value of the plant base of any manufacturing organisation based on the worth of its performance to meet the needs of different customers has been proposed. They are in the form of (i) service level, (ii) total quality level, (iii) level of cost effectiveness, including its level of (iv) safety and (v) environment friendliness. The measure has been implemented in an engineering firm to study its plant value for a four year period relative to a chosen base period. The service level, the total quality level and the level of safety have been found to have improved whereas the level of cost effectiveness has been deteriorated. On the whole, the value of the plant base has been found to have improved to the extent of 8 per cent by the end of the four year study period. It is expected that such a value measure would be an effective monitoring tool in the hands of operating managers to manage the technology portfolio of any manufacturing organisation. An attempt has been made in the paper for evolving an integrated framework to assess the value of plant assets.

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Introduction

Plant and infrastructures which are appropriate today may become obsolete in no time in the midst of rapid technological advances. Economies of scale may no more be relevant due to the existing massive plant capacity of standards (Ayres, 1992). Present quality standards turned out by the machines may no more be attractive to the customers. Escalation in cost of materials used, so also the cost of labour and processing may be the cause of concern for the plant viability. Even the spiralling cost increase of waste disposal under legal compulsions at times may threaten the discarding of the whole plant.

Besides timely replacement of obsolete machines, it is more important is the upkeep and maintenance of the plant and infrastructures to arrest the technological obsolescence. The plant and infrastructural facilities may be depreciated at a prescribed rate for the overpowering concern of income tax, but what is more important is to re-engineer the existing products and processes to meet the changing needs of the customers using the same age old machines with minimum of capital expenditure. The quoted attributes of plant facilities may no more be relevant, so also the historical cost of their acquisition. What is important is how well the plant facilities do function to meet the demands in the changing scenario. Whether the functional value of the plant asset base of an organisation has been depreciating or

It is more important to re-engineer the existing products and processes to meet the changing needs of the customers using the same age old machines with minimum of capital expenditure.

appreciating perhaps needs to be assessed and monitored.

Functional Value

Cost has been the historical basis of valuation of physical assets from the days of accounting history, standard depreciation method is followed as prescribed to deduce the net value of an asset. However, historical cost may not be equal to value except perhaps on the date of purchase. Depreciation as prescribed for a specific category of machines may not be relevant to all organisations. It would depend on how a particular organisation has used such a facility, the extent of use, the skill level of workforce, the quality of inputs processed, the condition of the tools used and the working environment. But more than the depreciation for the extent of their utilization, the level of maintenance and intelligent use of add-ons from time to time could make all the difference and condition might even be improved to make the old machines really appreciate rather than depreciate over time.

The level of maintenance and intelligent use of add-ons from time to time could make all the difference and condition might improve to make the old machines really appreciate rather than depreciate over time.

Considerable efforts have been made to assess the underlying technology of the plant and infrastructures based on the performance measure particularly in the fields of health care, chemicals and information processing (Altenpohl 1987; McGivney and Schneider 1988; Reynolds 1989; Wilensky 1990; Chambers 1991 and Kilpatrick *et al.* 1991). In fact, twenty years old Office of Technology Assessment (OTA) of the U.S. Congress has become by now an authoritative voice (Adam, 1989) to judge the appropriateness of a designed technology. The safe operations of the plant is indeed a fundamental requirement as agreed to by one and all, so also the environment friendliness of the plant, but the design and operational parameters of a technology as considered in the performance measure may be really casual in nature, to build up the capacity and efficiency of the plant and infrastructures. But even the capacity may not be fully utilized, so also the technical efficiency, to represent the functional value. Actual production may not mean value unless it is acceptable to the customers. What is important to the customers is to meet the requirements in time with desired quality of supplies at minimum

possible cost. Flexibility and upgradability as considered by many authors are no doubt important attributes of any technology, but again such parameters assume value to the extent they meet the varying needs of more and more customers. The extent of possible recycling of wastes is another attribute of technology, but that is again for improving the cost effectiveness of the conversion process. Thus, the functional value of the plant base lies really in its:

- Service capability
- Total quality capability
- Cost effectiveness
- Safety
- Environment friendliness

What is important to the customers is to meet the requirements in time with desired quality of supplies at minimum possible cost.

Service Capability

An appropriate measure for the service capability of the plant may be reflected by the total service level offered to the customers for the level of production achieved. The total service level for a particular product line would include the service level itself and the reliability of the service level. The service level may be reflected by the extent of manufacturing lead time in relation to lot size demanded (i.e. relative manufacturing lead time) and the reliability of service level jointly by (i) the per cent variation in relative manufacturing lead time and (ii) the extent of the gap between the actual and the desired delivery schedule in relation to the total quantity to be delivered (i.e. proportional delay in delivery commitment). However, the total service level would differ depending on the relative importance of customers based on their relative volume of purchases and the ease of credit realization from them. Such a phenomena may be taken into account to assess the total service level for a particular product line for a specific group of customers. Integrating the total service level with the level of production attained, the service capability of the plant base for a specific product line may be assessed. Recognizing the fact that service capability would differ depending on the nature of different products like routine, non-routine or developmental, so also its value on the relative profitability of different product lines, the service capability for all the product lines as available from the plant base may be assessed as reflected in fig. 1.

Total Quality Capability

This measure for the plant base would include (i) the quality level and (ii) the reliability level of different product lines as available to the customers. Suitable surrogate measures have been suggested as shown in Fig. 2 to reflect the average quality level of a product line based on

- per cent of times quality targets attained and variation of quality within accepted limits
- per cent rejection and
- per cent defectives and the extent of reworking cost thereon.

The reliability level of a particular product line could be assessed as in fig. 2 jointly by the

- extent of need for after-sale service and
- complaints received from customers in terms of relevant sales per cent.

Recognizing that total quality would differ depending on the nature of the products as before (i.e. routine, non-routine or developmental), so also its value on the relative profitability of different product lines, the functional value of the total quality capability as available from the plant base for all the product lines together may be assessed as shown in fig. 2.

Measure for Cost Effectiveness, Plant Safety & Environment Friendliness

The level of factor productivity achieved by the plant base for the different product lines with relative importance to the nature of products may be considered to reflect the cost effectiveness capability of the plant base as shown in fig. 3.

The number of accidents (including severity thereof) could be considered to reflect the plant safety level. The extent of environment friendliness of the plant may be assessed based on the extent of adverse impact it creates on the environment. The level of pollution may be used as an indicator in this direction. This is presented in fig. 4.

Measure of Functional Value of the Plant

The performance of the plant base as reflected by the service capability, the total quality capability, the cost effectiveness level, the level of safety and the environment friendliness together with different relative

weightings assigned to them would reflect the total capability of the plant base, herein termed as the functional value of the plant base as a whole over time (Kolay, 1994) as shown in fig. 5.

Case Study

The proposed concept of functional value of the plant base has been tried out for a medium sized engineering firm for a four year period, 1991 to 1994 as compared to a chosen base year 1990. During the period under study, the plant base of the organisation has been augmented as and when necessary, however, the real (inflation adjusted) growth in the plant investments has been nominal to the extent of 5 per cent by the end of the four year study period. But, the firm is known to be quite strong in the design and manufacture of precision engineering products and usually it undertakes to supply special types of engineering items as per customers' specifications, besides its regular routine items. The firm under study believes in two category of customers, routine and valued depending on the proportion of their purchases and ease of credit realization. How does the plant base serve to such routine and valued customers with regular and special products to reflect its functional value?

Service capability

With a reduction in the relative manufacturing lead time for regular and special products (as in tables 1 and 2), the service level has been improved in general for both routine and valued customers, except in only one year (i.e. 1992) for routine customers for the supply of regular products. The reliability of service for regular items, has been improved in general for both types of customers consequent to lower variation in relative manufacturing lead time and better fulfillment of delivery commitment. However, for the supply of special products, the reliability of service has gone down during the first two years particularly for the valued customers, thereafter improved during the last two years for both types of customers. Taking the twin aspects of service and reliability thereof, the total service level for the supply of regular products has been improved quite significantly during the period under study for both types of customers. It has also been improved in the case of special products for both types of customers as well, of course not of that extent as in the case of regular items; except in the year 1991 it has gone down by 3 per cent for valued customers. Recognizing the relative importance of different types of customers, the total service level for the customers as a whole for the supply of regular products has been improved significantly with the four year average being 9 per cent higher than the base year. However, the same for the supply of special

Lower the manufacturing lead time in relation to lot size demanded and produced i.e. relative manufacturing lead time (ML_{ujt}) for delivery of jth product to uth customer group, higher the relevant service level (CU_{ujt}) available from the plant base

$$[CU = 1/ML_{ujt}]$$

Service level index as available from the plant base (CU_{ujt})

Lower the per cent variation in the relative manufacturing lead time for delivery of jth product to uth customer group, higher the reliability of relevant service level available from the plant base

$$[YC_{1jut} = 1/VL_{ujt}]$$

WYC_{1ujt}

WYC_{2ujt}

Reliability of service level index as available from the plant base (YC_{ujt})

$$\overline{YC}_{ujt} = \frac{\sum_{w=1}^2 WYC_{wujt} \cdot \overline{YC}_{wujt}}{\sum_{w=1}^2 WYC_{wujt}}$$

Lower the gap between the actual and desired delivery schedule in relation to the total quantity to be delivered i.e. proportional delay in delivery commitment (DM_{ujt}) of jth product to uth customer group, higher the reliability of relevant service level (YC_{ujt}) available from the plant base

$$[YC_{2ujt} = 1/DM_{ujt}]$$

$$DM_{ujt} = \int_0^t (AD_{uj}(t) - DD_{uj}(t)) dt / \int_0^t DD_{uj}(t) dt$$

$AD_{uj}(t)$ and $DD_{uj}(t)$ being the actual and desired rates of delivery

Higher the volume of production (VP_{jt}) of jth product, higher the service capability of the plant base (CP_{jt})

$$[CP_{2jt} = VP_{jt}]$$

Total service level index (\overline{TU}_{ujt}) as available from the plant base for uth customer group of jth product

$$[\overline{TU}_{ujt} = \overline{CU}_{ujt} \cdot \overline{YC}_{ujt}]$$

Importance of customers (u)
 u = 1, routine customers
 = 2, valued customers
 = 3, most important customers

Total service level as available for jth product index (\overline{TU}_{jt})

$$\overline{TU}_{jt} = \frac{\sum_{u=1}^3 WT_{ujt} \cdot \overline{TU}_{ujt}}{\sum_{u=1}^3 WT_{ujt}}$$

$$[CP_{1jt} = \overline{TU}_{jt}]$$

Contribution volume ratio of products (PV_{jt})

Service capability as available for jth product from the plant - index (CP_{jt})

$$[CP_{jt} = \overline{CP}_{1jt} \cdot \overline{CP}_{2jt}]$$

Nature of product (j)
 j = 1, routine
 = 2, non-routine
 = 3, developmental etc.

WYC_{wujt} , w = 1, 2 being the weightages assigned to reliability of service parameters

WT_{ujt} , u = 1, 2, 3 being the weightages assigned to total service level parameters of the jth product

WC_{jt} , j = 1, 2, 3.....n being the weightages assigned to different product groups for assessing service capability of the plant

t refers to time period
 - refers to value during period (t) relative to that of the base period (0).

Service capability of the plant base index (CP_t)

$$CP_t = \frac{\sum_{j=1}^n WC_{jt} \cdot PV_{jt} \cdot \overline{CP}_{jt}}{\sum_{j=1}^n WC_{jt} \cdot PV_{jt}}$$

Fig. 1. Measure of service capability of the plant base

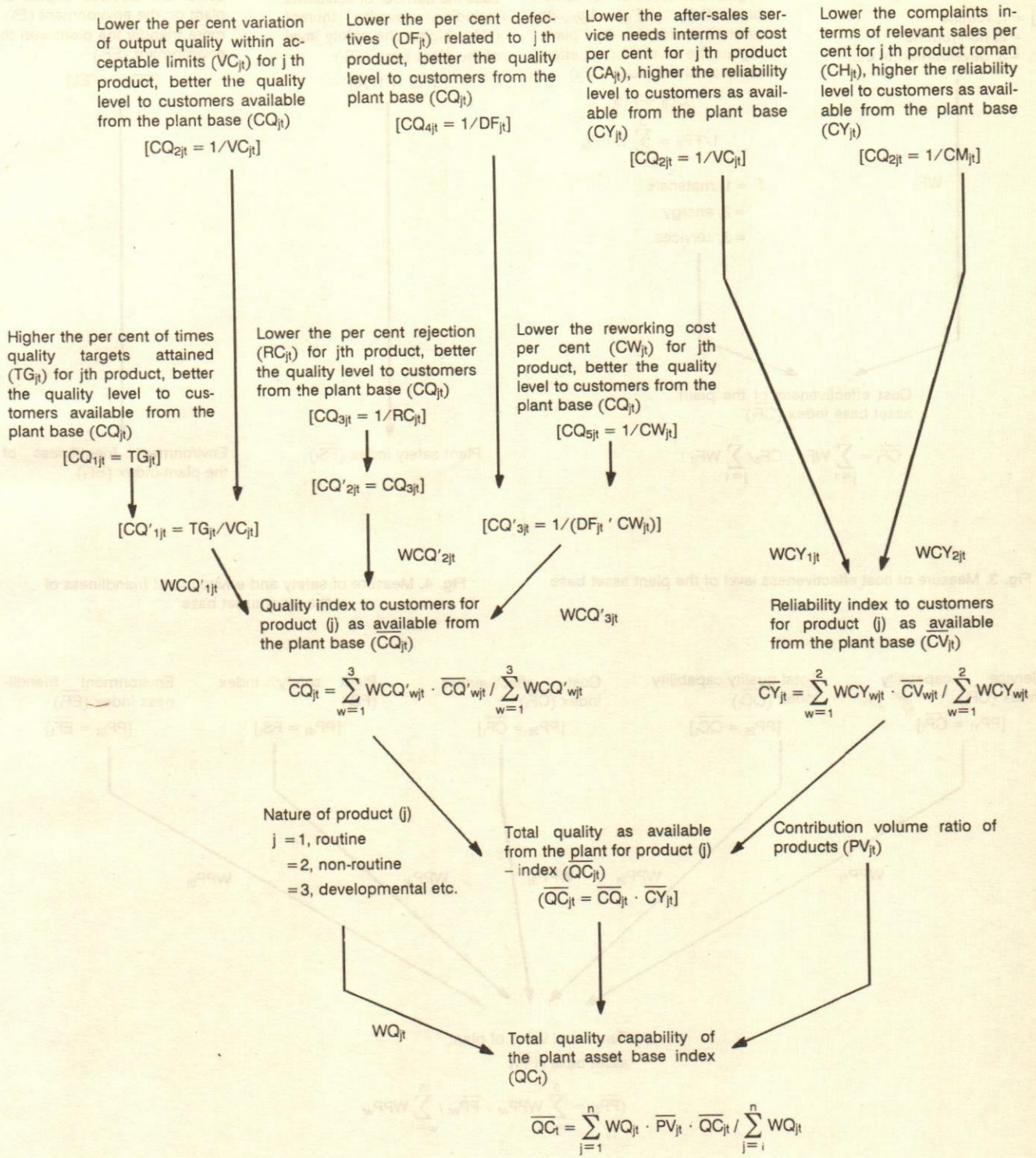


Fig. 2. Measure of total quality capability level of the plant asset base

Nature of product (j)

- j = 1, routine
- = 2, non-routine
- = 3, developmental etc.

Higher the level of fth factor productivity (FP_{ft}) for jth product achieved by plant, higher the level of cost effectiveness of the plant (CF_{jt})

$$CF_{jt} = FP_{jt}$$

$$1/FP_{jt} = \sum_{f=1}^3 1/FP_{fjt}$$

- f = 1, materials
- = 2, energy
- = 3, services

WF_{jt}

Cost effectiveness of the plant asset base index (CF_t)

$$\overline{CF}_t = \frac{\sum_{j=1}^n WF_{jt} \cdot CF_{jt}}{\sum_{j=1}^n WF_{jt}}$$

Less the number of accidents including severity thereof (NA_t), higher the safety level of the plant base (FS_t)

$$[FS_t = 1/NA_t]$$

Lower the adverse impact of plant on the environment (E_t), more friendly the plant with th environment (EF_t)

$$[EF_t = 1/E_t]$$

Plant safety index (FS_t)

Environment friendliness of the plant-index (EF_t)

Fig. 3. Measure of cost effectiveness level of the plant asset base

Fig. 4. Measure of safety and environment friendliness of the plant asset base

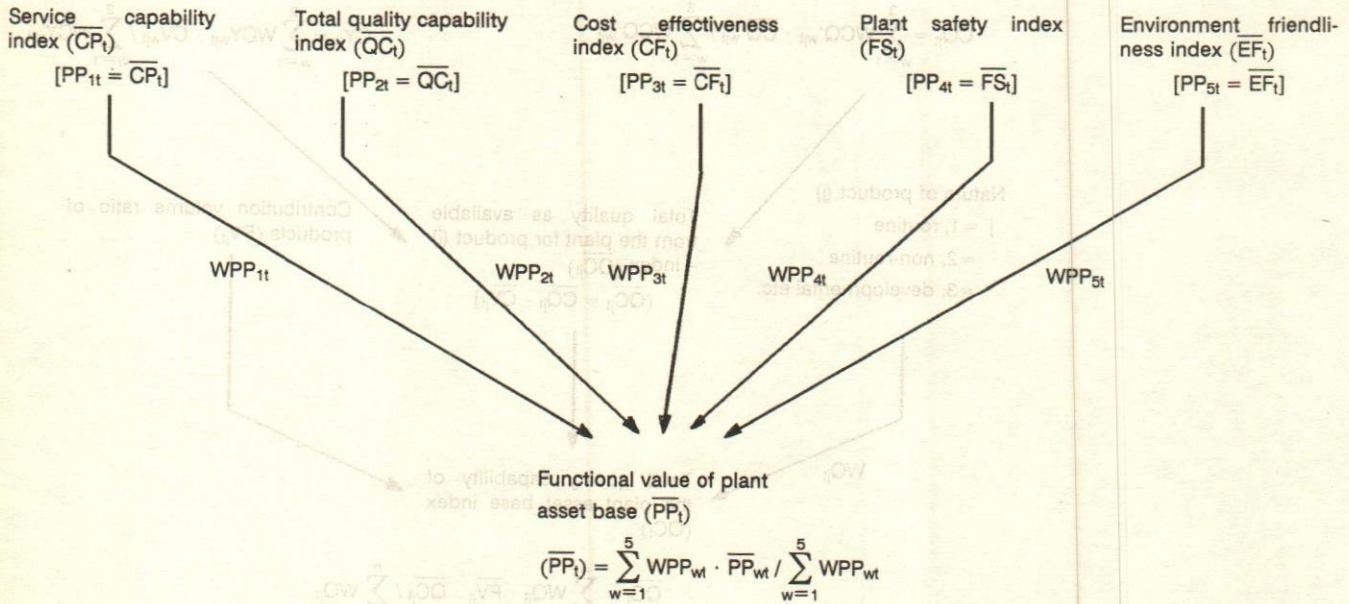


Fig. 5. Measure of functional value of the plant asset base

items, has gone down in the very first year (i.e. 1991), thereafter, it has been improved as shown in the tables 1 and 2.

Table 1: Service capability of the plant available for regular products

	1990 (base year)	1991	1992	1993	1994
Average relative manufacturing lead time (days)					
For routine customers	50.00	48.00	51.00	48.00	47.00
For valued customers	35.00	35.00	33.00	32.00	32.00
Service level index					
For routine customers	1.00	1.04	0.98	1.04	1.06
For valued customers	1.00	1.00	1.06	1.09	1.09
Variation in relative manufacturing lead time (per cent)					
For routine customers	8.00	8.00	7.50	7.20	7.20
For valued customers	4.00	3.80	3.80	3.90	3.70
Proportional delay in delivery commitment (per cent)					
For routine customers	5.00	5.00	4.90	5.00	4.80
For valued customers	1.00	0.98	1.00	0.97	0.96
Reliability of service index (with equal weightings to relevant factors)					
For routine customers	1.00	1.00	1.04	1.06	1.06
For valued customers	1.00	1.04	1.03	1.03	1.06
Total service level index (with equal weightings to relevant factors)					
For routine customers	1.00	1.04	1.02	1.10	1.12
For valued customers	1.00	1.04	1.09	1.12	1.16
Total service level index (with 1 : 2 weightings to routine: valued customers)	1.00	1.04	1.07	1.11	1.15
Volume of production index	1.00	1.08	1.10	1.09	1.10
Service capability index for regular products	1.00	1.12	1.18	1.21	1.27

With such an improved total service level achieved even for the delivery of still more volume of output over the years, the service capability of the plant base reflects an improving trend for special products with a four year average being 7 per cent higher. For regular products, the picture is really encouraging with a four year average being 19 per cent higher.

Table 2: Service capability of the plant available for special products

	1990 (base year)	1991	1992	1993	1994
Average relative manufacturing lead time (days)					
For routine customers	90.00	87.00	88.00	86.00	85.00
For valued customers	60.00	60.00	58.00	57.00	55.00
Service level index					
For routine customers	1.00	1.03	1.02	1.05	1.06
For valued customers	1.00	1.00	1.03	1.05	1.09
Variation in relative manufacturing lead time (per cent)					
For routine customers	12.00	12.00	12.50	11.80	11.50
For valued customers	7.00	7.20	7.00	6.80	6.80
Proportional delay in delivery commitment (per cent)					
For routine customers	11.00	11.00	10.80	10.70	10.60
For valued customers	6.00	6.20	6.20	6.00	5.80
Reliability of service index (with equal weightings to relevant factors)					
For routine customers	1.00	1.00	0.99	1.03	1.04
For valued customers	1.00	0.97	0.98	1.02	1.03
Total service level index (with equal weightings to relevant factors)					
For routine customers	1.00	1.03	1.01	1.08	1.10
For valued customers	1.00	0.97	1.01	1.07	1.12
Total service level index (with 1 : 2 weightings to routine: valued customers)	1.00	0.99	1.01	1.07	1.11
Volume of production index	1.00	1.01	1.01	1.03	1.05
Service capability index for regular products	1.00	1.00	1.02	1.10	1.17

Servicing customers with specially designed and fabricated products is no doubt more difficult with the same plant and infrastructures as compared to regular items. With a consensus opinion of the concerned executives of the organisation that the difficulty level for special items would be at least double of that regular items, and incorporating the effect of their

differential level of profitability, the service capability of the plant base reflects an improving trend, improved to the extent of 20% by the end of the study period (as shown in table 3).

Table 3: Service capability of the plant

	1990 (base year)	1991	1992	1993	1994
Service capability index					
For regular products	1.00	1.12	1.18	1.21	1.27
For special products	1.00	1.00	1.02	1.10	1.17
Average contribution volume ratio (per cent)					
For regular products	30.00	32.00	32.00	30.00	28.00
For special products	52.00	54.00	53.00	53.00	54.00
Service capability of the plant-index (with 1:2 weightings to regular: special products)	1.00	1.04	1.08	1.14	1.20

Total quality capability

Quality of the regular products of the organisation has been improved steadily over the years. In fact all the relevant factors building up the quality surrogate have shown signs of improvement except rejection percentage in 1991 and the reworking cost in 1994. In case of special products, the quality of manufacture has deteriorated marginally by 1 per cent in 1993 mainly due to higher reworking, however improved significantly during the last two years with signs of improvements in all the building blocks of quality measure. The reliability of special product lines has gone down initially during the first year as reflected by more of customers' complaints, thereafter improved for both the lines of products. Taking the twin aspects of quality and reliability, the total quality level for the special product line has not been encouraging during the first two years due to deterioration either in quality or reliability, however, improved significantly thereafter due to improvement in both these aspects. For the regular products however, the total quality level has been improved consistently over the years with improvement in both quality and reliability.

Such an improved trend of total quality for the regular and special product lines, on integration as before, reflects an encouraging total quality capability level of the plant base of the organisation as shown in table 4.

Table 4: Total quality capability of the plant

	1990 (base year)	1991	1992	1993	1994
Per cent of times quality targets attained					
For regular products	90.00	90.00	91.50	91.00	92.00
For special products	76.00	80.00	79.00	80.50	81.00
Per cent variations of quality within accepted limits					
For regular products	7.00	6.80	6.90	6.60	6.70
For special products	10.00	10.20	10.00	9.50	9.60
Per cent rejection					
For regular products	5.00	5.20	4.90	4.80	4.80
For special products	11.00	10.50	11.00	10.00	11.00
Per cent defectives					
For regular products	6.00	5.90	5.80	5.90	5.60
For special products	14.00	14.50	14.00	13.00	13.00
Reworking cost proportion (per cent)					
For regular products	1.00	0.98	0.98	1.00	1.01
For special products	5.00	5.25	5.40	4.80	4.60
Product quality from the plant-index (with equal weightings to relevant factors)					
For regular products	1.00	1.01	1.03	1.04	1.05
For special products	1.00	1.00	0.99	1.11	1.10
After-sale service cost proportion (per cent)					
For regular products	5.00	5.20	5.00	4.80	4.80
For special products	12.00	12.00	11.50	11.60	11.50
Customer complaints (in terms of relevant sales per cent)					
For regular products	1.00	0.98	0.97	0.98	0.96
For special products	4.00	4.20	3.98	3.90	3.80
Product reliability from the plant-index (with equal weightings to relevant factors)					
For regular products	1.00	1.00	1.02	1.03	1.04
For special products	1.00	0.97	1.02	1.03	1.05
Total quality capability index					
For regular products	1.00	1.01	1.05	1.07	1.09
For special products	1.00	0.97	1.01	1.14	1.16
Average contribution volume ratio (per cent)					
For regular products	30.00	32.00	32.00	30.00	28.00
For special products	52.00	54.00	53.00	53.00	54.00
Total quality capability of the plant-index (with 1 : 2 weightings to regular : special products)	1.00	0.98	1.02	1.12	1.14

Cost effectiveness capability

Unlike the service and total quality attributes, the cost effectiveness of the plant as reflected through factor productivity levels of consummable resources shows a reverse picture as in (table 5).

Table 5: Cost effectiveness capability of the plant

	1990 (base year)	1991	1992	1993	1994
Level of factor productivity achieved for consumable resources					
For regular products					
Materials	2.22	2.27	2.22	2.27	2.27
Energy	6.67	6.67	7.14	7.69	7.69
Services	4.00	3.70	3.57	3.33	3.45
For special products					
Materials	2.63	2.63	2.50	2.50	2.63
Energy	10.00	10.00	12.50	11.11	10.00
Services	4.55	4.17	3.70	3.45	3.13
Cost effectiveness capability index (with equal weightings to different factor productivity levels)					
For regular products	1.00	0.99	0.98	0.98	0.99
For special products	1.00	0.97	0.93	0.90	0.88
Cost effectiveness capability index (with 1 : 2 weightings to regular : special products)	1.00	0.98	0.95	0.93	0.92

This has been mainly due to lower level of productivity of the services inputs, reduced marginally for regular products but quite significantly in the case of special products.

Consequently, on integration with due weightings for the nature of product lines as before, the cost effectiveness capability of the plant base reflects a downward trend, 8 per cent lower by the end of the study period as shown in table 5.

Safety and environment friendliness

More and more safety provisions, emphasis on safety campaign and higher level of training and development of workers have all contributed towards reduction in the number of accidents in the first two years; subsequently, however, the emphasis on safety has been slackened, short cut to earn more bonus on regular items and trial and error to have the credit of more and more development of specials have resulted in relative deterioration in the plant safety as shown in table 6.

Being a manufacturer of precision engineering items with a good system of scrap collection and waste disposal and no change what-so-ever in the system, the environment friendliness of the plant has been considered to remain same during the period under study.

Table 6: Functional value of the plant

	1990 (base year)	1991	1992	1993	1994
Service capability of the plant-index	1.00	1.04	1.08	1.14	1.20
Total quality capability of the plant-index	1.00	0.98	1.20	1.12	1.14
Cost effectiveness capability of the plant-index	1.00	0.98	0.95	0.93	0.92
Plant safety index	1.00	1.20	1.33	1.09	1.09
Environment friendliness of the plant-index	1.00	1.00	1.00	1.00	1.00
Functional value of the plant-index (with equal weightings to relevant factors)	1.00	1.01	1.03	1.06	1.08

Functional value of the plant

With improved service and total quality, offset to some extent with reduced cost effectiveness, accompanied with improved safety and constant environment friendliness, the value of the plant base of the organisations as derived with equal importance to the constituent factors, reflects on the whole an improving trend, having improved to the extent of 8 per cent with an average for the four year period being 4.5 per cent higher than the base mark as reflected in Table 6.

The appreciating nature of the functional value of the plant base as above may be judged as against the real level of investments (inflation adjusted gross block) made in the same to reflect the effectiveness of managing the technology portfolio of the organisation.

Conclusions

Arresting technological obsolescence through innovation and creativity being the key to sustainable development in the midst of rapid technological advances, monitoring the functional value of the plant and infrastructures based on its performance assumes no doubt significance. The conceptual framework proposed does not aim at replacement of historical cost in the books of accounts for plant valuation, but it provides an easy tool in the hands of operating

managers to monitor and manage the plant asset base. The proposed surrogate measures of service capability, total quality capability and cost effectiveness including safety and environment friendliness perhaps would go a long way to enable the manufacturing organisations to adopt suitable strategies to strengthen the building blocks of such a functional value. The engineering firm under study shows how it has been able to maintain its otherwise old plant and infrastructures on the appreciating track with minimum of capital investments but with the help of special repairs programme from its inhouse technocrats.

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Perspectives on the Learning Organisation

P.N. Rastogi

The learning organisation has emerged as a new powerful paradigm of management for coping with environmental uncertainty and turbulence. There is however, no unanimity regarding its conceptual framework, structure, shape or form. The present paper outlines and juxtaposes together seven different perspectives on the nature and dimensions of a learning organisation. These perspectives, in terms of their complementary and unique insights, enrich and advance our understanding of this new managerial paradigm.

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Introduction

The concept of an organisation in which continuous learning and creation of knowledge are the core sources of innovation, excellence, and competitiveness; represents a new approach to, and philosophy of management. Consequently it has received a great deal of attention and has generated a growing volume of management literature since late eighties. The literature is rich in perspectives concerning the nature of a learning organisation and modes of building it. In what follows, seven such perspectives are outlined very briefly. They have been articulated by Dixon (1994); Engelbart, Mitroff et al (1994); Nevis et al, Nonaka (1991); Pedlar et al (1991) and Senge (1990).

Organisational Learning Cycle

Dixon (1994) conceptualizes a learning company in terms of an organisational learning cycle, which is an adaptation of the Kolb's experimental learning cycle (1984) of individuals. The latter consists of the sequence: concrete experience, reflective observation, abstract conceptualization, and active experimentation, leading back to concrete experience, and the recommencing of the cycle. Dixon adapts this framework to describe an organisational learning cycle of four stages as follows:

- Widespread generation of information
- Integration of new/local information into the organisation context
- Collective interpretation of information and
- Authority of take responsible action based on the interpreted meaning.

Widespread generation of information involves both external and internal modes. In the external mode, information is collected continuously by primary users from multiple sources. In the internal mode, information is created by 'what-if' experiments; data collection is

designed into action; successes and mistakes are analysed; checkpoint data for self-correction is provided; and R&D is conducted by line personnel.

Integration of new/local information into the organisation context involves timely dissemination of accurate and adequate information; unimpeded flow of information; incentives for accurate reporting; translation, or formatting of information for use; multi-skilling and multi-functioning of individuals; and integration of staff positions into line.

Collective interpretation of information is characterized by organisational dialogue skills, proximity to others with varying interpretations, frequency of interaction, availability of multiple perspectives, egalitarian conditions, organisation limited in size, and everything being open to question.

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Dixon demonstrates an holistic application of her learning cycle model to three real world organisations. Chaparral Steel (table 1) World Health Organisation, and Johnsonville Foods (table 2).

A perusal of the organisational learning cycles of the two organisations (as in tables 1 & 2) however, shows major weaknesses and inadequacies in Dixon's conceptual framework. While the organisational learning cycle perspective is new and interesting, the specification of items, or, contents under each of the four stages does not reflect their conceptual nature, or, basis. The items are mere enumeration of the policies and practices of the organisations concerned, Elucidation of the dynamic mechanisms, or, linkages, and interactions that activate and drive the learning cycle, are singularly missing.

Learning & Improvement

An enterprise according to Engelbart may be seen as possessing two basic infrastructures: a

Table 1: The Organisational Learning Cycle for Chaparral Steel

<p>Widespread generation of information</p> <p><i>External:</i></p> <ul style="list-style-type: none"> • Multi-functional teams visit suppliers, competitors. • The people who gather information, use it. • Networks maintained for early access to ideas. • Sabbatical plans for supervisors. <p><i>Internal:</i></p> <ul style="list-style-type: none"> • Line managers can authorise \$10,000 + for experiments. • Decisions are based on what can be learned from action. • Design vs. purchase to learn. • Experiments conducted on line, not in lab. • Apprenticeship programme. • Pay based on skill accumulation. • Hiring based on learning potential. • R&D and production not separate. <p>Integrating new local information into the organisational context</p> <ul style="list-style-type: none"> • Everyone rotates onto nightshift to spread knowledge. • Local operators selected for information transforming skills. • Unimpeded flow vs. batched flow. • Dispersal of initial team who worked on a new process. • Multi-skilling, multi-functioning, e.g., guards for data entry. • 'Vice-ing' in preparation for jobs. <p>Collective interpretation of information</p> <ul style="list-style-type: none"> • Building design for interaction, e.g., lockers in HQ building. • Morning meetings. • Egalitarian conditions—no assigned parking, no separate dining, all salaried, no time clocks. • Size held to 1,000. • 90% problems solved by spontaneous meetings. <p>Authority to take responsible action on the interpreted meaning:</p> <ul style="list-style-type: none"> • "If you have an idea, act it". Clear operating objectives, authorization to act within them. • Mistakes considered normal part of risk taking. • 93 per cent of employees are stock holders. • Bonus system linked to profits. • Individuals not singled out for praise.
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capability infrastructure and an improvement infrastructure (Stewart, 1996). Capability infrastructure consists of knowledge assets and tools including core competencies; a human system consisting of learning

Table 2: The Organisation Learning Cycle for Johnsonville Foods

<p>Widespread generation of information</p> <p><i>External:</i></p> <ul style="list-style-type: none">• Performance standards identified by line interviewing customers.• Members collect and respond to customer complaints. <p><i>Internal:</i></p> <ul style="list-style-type: none">• Members designed feedback systems on performance.• Performance standards identified by line interviewing customers. <p>Integrating new/local information into the organisational context</p> <ul style="list-style-type: none">• Members conduct orientation and training.• Feedback systems designed for quick response.• Members identify information and useful format.• E-mail to communicate successes.• Opportunity to spend one day with other organisation members. <p>Collective interpretation of information:</p> <ul style="list-style-type: none">• Egalitarian conditions.• Small organisation.• Reduction in hierarchy from six to three layers. <p>Authority to take responsible action on the interpreted meaning</p> <ul style="list-style-type: none">• Member discretion to meet performance standard within guidelines.• Reward based on individual and team performance, and personal development.• Profit sharing.• Employee decision-making, e.g. quality, compensation system, retention.

and teaching skills, instilling of attitudes, recruitment, designing organisation and procedures, and so on; and a tool system of machines, labs, facilities, vehicles, and so on. It enables members of an organisation to do their jobs, and the organisation to function and operate. Managers typically spend a lot of time and effort working on the capability infrastructure. The second infrastructure, an improvement infrastructure—comprises sets of activities that make the organisation better. The activities in this infrastructure too have a human and a tool dimension. They however, receive for less management attention than they should, especially in the present era of rapid change.

According to Engelbart, three kinds of activities labelled by him as A, B and C go on in companies. The 'A' activities are directly relevant to what the company sells. They refer to R&D, marketing, sales, manufactur-

ing and distribution. A whole set of management and control systems like reporting relationships, accounting mechanisms, budget and investment planning processes are associated with them. These activities underly the capabilities infrastructure. Investment in the domain of such activities (such as putting in a new assembly line, opening a new branch) increases profits but not profitability.

'B' activities refer to things done toward improving the 'A' work. Examples of 'B' activities include installing computer-aided-design (CAD) software, reengineering of human resources, bar-coding of items in a warehouse, and so on. They are often projects which serve the improvement infrastructure. Investment in 'B' activities like cycle-time improvement leads to increased profitability or percentage-rate gains in profit.

'C' activities are defined as those "improving the organisation's ability to do 'B' work". They refer to things done to get better at getting better. They also belong in the improvement infrastructure. They provide real leverage. They not only raise a company's percentage of profits, but also raise the rate at which they compound. Examples of 'C' activities are scarce, for most organisations never think explicitly about how to improve their ability to improve. Although Engelbart does not refer to the term 'learning organisation', his postulation of the concept of 'C' activities provides an unique perspective on the theme of organisational learning. Basically these activities are geared to improve human resources, CAD software etc; they include: increasing the effectiveness of transferring knowledge from one part of the company to another; getting better at scanning the competitive environment; improving the ability to run pilot programmes and projects faster and better; and so on.

Corporations are building tool systems to support 'C' activities. These include internal Websites, Lotus Notes databases, and data warehouses. Information technology is used to enhance the collective IQ of companies. This is done by creating a repository where people can share information and lessons learned. But human system to support 'C' activities is lagging. The important "C" activity according to Engelbart is to encourage and fund cross-functional "improvement communities". The latter are explicitly charged with the responsibility for overcoming common challenges to improve improvement. This may imply identifying, developing, and deploying devices to accelerate the processes of learning and improvement.

In this context, the example of Harley-Davidson Company is relevant. Its CEO has created a special 20-person steering committee over and above the usual

governance systems. The committee is constituted from three intersecting circles of persons drawn from (i) procedure product (ii) create/demand circle concerned with dealership, marketing etc and (iii) administrative staff. Harley-Davidson's intersecting brainstorming circles are examples of the kind of accelerating devices that organisations need to improve their abilities to improve their abilities (Stewart, 1996).

Learning as a Subsystem

In terms of a 'total systems approach' to organisations, a radical new organisation structure has been proposed by Mitroff *et al* (1994). This consists of four centres focussing on (a) Knowledge and Learning, (b) Recovery and Development, (c) World Service and Spirituality and (d) World-class Operations. They are coordinated, and the creative tensions between them managed, by the organisation's leadership. The roles of the four centres are:

- *Knowledge and Learning Centre* would focus on what do we need to know to produce and deliver world-class products and services.
- *Recovery and Development Centre* would focus on how can we aid the development of healthy employees and organisations.
- *World Services and Spirituality Centre* would focus on how do we aid the development of a healthy outsider world.
- *World-class Operations Centre* would focus on how do we orchestrate and implement world-class manufacturing, or, service operations.

The central idea behind this organisation design is that the four major dimensions of knowledge, health, service, and world-class operations cannot be separated; they form an interlocking whole. The role of an organisation's leadership is to integrate and manage the creative tensions among the four concerns. The concept of the learning organisation in this scheme is seen to be that of a subsystem.

Knowledge & Learning Centre

The major purposes (nature and role) envisaged for this centre (reporting to (CEO) are as follows:

- Collecting, organising, centralizing, and integrating information and knowledge from different parts of the organisation to provide a continually updated picture of the organisation as a whole.

- Measuring and monitoring how well each critical programme and function is performing, achieving its objectives, and contributing to the success of other programmes and functions.
- Exploring, examining, and probing the organisation for critical linkages and synergy between key programmes and functions, and to ensure that they are exploited purposefully.
- Identifying, monitoring, challenging, and replacing critical assumptions that underlie key programmes.
- Ensuring that all important problems are examined from multiple perspectives, so that the organisation does not suffer from narrow tunnel vision.

The centre receives a daily status report on the strengths and weaknesses of the company's programmes and capabilities in crisis management, environmentalism, total quality management, global competitiveness, issues management, and ethics. A similar centre has been proposed for General Motors (Barabba & Zaltman, 1991), with the following purposes:

- To draw on various sources of information, knowledge, data, and wisdom, in order to bring them to bear on important decisions about the business.
- To build expertise and provide assistance to facilitate improved thinking, decisions, and actions; to breakdown the barriers between functions; and to foster/accelerate systematic thinking that is needed to produce internationally competitive innovative products.
- To increase the problem-setting and problem-solving capacity of managers by acquiring, synthesizing, developing, evaluating, and disseminating information.
- To make managers aware of what they think they know, they think they need to know, they expect to happen given certain decisions, and the assumptions they hold about the If-Thens regarding decisions.
- Finally, the centre would most importantly focus on exploring possibilities, dreams, visions, and fears.

The design of organisations not only needs to change radically to meet the problems of a more complex, turbulent world, but also needs to be built on a philosophy of ethical management. Toward this end, Mitroff *et al.* offer a broad framework of design, not a detailed blueprint.

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Organisational Learning

According to Nevis *et al* (1995), organisational learning is the capacity or processes within an organisation to maintain or improve performance based on experience. It is representable as a three stage model:

- Knowledge acquisition—development or creation of skills, insights, relationships.
- Knowledge sharing—dissemination of what has been learned.
- Knowledge utilisation—integration of learning so that it is broadly available, and can be generalized to new situations.

These three stages interact with one another and form a dynamic cyclical process. The latter encapsulates an organisation as a learning system. Organisations as learning systems consist of two parts: learning orientations and facilitating factors. Learning orientations are the values and practices that reflect where learning takes place and the nature of what is learned. They are descriptive factors which together form a pattern that defines an organisation's learning style. Facilitating factors "are the structures and processes that affect how easy, or, hard it is for learning to occur, and the amount of learning that takes place". Both parts are required to define the nature of an organisation as a learning system. The constituent elements of both these parts may be outlined briefly as follows.

Learning Orientations

Nevis *et al* (1995) identify seven learning orientations. They further view these orientations as a matrix. An organisational unit, according to them, can be described by the distinct pattern of its learning orientations in the matrix. Such a pattern, serves to characterize the unit's learning style. Learning styles, in turn, may depend on the industry, size, or age of an organisation, or the nature of its technology, to varying degrees. The seven learning orientations are:

- *Knowledge Source (Internal/External)*: This reflects a preference for developing knowledge internally vs. a preference for acquisition of

knowledge developed externally.

- *Product-Process Focus*: This highlights the emphasis on accumulation of knowledge about what products/services are vs. a focus on how organisation develops, makes, and delivers its products/services.
- *Documentation Mode (Personal/Public)*: This denotes the dichotomy between knowledge possessed by individuals vs. publicly available know-how.
- *Dissemination Mode (Formal/Informal)*: This depicts the contrast between formal, prescribed, organisation-wide methods of sharing learning; and informal methods such as role modeling and casual daily interaction.
- *Learning Focus (Incremental/Transformative)*: This reflects focus on incremental, or, corrective learning vs. focus on transformative, or, radical learning.
- *Value Chain Focus (Design/Deliver)*: This highlights the emphasis on learning investments in engineering/production activities (design and make functions) vs. emphasis on sales/service activities (market and deliver functions).
- *Skill Development Focus (Individual/Group)*: This contrasts the development of individual skills with the development of team or group skills.

Facilitating Factors

There are ten factors which facilitate or expedite organisation learning, these are:

- *Scanning Imperative*: It refers to the collection of information about conditions and practices outside the organisation unit, awareness of the external environment, and curiosity about it.
- *Performance Gap*: It refers to the shared perception of a gap between actual and desired state of performance. Such gaps are deemed to provide opportunities for learning.
- *Concern for Measurement*: It refers to the effort toward defining and measuring key factors when venturing into new areas. Striving for specific quantifiable measures, and discussion of metrics constitute forms of learning activity.
- *Experimental Mind-set*: This factor refers to support for trying out new ideas and approaches, learning from failures, and viewing changes in work processes, policies, and structures as a continuous series of learning opportunities.

- *Climate of Openness*: It refers to accessibility of information, open communications within the company, sharing of problems/errors/lessons learned, and acceptance of debate and contention as ways to examine and solve problems.
- *Continuous Education*: This factor reflects ongoing commitment to education and skills upgradation at all levels of the organisation, as well as, support for all member's growth and development.
- *Operational Variety*: It refers to a pluralistic rather than singular definition of valued competencies.
- *Multiple Advocates*: New ideas and methods emanate from employees at all levels.
- *Involved Leadership*: It refers to the crucial role of leaders toward articulating and implementing the organisational vision. The leaders interact with members frequently, and get actively involved in educational programmes.
- *Systems Perspective*: This refers to the perception of the interdependence of organisational units, understanding of problems and solutions in terms of systemic relationships among processes, and a clear appreciation of the connection between the needs and goals of the units with the needs and goals of the organisation as a whole.

The seven learning orientations, and the ten facilitating factors, are subsumed within the three stages of knowledge acquisition, dissemination, and utilization. In terms of this framework, the two general directions for enhancing organisational learning are to improve the effectiveness of both the learning orientations, and the facilitating factors in a conjoint and coordinated manner. The magnitude of change effort involved in this context, may however, vary from incremental and modest to large and radical.

The two general directions for enhancing organisational learning are to improve the effectiveness of both the learning orientations, and the facilitating factors.

Knowledge Creating Company

Nonaka (1991) defines learning organisation as the knowledge creating company. He views learning or-

ganisations as successful companies which "consistently create new knowledge, disseminate it widely throughout an organisation, and quickly embody it in new technologies and products". These activities define the "knowledge-creating" company whose sole business is innovation. Nonaka draws his premises and inferences from leading Japanese companies.

Creating new knowledge, however, is not a simple matter of processing objective (i.e., hard and quantifiable) information. Knowledge is both explicit and tacit. Explicit or codified knowledge is that which can be described or transmitted in formal, systematic language. Tacit knowledge, on the other hand, cannot be easily formalized and communicated. It is deeply rooted in an individual's action, commitment, and involvement in a specific context. Tacit knowledge involves both cognitive and technical components. Cognitive component centres on 'mental models' based on the creation and manipulation of analogies in human mind. The technical component of tacit knowledge consists of particular know-how and skills that apply to specific contexts.

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Creation of knowledge in organisation depends on accessing the tacit and often highly subjective insights, intuitions, and conjectures of individual employees; and making them available for testing and use by the enterprise as a whole. Such an access to individual insights embodying tacit knowledge into technologies and products, in turn, is possible only when the employees identify themselves with the goals and missions of their organisation. Creation of knowledge is not a specialized activity. It involves recreating "the company and everyone in it in a nonstop process of personal and organisational renewal". It lies at the very centre of a company's human resources strategy.

Designing the Knowledge-Creating Company

Knowledge creation has been viewed as a process of making tacit knowledge explicit. It has direct implications for a company's organisation design and definition of managerial roles and responsibilities. The structures and practices of a company translate its vision into innovative technologies and products.

The fundamental design principle as ascertained from leading Japanese firms, in this context, is redundancy. The latter denotes "the conscious overlapping of company information, business activities, and managerial responsibilities". Redundancy helps create a "common cognitive ground" among employees, through frequent dialogue and communication. Insofar as employees share overlapping information, they can sense, and understand what others are trying to articulate. Redundancy thus facilitates not only the transfer of tacit knowledge, but also spreads new explicit knowledge for internalization by employees.

Japanese companies try to build redundancy in several ways as follows:

- Canon, for example, divides a product development team into competing groups. These groups develop different approaches to the same project, and then debate their proposals and arrive at the best one.
- Redundancy is built through strategic rotation between different areas of technology, and between functions such as R&D and marketing. Employees are thereby enabled to understand their company's business from multiple perspectives.
- Redundancy is also built through open access to company information which may be stored in a single integrated database which is accessible to all employees.

Creation of knowledge, thus, is not the exclusive responsibility or prerogative of any particular group of experts or department. Senior and middle managers, as well as, frontline employees are intimately involved in this process. Frontline employees are engrossed in the daily details of particular technologies, products, or markets. They are storehouses of highly specific information about a company's business, but their ability to convert this information into useful knowledge is very limited owing to their narrow job perspectives. They are unable to relate their ideas, experience, and insights, to broader and shifting contexts.

Knowledge Creation

The process of knowledge creation occurs across three organisational levels—the individual, the group, and the firm. Each of these levels differs from the others in critical characteristics that however, contribute to the overall process. The nature of knowledge creation at each of the three levels may be outlined as follows (Nonaka & Takeuchi, 1995):

Creation of knowledge is not the exclusive responsibility or prerogative of any particular group of experts or department.

- The *individual level* is characterized by action and reflection which enhances intuitive approaches to problem solving. Individuals combine action and thought, and engage in experimentation in terms of their autonomy. Actions serve to clarify and shape thoughts, and thoughts serve to interpret action.
- The *group level* facilitates the drawing out of the tacit knowledge of individuals through discussion, dialogue, and interaction.
- The *firm level* is characterized by the nature and extent of inter-group relationships, and the autonomy available to individuals. Firm's structure also serves as a regulating mechanism in competitive resource allocation.

Knowledge creation within enterprises is thence seen to be characterized by the critical attributes of autonomy, interaction, and structure, at the individual, group, and firm levels, respectively. The role of managers, in this context, is to coordinate knowledge creation activities across levels.

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Role of Middle Managers

Teams, and middle managers as team leaders, play a central role in the creation of knowledge at Japanese companies. They pool the information and enable integration of individual perspectives into a new collective one. In this process, middle managers serve as bridge between the top management's lofty vision, and the complex and difficult market reality faced by the frontline employees. Middle managers translate the company's vision into reality by creating middle-level business and product concepts. Middle managers synthesize the tacit knowledge of both the

top (senior managers) and bottom (frontline employees) levels.

Learning Organisation Structure

What is, or, should be, the structure of a learning organisation? How may it be designed? What are its dimensions? The issues of structure, design and dimensions of a learning organisation have been perceptively addressed by Pedlar *et. al.* (1991). They not only specify the dimensions of design, but also develop a blueprint of its organisational format, or, pattern comprising eleven dimensions. They are organised into four core clusters as follows (fig. 1):

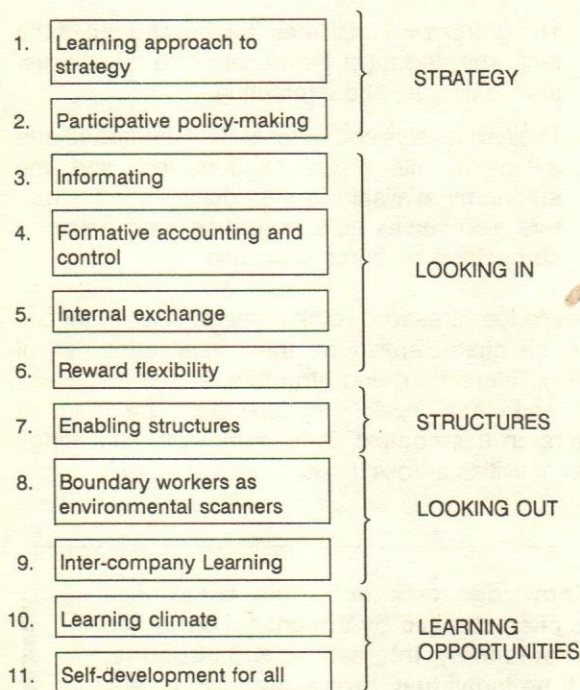


Fig. 1. The Blueprint of a Learning Company

In the blueprint, *the enabling structures* represent the central pivot of the learning organisation since they are designed to create opportunities for business and individuals' development. For instance, rules and procedures are frequently reviewed and changed if necessary; and appraisals are geared to learning and development rather than to reward and punishment. The two clusters above 'structures' are mirrored by two below.

A **strategy** cluster consists of:

- (i) *a learning approach* whereby the company policy and strategy formation, together with implementation, evaluation, and improvement, are

consciously structured as a learning process enabling continuous improvement through flexibility;

- (ii) *participative policy-making* which involves all stakeholders (including customers, suppliers, and owners) in the strategy-forming processes with a commitment to discuss and work through conflicts.

Looking In cluster has four dimensions:

- (a) *informating*, which means that Information Technology is used to inform and empower people, encouraging wide access to information and more 'open' systems;
- (b) *formative accounting and control*, comprising systems that are structured to assist learning and add value, encouraging individuals and units to act as small businesses, and to think about who their customers are;
- (c) *internal exchange* between units and departments as suppliers and customers of each other, encouraging wide sharing of expectations and information, negotiations, contracting, and providing feedback on goods/services received, fostering an environment of collaboration rather than competition;
- (d) *reward flexibility* toward recognizing both individual and team achievements, and fostering acquisition of new skills and competencies by employees.

Looking out cluster embraces

- (i) *boundary workers* as environmental scanners, asking for, respecting, and using the experiences of all members who interact with external customers to feedback information on customer needs;
- (ii) *inter-company learning* whereby neutrally advantageous learning activities are initiated, such as joint-trading, sharing in investment, and job exchanges.

Learning Opportunities cluster comprises

- (a) the fostering of *a learning climate*, a general attitude of continuous improvement, the positive valuing of difference (age, gender, colour, and so on), learning lessons from mistakes, and so on.
- (b) *self-development* for all members, employees at all levels, and external stakeholders.

Disciplines for Organisational Learning

Senge (1990) prescribes and describes five disciplines for organisational learning, which are: personal mastery, mental models, vision sharing, team learning and systems thinking. These disciplines are lifelong programmes of study and practice for creating and sustaining a learning organisation. They must be practiced together harmoniously and in a mutually supportive manner, if effective individual and organisational learning is to occur continuously. "It is vital that the five disciplines develop as an ensemble".

Five disciplines for organisational learning are: personal mastery, mental models, vision sharing, team learning, and systems thinking.

Personal Mastery: It refers to individual learning for expanding one's personal capacity to create the results desired most. It also refers to creation of organisational environment which encourages all members to develop themselves toward their chosen goals and purposes. It involves noticing and managing the working of one's mind, openness and receptivity to new ideas, and seeing things in a positive helpful light.

Mental Models: This discipline involves reflection, continual clarification, and improving one's internal images of the world, and seeing how they shape one's actions and decisions.

Shared Vision: It refers to creation of commitment in a group by developing shared images of the future which group members seek to create together. It also includes the principles and guiding practices by which the group hopes to get there.

Team Learning: It involves sustained cultivation of conversational and collective thinking skills which enable groups of people to develop expertise and capabilities greater than the sum of individual members' talents.

Systems Thinking: It refers to a way of thinking about, and understanding, the forces and interrelationships that shape the behaviour of systems. It helps one to see and interpret complex situations objectively to change and design systems more effectively. It involves focussing on the systematic source of problems, and eliminating their underlying causes, instead of merely addressing their symptoms.

Senge offers an inside-out perspective on change, based on the personal transformation of the members of an organisation toward fostering a learning community. The latter is characterized by authentic interpersonal relationships and shared values. In the context of creating learning organisations, he underscores the pivotal role of leaders. Leaders, according to Senge, are designers, teachers, and stewards. Their role requires new skills like the ability to build shared vision, to bring to the surface and challenge prevailing mental models, and to foster systematic pattern of thinking. Leaders are responsible for building learning organisations where people are enabled to continually expand their capabilities to shape their future through knowledge and values. A number of novel techniques toward implementing the desired organisational change may be utilized in this context (Senge *et al*, 1994).

Leaders are responsible for building learning organisations where people are enabled to continually expand their capabilities to shape their future through knowledge and values.

But how can one identify and recognize a learning organisation? Some of the distinguishing characteristics of a learning organisation may be listed as follows (Senge *et al*, 1994):

"In a learning organisation.....

- People feel they are doing something that matters to them personally and to the larger world.
- Every individual in the organisation is some how stretching, growing, or enhancing his capacity to create.
- People are more intelligent together than they are apart. If you want something really creative done, you ask a team to do it instead of sending one person off to do it on his or her own.
- The organisation continually becomes more aware of its underlying knowledge base, particularly the store of tacit, unarticulated knowledge in the hearts and minds of employees.
- Visions of the direction of the enterprise emerge from all levels. The responsibility of top management is to manage the process whereby new emerging visions become shared visions.

- Employees are invited to learn what is going on in the organisation so they can understand how their actions influence others.
- People feel free to inquire about each other's (and their own) assumptions and biases. There are few (if any) sacred cows, or, undiscussable subjects.
- People treat each other as colleagues. There's mutual respect and trust in the way they talk to each other and work together, no matter what their positions may be.
- People feel free to try experiments, take risks, and openly assess the results. No one is killed for making a mistake".

The basic premises of Senge's perspective on learning organisations are clear and simple. The first and foremost is that competitive advantage derives from continuous learning at both individual and collective levels in an organisation. The next is that people working together with integrity, authenticity, and collective intelligence, are much more effective as a business than people engaged in organisational politics, game playing, and narrow-minded selfish behaviour.

Conclusions

The seven perspectives on learning organisation outlined in the paper present plural frameworks of its nature, structure, and requirements. As such, they bring out the fact that there is no universal, or, widely accepted theory of the learning organisation. However, the core premises of this approach and philosophy are: the primacy of knowledge as the most important resource; the imperative requirement to engage in continuous learning at the level of both individuals and groups; the importance of employees' reflective understanding, motivation, and commitment in this context; and the crucial new role of organisational leadership in guiding and implementing the corporate transformation. Within the broad ambit of these premises, numerous modes, structures, patterns, and configurations are possible as revealed by the foregoing seven perspectives.

The perspectives also bring forth several important ideas and insights which complement one another as part of a rich mosaic of concepts. Dixon's concept of the organisational learning cycle for example, highlights

the need for seamlessly aligning the phases of enterprise learning. Engelbart's incisive characterization of the essence of learning as improving to improve, underscores the crucial importance of accelerating devices, or, mechanisms in contrast to governance mechanisms. Mitroff *et al* view learning organisation as a subsystem of the enterprise as a total system. They relate the role of this subsystem to the requirements of organisational health, and social responsibility on the one hand; and competitiveness, on the other. Nevis *et al* dissect the learning organisation in terms of seven learning orientations and ten facilitating factors, and call for improving the effectiveness of both in a conjoint and coordinated manner. For Nonaka, a company can become learning organisation only when it creates knowledge and pursues innovation as a way of life. He elucidates the process of knowledge creation, and stresses the importance of teams and middle management in this context. Pedlar *et al* veritably lay out a blueprint along which a learning organisation may be created. For Senge, the learning organisation is not a matter of design; it cannot advance without an enduring personal transformation of its leaders and members.

The foregoing spectrum of ideas, insights, and views, shows that there is no single best way, mode, or, form for building a learning organisation. The most useful thing to do in this context would, perhaps, be to identify, explore, and elaborate the core issues and themes involved in building a learning enterprise.

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Productivity of CSIR Senior Research Associates – A Review

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The CSIR Senior Research Associateship Scheme initiated since 1958, provides an opportunity to highly qualified Indian scientists and technologists to pursue a research career. The Scheme was reoriented in 1992 to tap SRAs potential for conducting purposeful and in-depth research. The paper reviews and analyses the research productivity of SRAs in order to assess the impact of the steps taken by CSIR to make the scheme research oriented. The data on research publications and patents filed by 234 SRAs who left the scheme after competing 3 years tenure during the period 1991-95 has been compiled and collated. Similar data has been compiled for presently working 122 SRAs who have completed 2 years stay in the scheme. The analysis of the data indicates that there is distinct improvement in the research productivity (in terms of papers published and patents filed) of the SRAs, from 1992 onwards.

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Introduction

The Scientists' Pool Scheme, being administered by the Human Resource Development Group (HRDG), Council of Scientific & Industrial Research (CSIR) since 1958, provides an opportunity to highly qualified Indians returning from abroad and also unemployed persons qualified in India, to pursue research career. Many changes have been made in the Scheme over the last 40 years, to make it effective with changing socio-economic needs. Since 1992, a selectee under the Scheme has been redesignated as Senior Research Associate (formerly known as Pool Officer). Earlier, the Pool Officers were generally engaged in routine activities such as teaching, design, clinical work etc. other than research, but now it has been specified that the primary work of an SRA is to conduct serious and in-depth research in his chosen scientific field. The minimum qualification required for candidates of Natural Sciences group is Ph.D. followed by 2 years research/teaching experience, and for Engineering and Medical Sciences group, postgraduation followed by 2 years work experience. Thus, the aspirants to SRAs are highly qualified and experienced persons and they have high potential for undertaking serious and productive research assignments.

The Scheme provides an opportunity to tap their potential for purposeful research. Submission of a detailed research proposal to be pursued during their 3 years tenure has been made mandatory and the proposal is discussed and evaluated by the experts of Selection Committee during personal interview with the candidates. The selection of a candidate mainly depends upon the soundness of the research proposal and his capability to implement it successfully. The special features of the scheme are as follows:

- The SRAs enjoy the freedom of choosing a research problem and develop the same in the form of a research proposal.

- They can choose to work in an institute or a research laboratory where adequate facilities are available for implementing the research proposal.
- They are also encouraged to associate themselves with the expert(s) working in their chosen field/specialisation.
- About 300 SRAs are working in the various Universities, R&D Organisations, Hospitals and other National Institutes all over India, at a given point of time.

The SRAs, at the time of joining, are asked to implement the specific research programme proposed by them. Their work performance and publications based on research done as SRA, are evaluated at the end of each year for granting extension to the next year. More than 5 years have passed since the orientation of the scheme towards research activities. It is time to review and assess the research productivity of the SRAs in order to assess the impact of the steps taken and the changes made in the Scheme since 1992. Keeping in view the perceived need, a study has been undertaken by the HRDG to quantify the research contributions of the SRAs working in the scheme. In addition to research then also perform other activities as part of their duties such as, part-time teaching, process development, clinical assignments etc. wherever necessary. The number of papers published, accepted and communicated for publication, and patents filed by the SRAs have been taken as indices of the research productivity in this study. The study of SRAs' research productivity has been sub-divided into two main streams, as follows:

- * The research productivity of the SRAs who completed their full tenure of 3 years and left the Pool and
- * The research productivity of the presently working SRAs during their 2 years of stay.

Research Productivity of SRAs

Productivity during 3 years tenure

A total of 879 SRAs left the Pool during 1991-1995. Records of 749 have been scanned, and out of these 234 SRAs left the Pool after completing 3 years tenure, whereas others left at various stages of the tenure i.e. less than 3 years. Only cases of these who availed full tenure i.e. 3 years had been taken up for detailed Research Productivity Study. The study is further subdivided into (a) the combined productivity of a total of 234 SRAs who left during the period from 1991 to 1995. (b) the productivity of SRAs who left in each year from 1991 to 1995.

Five Years Combined Research Productivity

The records of a total number of 234 SRAs who left the Scientists' Pool have been thoroughly scanned and the data on publications, based on their research work, has been compiled and collated. Table 1 presents publication output by these 234 SRAs, in terms of the number of research papers published and also the number of papers accepted and communicated for publication. A total of 290 research papers had been published, and also 92 had been accepted and 163 papers communicated to various journals for publication by these SRAs. Out of 234 SRAs, 118 belonged to Natural Sciences group viz. Life Sciences, Chemistry, Physics and Earth Sciences and 116 were from Medical Sciences group. Table 2 presents the data on research productivity of all these SRAs. In order to judge the research productivity of the SRAs, they could be grouped into the following four grades which serves as a yardstick or an arbitrary measure for ranking.

- The SRAs who had published 4 or more papers, represent the high productivity group.
- The SRAs who had published 1 to 3 papers, the optimal productivity group.
- The SRAs whose papers had been accepted or communicated, the average productivity group and
- Those who had not shown any research output in the form of published, accepted or communicated papers, low productivity group.

Table 1: Number of published, accepted and communicated papers by the SRAs who left the Pool after 3 years tenure during 1991 to 1995

Subject	No. of SRAs	Published Papers	Accepted papers	Communicated Papers
A: Natural Sci. (1-4)	118	195 (65)	63 (35)	121 (54)
Life Sci.	60	114 (32)	40 (20)	76 (31)
Chemistry	35	49 (20)	13 (9)	26 (15)
Physics	13	12 (7)	6 (3)	10 (5)
Earth Sci.	10	11 (6)	4 (3)	9 (3)
B: Medical Sci.	116	95 (37)	29 (22)	42 (19)
Total (A+B)	234	290 (102)	92 (57)	163 (73)

Note: Figures within brackets show the number of Sr. Research Associates who had contribution in at least one research paper.

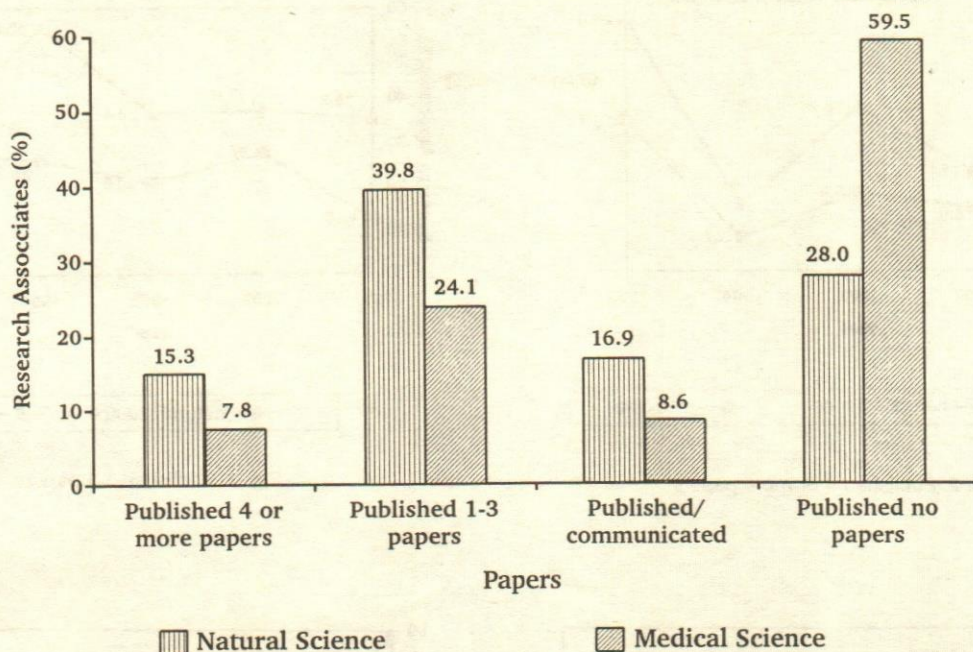


Fig. 1. Research productivity of the Sr Research Associates who had completed 3 years tenure and left during 1991 to 1995

Table 2: Research Productivity of the SRAs who had stayed 3 years in the Pool and left during 1991 to 1995

Subject	No. of SRAs	Percentage of Research Associates who had			
		Published ≥ 4 Papers	Published 1-3 Papers	Commun. /Accept. Papers	No publication output
		%	%	%	%
Life Sci.	60	21.7	31.7	18.3	28.3
Chemistry	35	5.7	51.4	20.0	22.9
Physics	13	15.4	38.5	7.7	38.5
Earth Sci.	10	10.0	50.0	10.0	30.0
A: Natural Sci. (1-4)	118	15.3	39.8	16.9	28.0
B: Medical Sci. (A+B)	116	7.8	24.1	8.6	59.5
Total	234	11.5	32.1	12.8	43.6

The relative publication performance data for Natural Sciences Group versus Medical Sciences group has also been depicted in fig. 1. The figure clearly brings out the better performance of Natural Sciences group over Medical Sciences.

Year-wise Research Productivity

Table 3 gives year-wise data on the number of SRAs who left the Pool after completing 3 years tenure. The number of SRAs leaving the Pool each year varied between 25 and 56 during period 1991-1995. Figures 2 to 5 depict year-wise research productivity of the SRAs belonging to two major groups viz, Natural Sciences and Medical Sciences who left the Scientists Pool Scheme during 1991 to 1995 after completing three years tenure.

Table 3: Number of SRAs who left the Pool after completing tenure during year

	1991	1992	1993	1994	1995	Total
Natural Sciences	17	27	22	27	25	118
Medical Sciences	8	29	34	27	18	116
Total	25	56	56	54	43	234

Interestingly from fig. 2, the research productivity, in general, had increased over the years. For example, the percentage of Natural Sciences SRAs who published 4 or more papers had increased from 11.8 per cent in 1991 to 28 per cent in 1995. Similarly for Medical Sciences, it increased from 0 per cent in 1991 to 16.7 per cent in 1995. In fig. 3 the same trend is displayed by the group of SRAs who had published 1-3 papers. In the case of average productivity Natural Sciences group of

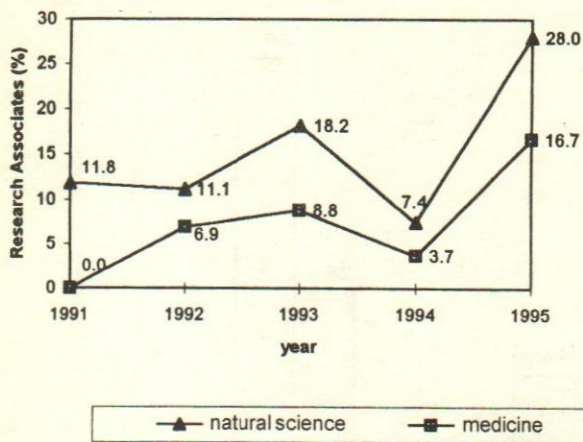


Fig. 2. Published 4 or more papers

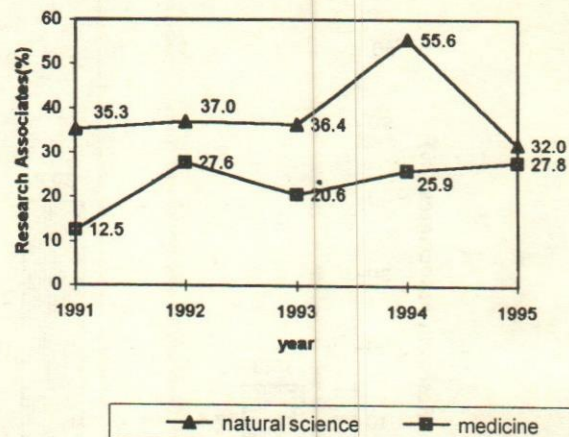


Fig. 3. Published 1-3 papers

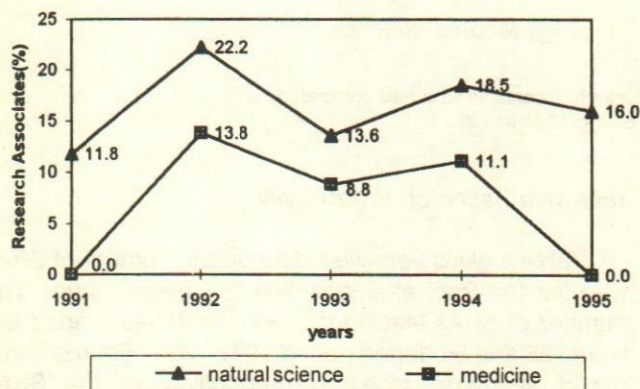


Fig. 4. Communicated/Accepted papers

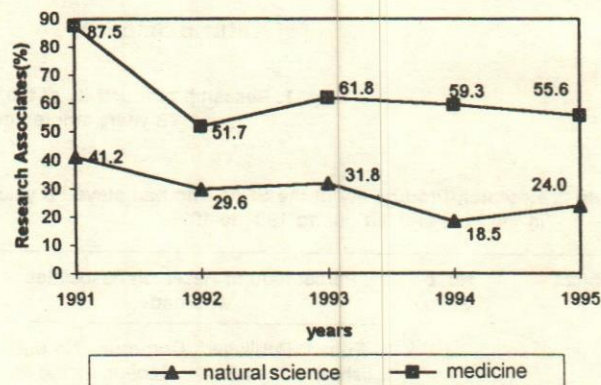


Fig. 5. Published no research papers

SRAs, there was distinct year-wise improvement in the publication productivity (fig. 4). For SRAs belonging to Medical Sciences group, the percentage of non-performers during 1991 was 87.5 per cent which decreased to 55.6 per cent in 1995, whereas for Natural Sciences group the figure decreased from 41.2 per cent to 24 per cent indicating a marked improvement of research productivity over the years (fig. 5).

Productivity of Presently Working SRAs

A total number of 122 records of SRAs presently working in their 2 years of stay in the Pool have been scanned for collecting information on the number of papers published, received acceptance and communicated by the working SRAs who had completed 2 years stay in the Pool. The period of survey was 1993 to 1996. A total of 140 research papers had been published, 66

papers received acceptance and 68 papers were communicated to various journals. Table 4 presents data on the research productivity of 79 SRAs belonging to the Natural Sciences group and 43 to the Medical Sciences group. For the Natural Sciences group, 6.3 per cent of the SRAs were of the high productivity, 31.6 per cent of optimal productivity and 33.1 per cent of average productivity. On the other hand, the corresponding trends for Medical Sciences group were 20.9 per cent high productivity, 48.8 per cent optimal productivity and 11.6 per cent average productivity. 29 per cent of the Natural Sciences group and 18.7 per cent of the Medical Sciences group SRAs have not shown any publication output. Figure 6 displays the comparative performances of the SRAs of Natural Sciences versus Medical Sciences group. It could be seen that the Medical Sciences group have performed better than that of Natural Sciences Group.

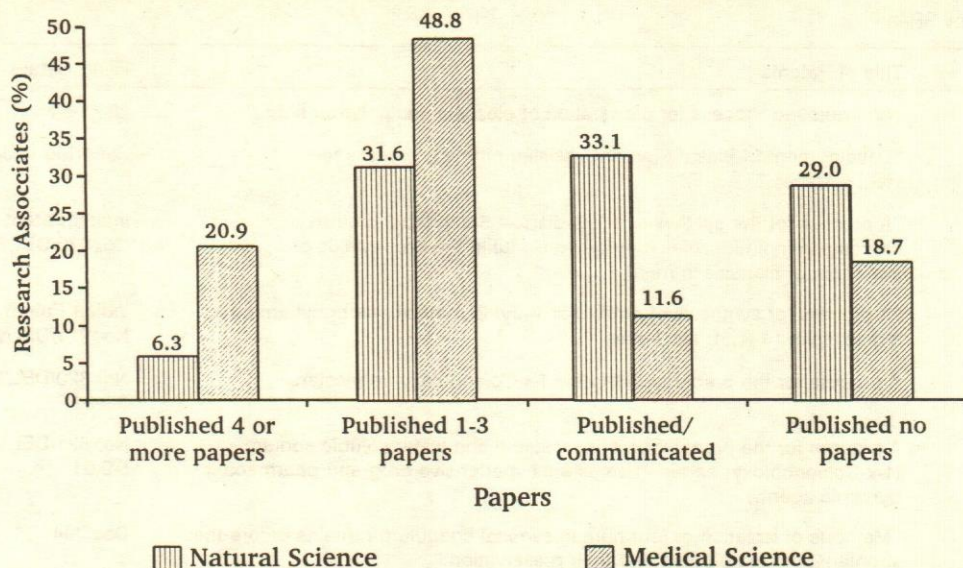


Fig. 6. Research productivity of the working Sr Research Associates who have stayed 2 years in the Pool

Table 4: Research productivity of the working SRAs who had been in the Pool for 2 years

Subject	No. of SRAs	Percentage of SRAs who had			
		Published ≥ 4 Papers	Published 1-3 Papers	Commun./accept. papers	No publication output
Life Sciences	38	13.2	28.9	23.7	34.2
Physics	16	-	31.2	43.8	25.0
Chemistry	19	-	26.3	42.1	31.6
Earth Sciences	6	-	66.7	33.3	-
A: Natural Sci. (1-4)	79	6.3	31.6	33.1	29.0
B: Medical Sciences	43	20.9	48.8	11.6	18.7
Total (A+B)	122	11.5	37.7	25.4	25.4

Quality of Papers Published

The SRAs have been frequently publishing papers in the standard referred journals, nationally and internationally recognised. Table 5 presents data on break up of the numbers of papers published in the National and International Journals by the SRAs who left during 1991 to 1995 after 3 years tenure in the Pool. A sizeable number of papers had been published in the international journals. Out of the total number of papers, 78 had been published, 15 accepted and 32 communicated for publication in the international journals. Thus 1 out of 4 papers had been published, 1

out of 6 accepted and 1 out of 5 communicated for publication in the international Journals. The SRAs belonging to Natural Sciences group have shown star performance in research publications in the international journals. Ninety five per cent of the published and 98 per cent of the accepted/communicated papers in International journals have been contributed by this group.

Table 5: Breakup of Publications in National and International Journals by the SRAs who left the Pool after 3 years tenure during 1991 to 1995

Subject	Published paper in		Accepted papers in		Communicated papers in	
	Nat Jour.	Int Jour.	Nat Jour.	Int Jour.	Nat Jour.	Int Jour.
A: Natural Sci. (1-4)	121 (46)	74 (41)	49 (26)	14 (12)	89 (44)	32 (16)
Life Sci.	80 (27)	34 (20)	35 (16)	5 (5)	56 (26)	20 (9)
Chemistry	26 (11)	23 (13)	9 (6)	4 (4)	18 (10)	8 (5)
Physics	11 (5)	10 (4)	1 (1)	5 (3)	7 (5)	3 (1)
Earth Sci.	4 (3)	7 (4)	4 (3)	0 (0)	8 (3)	1 (1)
B: Medical Sci.	91 (36)	4 (3)	28 (22)	1 (1)	42 (19)	0 (0)
Total (A+B)	212 (82)	78 (44)	77 (48)	15 (13)	131 (63)	32 (16)

Note: Figures within brackets show the number of Sr. Research Associates who had contribution in at least one research paper. Nat Jour.: National Journal Int Jour.: International Journal

Table 6: Patents filed by SRAs

Subject	Title of Patents	Filing Details
Physics	"An improved Process for preparation of piezoelectric polymer films."	28-11-94
Physics	"Development of Plasma (or Ion) assisted nitriding process for steel surfaces."	Reported in June 1993
Chemistry	"A process for the synthesis of 1, 5-diaryl-4, 5-dihydro-2-methoxy-carbonylaminoimidazoles may prove useful in the prophylaxis or treatment of filariasis in man	Indian Patent No. 970/DEL/92
Chemistry	"A process for synthesis of antifilarial 1-aryl-2- methoxy-carbonyl amino-1, 3-diazaspiro [4, 4(5)] alk-2-enes,	Indian Patent No. 971/DEL/92
Chemistry	A process for the preparation of new 1-x-Coleonoloxo nemiester.	No. 820/DEL/91 5-9-91
Chemistry	A process for the preparation of new stable and water soluble sodium (1-x-Coleonholoxy) nemesis use as antihypertensive drug and pharmacodynamic agent.	No. 821/DEL/91 5-9-91
Biochemistry	"Methods of isolation of four human seminal coagulum proteins before their spontaneous degradation and their preservation."	Dec. '94
Botany	"A process for the production of peptone like products using alkaline proteinase of <i>Trichoderma Koningii</i> "	Reported in July 1996
Botany	Developed "Brop-1" a highyielding synthetic variety of opium poppy. (which has about 13% morphine content)	Reported in June 1993
Med/Anaesthesia	"Development and Design of indigenous instrument/equipment for assessment of obstetrical wedge in Indian Pregnant women."	Reported in July 1995
Orthopaedics	Design of the instrument is formulated and patent is likely to follow the study. "Design & Development of Mini-External Fixator" to be used for treating fractures of the hand and distraction osteogenesis."	Reported on 20-2-95

Patents

In addition to the publication of research papers, some of the SRAs had been active in filing patents based on their research work. Nine patents had been filed by the Natural Sciences group and 2 by Medical Sciences group of SRAs. Table 6 gives the details of the patents filed by the SRAs.

Productivity Comparisons

In table 7 the comparative research publication performance of the SRAs who left the Pool during the period 1991-95 after completing 3 years tenure (Batch-1) versus the working SRAs with two years stay in the Pool during 1993-96 (Batch-2) has been summarized. The average numbers of papers at the credit of per active SRA are 4.1 and 3.0 for Batch-1 and Batch-2 respectively. It is evident that the active SRAs of Batch-1 had produced more number of papers than that of Batch-2. The performance of Batch-2, however, had been than that of Batch-1 with respect to optimal and average research productivity. In Batch-1, 43.6 per cent of the SRAs had no publication output when compared to 25.4 per cent of Batch-2.

Table 7: Comparative Research Productivity of SRAs*

	SRAs who completed 3 year tenure and left between 1991 and 1995. (Batch-1)	Working SRAs with 2 years stay during 1993-96 (Batch-2)
Average No. of papers		
per SRA	2.3	2.2
per active SRA	4.1	3.0
Percentage of SRAs published \geq 4 papers	11.5	11.5
Percentage of SRAs who published 1 to 3 papers	32.1	37.7
Percentage of SRAs who had accepted/communicated papers.	12.8	25.9
Percentage of SRAs who had shown no publication output.	43.6	25.4

* SRAs belonging to Natural Sciences and Medical Sciences combined.

Conclusions

Based on the analysis of data presented in tables 1 to 7 and figs. 1 to 6 on the research productivity of the SRAs over the periods 1991-1995 and 1993-1996, it is concluded that:

- There has been a distinct improvement in the publications of papers from 1992 onwards due to CSIR's emphasis on research activity as a main function of the SRAs.
- About 75 per cent of the presently working SRAs (1993-96 batch) had been productive in research publications when compared to 56 per cent of the productive SRAs of earlier 1991-95 batch. This indicates that more number of the presently working SRAs are making efforts to produce some visible research output.
- The relative research publication output of the Natural Sciences group had been better than Medical Sciences group during the period 1991 to 1995, whereas, the performance of the Medical Sciences group had improved over the Natural Sciences group during the period 1993 to 1996.

- Out of the total published papers by the SRAs a sizeable number had been published in the standard international journals indicating the high standard of the publications.
- In addition to the research publications, some of the SRAs had shown very prominent research output by way of filing some Patents. Eleven patents had been filed during the period 1991-96 by the SRAs.
- There is a scope for further improvement in research productivity of the SRAs belonging to Natural Sciences as well as Medical Sciences group. CSIR has planned strategies to enhance the research productivity of the SRAs.

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Socially Optimal Insurance for Industrial Injury Accidents

K.R. Shanmugam

This paper aims to ascertain whether the existing benefit levels provided under the Employees State Insurance scheme for industrial injury accidents are efficient. If worker's compensation is to provide optimal insurance, the marginal wage reduction that workers are willing to accept for higher expected benefits should reflect the terms of trade for insurance. The empirical results show that the actual wage reductions in wages are 1.4 times higher than the value needed for optimal social insurance. It implies that the existing benefit levels provide suboptimal level of income insurance, abstracting from moral hazard considerations.

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Introduction

Work-related injuries and diseases are undesirable by-products of the creation of goods and services for consumers. Moreover, both the abatement of pollution in industry and the limitation of industrial diseases due to pollution and accidents can be costly. In such a context, a firm has two principal choices. It can simply pay the workers for incurring the risks of employments or it can reduce its wage costs by making greater investment in the safety of the work environment. Typically, these mechanisms are interrelated. The firm can increase its expenditures on safety until the incremental wage reduction generated by improved safety no longer exceeds the added costs of these improvements. Perfect safety would generally be too costly even if it were technically feasible. However, the worker's own valuation in risk in effect determine the price that the firm must pay if it does not find it financially worthwhile to diminish the risk (Viscusi, 1983).

Social efficiency may be said to exist when the legal system assigns responsibility for accident or illness costs in a way that leads workers and firms to minimize the sum of prevention costs as well as the costs of actual injuries while social equity refers to the situation where the costs of accidents and diseases are allocated in a fair manner (Darling-Hammond and Kneisner, 1980). The first aspect can be assessed by estimating the effects of compensation insurance on industrial safety. For this, one must need the time series data covering the periods of both before and after implementation of the insurance scheme. Due to lack of data limitation, on the second aspect of the compensation law namely the social equity alone is dealt with. The Employees State Insurance (ESI) scheme plays a vital role in providing the compensation benefits for industrial accidents. Workers also get the compensation from the Workmen's Compensation Act if they are not covered under ESI. These schemes are mutually exclusive. The principal purpose is to provide income support to the workers

who experience an on-the-job injury. The benefit floors for different classes of injury were set by the government and not due to the result of a voluntary market transaction. Hence the existing benefit levels may or may not be necessarily efficient or adequate. It is, therefore, essential to assess the social equity effects of worker's insurance benefit scheme, that is, the extent to which the system's benefit structure protects injured workers from economic hardship. The present paper examines how the optimal insurance level can be determined and how the observed wage loss replacement rate of workers can be empirically estimated and used to ascertain whether the existing benefit levels are optimal.

It is, therefore essential to assess the social equity effects of worker's insurance benefit scheme, that is, the extent to which the system's benefit structure protects injured workers from economic hardship.

Theory & Methodology

The theory of compensating differentials, originally conceived by Adam Smith and its reconstruction of hedonic (i.e., Quality-adjusted) wage function approach by Rosen (1974) form the basis of this study. The theory posits that jobs with less desirable characteristics require a wage premium to attract workers, when other things remain the same. The actual wage embodies a series of implicit (hedonic) prices at which various job attributes such as pace of work and probability of injury risk can be bought or sold. Controlling for other aspects of the job, the wage premium that workers receive for employment risk can be estimated. Then, these estimated premiums can be used to place a monetary value on the injury risk of workers. There are considerable empirical works to analyse the wage-risk trade-offs of workers in many countries. Smit (1979) and Viscusi (1993) provide excellent survey on the subject. In recent years, studies such as Ruser (1985) and Viscusi and Moore (1987) analysed the role of WCB system in affecting these differentials.

From a conceptual stand point, one would expect WCB to play a significant role since the firm can compensate the workers for occupational hazards either through *ex ante* compensation (i.e., wage differentials) or *ex post* (such as insurance benefits). The relative importance of the two forms of compensation depends on the degree to which workers wish to insure the income risks of job related injury—a value that hinges on factors

such as degree of wage loss and the effect of accident on the marginal utility of consumption. If WCB is to provide optimal insurance, the marginal wage reduction which workers are willing to accept for higher expected benefit amounts should reflect the terms of trade for insurance. To illustrate the derivation of this optimality condition, we present below the theoretical model developed by Viscusi and Moore (1987).

Consider a health state dependent utility model with only two possible states. In state 1, the worker is healthy and experiences utility $U(x)$ from any given consumption level x . In state 2, the worker experiences a job injury and has utility $V(x)$. For any given consumption level, the worker would rather be healthy than not ($U(x) > V(x) > 0$), has greater marginal utility of consumption when healthy than when injured ($U_x > V_x > 0$) and has a diminishing marginal utility of consumption ($U_{xx}, V_{xx} < 0$). (Letter subscripts on these functions indicate partial derivatives). Let p denote the risk of job injury. Let W be the wage paid to the worker when he is healthy and B be the level of insurance benefit when he is injured. To facilitate the conceptual analysis, assume all disabilities are temporary and total. Let there be a tax on wages so that the consumption levels in states 1 and 2 are $(1-t)W$ and B respectively. The worker's expected utility is then:

$$(1-p)U[(1-t)W] + pV(B) = E \quad (1)$$

The rate of trade-off between wages and worker's compensation benefits that maintains the worker's level of welfare is:

$$\frac{dW}{dB} = \frac{-dE/dB}{dE/dW} = \frac{-pV_x}{(1-p)(1-t)U_x} \quad (2)$$

If $p=0$, then dW/dB also equals zero. The existence of a trade-off between wages and compensation benefits consequently hinges on the existence of some risk that state 2 will prevail. Suppose the tax rate is zero and if compensation insurance is available on an actuarially fair basis, we can show that income will be allocated across the two states so that U_x equals V_x . In this perfect market case, (2) reduces to $(dW/dB) = -p/(1-p)$. The term $p/(1-p)$ is a familiar insurance pricing term for actuarially fair insurance, whereby the price of insurance is governed by the relative odds of an accident. The extent of wage offset rises with the value of p because the expected benefit amount rises as well. For the workers in the sample considered below, and using the average probability of injury risk per worker as the value of p , this condition implies a trade-off -0.08 . That is, workers will sacrifice 8 paise of compensation (i.e. wages) when healthy for an additional 1 rupee in

compensation when injured (i.e. insurance benefits), if there are no taxes and if insurance is available on an actuarially fair basis. With actuarially unfair insurance, the formula becomes $-ph/(1-p)$ where h is the insurance loading factor. These administrative costs make insurance more expensive to obtain so workers will desire less of it. The manner in which these relationships are altered under the existing insurance system can be ascertained by assuming that the government has structured the compensation system optimally.

Data & The Model

The study utilises the data generated through a primary survey conducted in 1990, covering 522 blue collar male employees working in manufacturing industries in Chennai district, Tamil Nadu. Multi-stage random sampling technique was adopted to draw the sample respondents. In the first stage, blue collar male employees in manufacturing industries in Chennai were chosen. Then, these workers were stratified into 17 groups using their industrial code at 2 digit National Industrial Classification (NIC) level. Fixing one per cent from each stratum, 522 workers were randomly drawn on the basis of four workers from each randomly selected factory. The collected data set consists of informations on workers' personal as well as enterprise characteristics.

The data source for the job injury risk is the Administrative Report of the Chief Inspector (C.I) of Factories, Chennai. The report provides data on the total number of male workers in manufacturing industries and the number of injury accidents to them on an annual basis at 2 digit NIC level. Since the risk level may vary substantially across years, the average probability of job related injury risks per 100 workers (INJURY) over 1987-90 period were computed to eliminate the distorting influence of such random fluctuations. Then, this risk measure was matched to the workers in the sample using NIC code.

The worker's compensation benefit measure used here was defined as the weighted average of the daily replacement rate for total temporary, total permanent and partial permanent disabilities. It was imputed from data on the sample worker, using the Standard Benefit Rates (SBR) of ESI scheme, which are given in table 1.

Table 1: Daily Wages and SBR in ESI Scheme

Wages (in Rs.):	0-6	6-8	8-12	12-16	16-24	24-36	36
SBR (in Rs.):	2.50	3.50	5.00	7.00	10.00	15.00	20

The disablement benefits are provided for both permanent and temporary total disablement at full rate (i.e., 25 per cent more than the SBR). In case of partial disablement, the above rate is multiplied by the proportion of loss in the earning capacity due to the nature of injury. Since the disaggregated data on different types of accidents which resulted in permanent or temporary or total and partial impairments were not available, the average benefit rate was calculated, giving equal weightage to each type of disablement. In order to calculate the partial disablement benefits, we utilised the details given in the Administrative Reports of CIF on the percentage of injuries on different sites. It provides for seven different categories. For each of these seven categories, the Act provides the loss of earning capacity which ranges over the intervals. We took the average between the low and high values and the average proportion of site of injuries over 1984-87 periods were used as the weights. The details on the average percentage of site of injuries over 1984-87 and the average loss in the earning capacity are reported in table 2.

Table 2: Percentage of Injuries on Sites and Loss of Earning Capacity

Site	Foot	Leg	Body	Hand	Finger	Eye	Head
% of site of injury	11.20	16.70	7.89	16.29	33.28	8.13	6.50
% of loss of capacity	5	30	65	60	10	35	70

Then, the weighted average of the daily replacement rate was divided by the worker's actual after tax daily wage rate to obtain a measure of the potential income replacement (IRR). Since this measure was derived from the wage, the endogeneity problem would arise. To prevent this problem, IRR equation was estimated in the first stage regression including worker's personal as well as job characteristics and dummy variables for the locations of the firm where the worker employs. The predicted value of the benefit replacement rate variable was used as the measure of WCB in the wage equation estimates. As the theory suggests that WCB affects wages only at positive risk levels, the IRR variable was allowed to interact with INJURY in the empirical analysis

The empirical model consists of estimating the following hedonic wage equation:

$$W_i = \alpha_0 + \alpha_1 \text{INJURY} + \alpha_2 \text{INJURY} \times \text{IRR} + \sum_k \beta_k X_{ik} + U_i \quad (3)$$

where, W_i is the natural logarithm of after tax hourly wage rate which was computed assuming 2000 annual

Table 3: Wage Equation Estimates: Manufacturing Industrial Workers, 1990 (Dependent Variable: Natural Logarithm of After Tax Hourly Wage)

Variables	Definition	Mean (S.D.)	Coefficient ('t' Value)
WAGE	After Tax Hourly Wage Rate (in Rs.)	5.30 (2.25)	-
IRR	Estimated Worker's Compensation Insurance Daily Replacement Rate	0.47 (0.16)	-
INJURY	Probability of job related non fatal risks per 100 workers	7.29 (16.55)	0.0150 (4.296)
IRR × INJURY		-	-0.0146 (-1.777)
SCHOOL	Education (in completed years)	9.98 (2.46)	0.0231 (4.584)
AGE	Age of the Worker (in years)	13.95 (7.04)	0.0550 (3.942)
AGE × AGE	Age Squared	-	-0.0005 (-2.438)
BC	Dummy Variable: 1 if worker belongs to backward community; 0 - otherwise	0.65 (0.48)	0.0524 (2.183)
WORK	Work force in the firm where the respondent works	90.96 (273.66)	0.0002 (3.990)
PRIVATE	Dummy Variable: 1 if worker employs in a private firm; 0 - otherwise	0.87 (0.34)	0.2288 (2.417)
STATE	Dummy Variable: 1 if worker employs in a state owned firm; 0 - otherwise	0.11 (0.32)	0.3399 (3.364)
SUPERVISOR	Dummy Variable: 1 if worker is a supervisor; 0 - otherwise	0.27 (0.44)	0.0821 (2.272)
FITTER	Dummy Variable: 1 if worker is a Fitter; 0 - otherwise	0.05 (0.23)	0.0708 (1.354)
TECHNICIAN	Dummy Variable: 1 if worker is a Technician; 0 - otherwise	0.01 (0.11)	0.4650 (4.305)
ASSISTANT	Dummy Variable: 1 if worker is an Assistant; 0 - otherwise	0.11 (0.32)	-0.2749 (-6.764)
DECISION	Dummy Variable: 1 if worker makes decision on the job; 0 - otherwise	0.46 (0.50)	0.0887 (2.834)
SECURITY	Dummy Variable: 1 if worker's job provides security; 0 - otherwise	0.62 (0.49)	0.0474 (1.814)

(Table 3 Contd.)

(Table 3 Contd.)

Variables	Definition	Mean (S.D.)	Coefficient ('t' Value)
LOCATION 1	Dummy Variable: 1 if worker's firm comes in Division 1 of C.I. Factories; 0 - otherwise	0.13 (0.34)	-0.0950 (-2.008)
LOCATION 2	Dummy Variable: 1 if worker's firm comes in Division 2 of C.I. Factories; 0 - otherwise	0.43 (0.50)	-0.0776 (-2.129)
LOCATION 3	Dummy Variable: 1 if worker's firm comes in Division 3 of C.I. Factories; 0 - otherwise	0.30 (0.46)	-0.0888 (-2.285)
CONSTANT			-0.3131 (-1.098)
R ²			0.6383
F			49.3206
N		522	
Value of Injury (in Rs.)			8586.00

hours worked; U_j is the error term; α 's and β 's are the parameters to be estimated and X_{ik} s are the determinants of wages other than risk. The definition, mean and standard deviation of the variables included in the wage equation are given in table 3.

Regression Results

The result of ordinary least squares estimates of the wage equation has been presented in column 4 of table 3. The coefficients of almost all the non-risk variables have the expected signs and most of them are statistically significant at 5 per cent significance level. The wages rise at a declining rate with age and increase with education. Wages are higher if the worker works in a large or private/state owned enterprise. Supervisors, technicians and the workers who take decisions on the job receive higher wages while assistant workers earn less income. The wage rates are relatively lower in all the three locations than in the reference one.

The main focus of the analysis is on the risk and WCB measures. The effect of INJURY on wages is positive and significant. The coefficient of INJURY implies that the effect of a unit increase in risk so that the annual injury risk has risen by 0.01. Its effect on the value of the logarithm of wage equals (dW/d INJURY = $0.0150 - 0.0146 \times$ IRR) 0.0081. Evaluating at the mean value of wage and multiply the resulted value by 2000 to annualize the figure, this will give an estimated trade off of Rs. 85.86 per year. If we multiply the resulted value by 100 to reflect the scale of the risk variable, we get the imputed value of saving a statistical injury as Rs. 8586. As expected, the

interactive effect of IRR with INJURY variable on wages is negative and statistically significant at 10 per cent level, lending support to the hypothesis that higher WCB reduces measured compensating wage differentials. If IRR dropped to zero, the required wage premium would rise substantially because of the income risks workers would face. One measure of this increase is the increased implicit value of a job injury which would rise to Rs. 15900. Similarly, full earnings replacement (i.e., IRR = 1) would lead to implicit values of injuries of Rs. 424. Although extrapolations of this nature are not as reliable as are estimates pertaining to current levels of compensation, the overall spirit of the result is clear.

If there were no programme providing income replacement to injured workers, the level of risk premium would increase greatly. The resulted effect of full compensation is of interest in its own right since it isolates the earnings risk from the health status risk associated with work related injuries. It is observed that about 5 per cent of current implicit valuations of injuries represent implicit values of the non-monetary aspects of injuries. That is, Rs. 424 is the value of the non-monetary health losses associated with injury accidents. This value pertains to the value of pain and suffering and the more general welfare losses from non-work disability.

Are Benefits Levels Optimal?

The fundamental and more immediate policy concern to which this paper is addressed is whether there is an adequate level of earnings replacement under the worker's compensation system. From the estimated parameter of interaction term IRR in table 3, one can calculate how changes in the benefit formula affect the wage level. The results imply that an additional 1 rupee in WCB leads to a 11 paise decline in wages. The observed rate of substitution is more than the 8 paise per one rupee trade-off that would be optimal with actuarially fair insurance. It also implies that workers are willing to sacrifice more wages when healthy than would be dictated by the added insurance cost because the observed rate is 37 per cent higher than the optimal rate with actuarially fair insurance. In other words, when compensation benefit increases, wages in the no-accident state decline by more than $ph/(1-p)$, indicating that income is more highly valued in the compensation state than in the no-accident state. The wage reductions are so substantial that the wage decreases more than cover the worker's compensation premiums. Of course, there may be legitimate economic reasons why a level of insurance that is optimal from the stand point of the individual facing actuarially fair insurance opportunities may not be socially optimal in practice. The main source of difficulty is moral hazard. Higher levels of insurance extend the duration of injury spells and increase the

false reporting of injuries. As a result, some apparent under insurance will consequently be optimal for social insurance (Viscusi, 1991).

Conclusion

In this paper, an attempt has been made to ascertain whether the existing insurance benefits for industrial injury accidents are optimal. It utilizes the data generated through a primary survey covering 522 manufacturing industrial workers in Chennai district, and the job related injury risks data provided by the Chief Inspector of Factories and worker's benefit formulas under ESI scheme. The empirical results suggest that there exists a negative trade-off between wages and compensation benefits and about 5 per cent of compensating differentials for job hazards is for the non-monetary aspects of potential loss. The most important implication of the result is that the observed rate at which workers are willing to trade off base wages for higher levels of insurance benefits exceeds the actuarial rate of trade-off. It suggests that the benefit levels provided by ESI for non fatal injury accidents were inadequate (suboptimal). Such underprovision of benefits may nevertheless be efficient if moral hazard is an important concern.

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Commodity Production & Command Differential: Implications for Economic Development

Bhaskar Majumder

Commodity is the sphere where economic activities like production, exchange, distribution and consumption take shape. Since economic development is considered to be an upward movement in the structure of commodity production, and since command differential as a derivation of application of initial technology by individuals leads to a new set of commodities (and technologies), so the question regarding the possibility of economic development as a historical process of participation of man in commodity production is relevant. Commodity production of a particular nature leads to the development of a specific relation between participants inside the production boundary and potential participants outside, between both on the one hand and nature on the other. The formation of these relations invite conflicts and shocks in society. This is the point which warrants state action as a shock absorber in social production.

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Introduction

The concern for commodity production and growth is as old as the birth of economics as a branch of scientific analysis (Chakraborty, 1988; Kuznets, 1961 and 1965, Kerr, 1993). One can take a national economy as the unit of analysis where the indicators like attaining economic self-reliance, removal of poverty, attaining competitiveness in the world economy attract attention for their being important in themselves. The positive volume of physical output and positive rate of growth may fail to ensure the aforesaid objectives. A fresh look thus is necessary on the question of commodity production not only to examine the technical feasibility of economic growth but also to examine if that growth can be ensured by people who are the cause and consequence of growth, and hence also to examine the nature of that growth.

Commodity Production

It is well-known that the problems like unemployment, poverty, inequality, inflation, foreign debt etc., are rooted in issues related to production of commodities. At the outset consider initial production. The beginning is an unknown world explorable to man. The urge for survival or initial material existence compels him to transform nature (observable and accessible to him) by application of his labour-power. Initial output is produced by man independent of his own choice and independent of the question of any consensus. It is the individual compulsion which becomes a social phenomenon because of (i) the inability of the individual to produce all the commodities he needs; (ii) the choice-neutrality of any particular individual in the sense that if (i) holds good, he will have to produce in excess for others and hence exchange. At the same time, it is a fact that location of individuals in the production map

shows the location of the same individuals in the consumption map. The latter, viz., the relative command of individuals over commodities produced may not satisfy all individuals equally. This command-differential ultimately leads to questioning the nature of commodity production and growth-path.

Command-differential ultimately leads to questioning the nature of commodity production and growth-path.

How does command-differential come? The application of technology at the dawn of its own history, e.g., in an era of hunting, does not yield any questionable command-differential. There production is in terms of ability of an individual, but sharing is in terms of need. 'Questionable command-differential' is derived from 'resource differential': unequal resources owned and transformed by the resource-owners in the domain of production of commodities. Natural resources are generally non-renewable, and, subject to knowledge of engineering, substitutable in production of commodities. Manpower or quality-weighted labour force transforms nature to yield output. Non-labour resources like land and machinery did not exist in a vacuum; while land is known to be a direct part of nature, machinery is 'past labour exercised on nature' maintained for re-use in production of a new set of commodities. The higher the stage of production of commodities the higher is the importance of non-labour resources and the lower is the significance of land and sometimes labour. However, it is the owner of labour, viz., the labourer who opens up the technological options for unlimited economic growth of the globe on an infinite time sequence.

Thus the commodity-technology association for the economy can be written as :

$$\{Q, T\} \equiv \{Q_i, T_j\}; \quad \left. \begin{matrix} i = 1, \dots, n \\ j = 1, \dots, m \end{matrix} \right\} \quad \dots(1)$$

Where Q is a vector of produceable commodities and T is a vector of technologies in production of Q .

Herein $m \geq n$, on the assumption of non-identical technology for any two commodities. T denotes the nature of association between human (labour) and non-human resources. While Q is constrained to move along a single product curve, T is an operator that explains the shift of the curve. T covers certain characteristics like 'scale of operations', nature of the products etc. (Stewart, 1977). Q and T are determined simultaneously. It is not that the economic agents will have to produce

all the n produceable commodities (resource-technology specifying) at a particular period of time. It may choose to produce any subset of the whole.

Starting with a simple two-individual (A_1 and A_2) two commodity (Q_1 and Q_2) case, one can obtain production strategy as follows:

The production of commodities reflects autonomous behavior of both A and B. Then one arrives at their respective 'command positions' and possibility of 'command-differential'. As a first example:

Example: 1

Economic Agents	A_1	A_2
Technology in use	T_1	T_2
Production of Commodities	Q_1	Q_2
Self-use	Q_{11}	Q_{22}
Excess for exchange	Q_{12}	Q_{21}
Exchanged Commodities	Q_{21}	Q_{12}
Command Position	(Q_{11}, Q_{21})	(Q_{21}, Q_{22})

Let there be equivalence in exchange in terms of a numeraire; it can be any of the two commodities. So one takes $Q_{12} \approx Q_{21} > 0$ for interdependence and hence for exchange to occur, thus showing existence of A and B in social production.

In this system

$$Q_1 = Q_{11} + Q_{12} \quad \dots(2)$$

$$Q_2 = Q_{21} + Q_{22} \quad \dots(3)$$

Let C_1 and C_2 denote positions of individuals A_1 and A_2 respectively in total output (Q_1, Q_2) . Then

$$C_1 \equiv (Q_{11}, Q_{21}), \quad Q_{11} \geq 0, \quad Q_{21} > 0 \quad \dots(4)$$

$$C_2 \equiv (Q_{12}, Q_{22}), \quad Q_{22} \geq 0, \quad Q_{12} > 0 \quad \dots(5)$$

The system generates the same level of output for each period with a given state of technology specific to a given commodity produced by a single economic agent.

There is no category as households selling labour to firms. The economic agents are producers, employing their own labour (not hired) and non-labour resources (part of nature) accessible to them. Resource constraint is assumed away. So one obtains a production system as a characterization of interdependence among the producers. These producers become consumers in a post exchange situation.

Let individual A_3 join the system producing Q_3 and it is also an autonomous decision, out of which his self-use in Q_{33} , so that

$$Q_3 - Q_{33} = Q_{31} + Q_{32}, Q_{33} \geq 0, Q_{31}, Q_{32} > 0 \dots (6)$$

is the necessary condition for existence of A_3 in social production, where Q_{31} and Q_{32} are portions of Q_3 required by A_1 and A_2 respectively. Now if none of them need Q_3 , then A_3 fails to participate in social production. The implication is, production of commodities independent of requirements by the rest of the society does not ensure command of the particular individual behaving autonomously in production of commodities.

Now in a situation where commodity produced by one is required by the other, the 'relative command positions' are derived in a post-exchange situation. With repetition of T_1 by A_1 and T_2 by A_2 , there does not come any command-differential, on the assumption of maintenance of equivalence in exchange. Even if money is introduced to work only as medium of exchange, this equivalence in exchange, this equivalence in exchange is not disturbed. How does command-differential come then?

Accepting $Q_{12} \approx Q_{21} > 0$, the same initial technologies are unlikely to be repeated in producing Q_1 and/or Q_2 . If both A_1 and A_2 move technologically upward to produce more of Q_1 and Q_2 , there is a chance that the equality $\lambda Q_{12} = \lambda Q_{21}$, $\lambda > 1$ is ensured, denoting reducing labour-time required to produce commodities following technological progress. However, technological progress in production of commodities by A_1 and A_2 are unlikely to be equal (or at the same rate) so that non-equivalence in exchange and in command position comes again. The point is that inter-firm technology-differential via generation of surplus or deficit output (relative to what is required by the rest of the agents) leads to the ultimate command-differential. Obviously this command-differential is a post-exchange phenomenon.

In an n -commodity frame, one commodity being produced by one individual having a single non-identical technology, the 'relative command positions' and 'command-differentials' are derived for n individuals.

Let the n commodities be Q_1, Q_2, \dots, Q_n decided to be produced by n individuals A_1, A_2, \dots, A_n , with associated technologies T_1, T_2, \dots, T_n . Here T_1 is one specific way of converting natural resources by A_1 to produce Q_1 (consumable and tradeable). T_1 is the 'best available' technology among alternative technologies and by application becomes best practiced technology

for Q_1 . Similarly for T_2, \dots, T_n . Thus, in this n -commodity frame, the command-positions for individuals A_1, A_2, \dots, A_n are as follows:

Economic Agents position	Product and associated technology	Command
A_1	(Q_1, T_1)	C_1
A_2	(Q_2, T_2)	C_2
-	-	-
-	-	-
A_n	(Q_n, T_n)	C_n

In this the command position is shown by the sharing of output by the agents participating in production as the following:

$$C_1 \equiv (Q_{11}, Q_{21}, \dots, Q_{n1}), Q_{11} \geq 0, (Q_{21}, \dots, Q_{n1}) > 0$$

$$C_2 \equiv (Q_{12}, Q_{22}, \dots, Q_{n2}), Q_{22} \geq 0, (Q_{12}, Q_{32}, \dots, Q_{n2}) > 0 \dots (7)$$

$$C_n \equiv (Q_{1n}, Q_{2n}, \dots, Q_{nn}), Q_{nn} \geq 0, (Q_{1n}, \dots, Q_{n-1,n}) > 0$$

Also the output and its alternative uses are stated as:

$$Q_1 = Q_{11} + Q_{12} + \dots + Q_{1n}, Q_{11} \geq 0, \sum_{j=2}^n Q_{1j} > 0$$

$$Q_2 = Q_{21} + Q_{22} + \dots + Q_{2n}, Q_{22} \geq 0, \sum_{j=1, j \neq 2}^n Q_{2j} > 0 \dots (8)$$

$$Q_n = Q_{n1} + Q_{n2} + \dots + Q_{nn}, Q_{nn} \geq 0, \sum_{k=1}^{n-1} Q_{nk} > 0$$

With same state of technology continued by the individuals in production of commodities, one individual producing one single commodity, command-differential does not come, the equivalence in exchange being unchanged. With respect to altered ways of producing the same commodity i.e., with respect to technological shifts, there come altered levels of output and hence command-differential. Market (the context of exchange) or price-mechanism could alter the initial exchange-equivalence, but the point is money-based market is en-

Market or price-mechanism could alter the initial exchange-equivalence, but the point is money-based market is engineered through some agency at some stage.

gineered through some agency at some stage. At this stage the introduction of money-based exchange-price mechanism, are not considered in the system. Rather, it shows interdependence.

The system considered here shows interdependence in production of commodities, and not a system (Leontief type, for example) where final demand for each commodity is given as an exogenous variable that determines the level of output.

The point precisely is that the system repeats itself if there does not occur technological change. The system is disturbed by technological change. This leads to altered sharing of commodities produced by individuals in a post-exchange situation.

Non-identical command positions, derived from product and associated technology adopted by individuals, lead to new sets of products and technologies and hence altered command-differential. While initial participation of an individual in commodity production is choice-neutral, derived command-differential is a signal for him to try to alter the initial situation. With respect to technological change, the production system alters its character from a simple interdependence to a complex interdependence. Some producers outcompete others when they accumulate capital (machinery, tools etc.), given the initial equivalence in exchange of commodities unchanged, and convert others into potential sellers of labour-power. Here comes the question of adoption and acceptability of the altered situation, the power of society to absorb shocks following the advent of new technology, and hence the necessity of consensus among economic agents (actual and potential), the formation of the rules of the game (in using technologies, producing output etc.) and need for the supervision by a competent referee (Market and/or State).

With respect to technological change the production system alters its character from a simple interdependence to a complex interdependence.

Consensus on Commodity Production

Production of commodities in an economic system thus oriented via changing technology at unequal rates for economic agents is a reflection of cooperation between (i) people working inside a plant and (ii) labourers employed inside a plant and potential labourers (job-seekers in the working age) outside the plant.

- Inside a plant there are owners of labour-power and owners of non-labour power, e.g., owners of material resources and machinery. Any cooperation between these two categories is derived from an exercise of uneven but changing bargaining power of these two categories. An immediate reflection of this exercise of power is wage-agreement or agreement on benefits to the respective categories. The conflict between 'labour-reward' and 'non-labour reward' is revealed inside a plant, which may be resolved ultimately in selecting technologies of higher-order by the owners of non-labour resources. Advanced technologies offer the scope of higher wages corresponding to increased productivity of existing labourers. Higher wages are not dissociated from higher returns on non-labour resources. In absence of crowding in of investment possibilities, it may lead to (a) possible exit or retrenchment of a section of labourers from the existing plants where they are employed or (b) raising the burden on the rest of the economy via increasing the size of the unemployed labourers or shrinkage of scope for potential labourers outside to be employed in existing plants. Thus, ultimately the 'required consensus' rotates not only inside the domain of a single plant or all the plants operating in an economy at a particular point of time, but on possibility of shock absorption by all the people in the economy. We then come to (ii).

Advanced technologies offer the scope of higher wages corresponding to increased productivity of existing labourers. Higher wages are not dissociated from higher returns on non-labour resources.

- If a process of growth and consumption is viable to all, then the benefits and burdens have to be shared by all. The people outside the plant at present or beyond the domain of production, will have to abide by the norms of a commodity-producing society. These norms aim at development of a man to suit the requirements of a commodity producing society.

It is a fact that development of technology forms an advanced stage of production that leads to a shifting of plants far away from labour-dependence. The application of higher-order technology by the 'new producers' not

only ensures long-term benefits but also curtails immediate pressure from owners of labour inside the plant via the offer of higher labour-rewards. Labourers respond to money wages and hence accept this solution.

It is assumed that the application of higher-order technology-led command differential leads to a situation where a major section of population become non-participants in economic activities. Suppose there is a strong legal frame to ensure the rights of participants, how does the production-system work then?

The underlying conditions here are:

- There is an implicit agreement between non-participants (voters in the political system) and the Government that the latter will ensure social security for the former e.g., in the form of unemployment insurance/allowance etc.
- There is an implicit agreement between participants (voters in the political system) and the government that the property of the former will be secured and their participation in economic activities will be protected subject to their paying taxes etc., to the government:
- There is an implicit agreement between non-participants and participants that the latter will provide 'benefits' for the former; if not, the former may apply force (illegal) to extract benefits from the former.

How does the question of consensus come regarding production of commodities in an economy by participants willing (and unobstructed) to participate?

The key lies in command-differential derived from technology-differential. One may try to explain command-differential in natural resources. Such an attempt assumes away explanation of how the right of exclusion is conferred on a few individuals. For example, let initial commodity production start at time t_0 with equal access to natural resources. At time point t_1 , some of these individuals will acquire more power (owning and using natural resources) to move ahead relative to others, because of application of superior technology (especially their superior brain developed via learning by doing). If unequal distribution of natural resources is taken as the starting point then the phenomenon during the time interval (t_0, t_1) is ignored, with possibilities of wrong implications. Thus we stress on technology-differential as an explanation of command-differential and this brings the question of selecting commodities by individuals to derive highest attainable command in attainable commodity basket.

Technology-differential as an explanation of command-differential brings the question of selecting commodities by individuals to derive highest attainable command in attainable commodity basket.

Do participants (to the exclusion of non-participants) arrive at a consensus regarding commodity production? Each participant is an optimizer of his own goal. Each tries to develop higher-order product and technology, thus threatening some participants to face exit in absence of 'at least equal improvement' in acquiring technology. Even if all the participants have the same optimization target with equal access to information and natural resources at the same point of time, 'inter-temporal inter-personal' inequality in movement is inevitable. Since there cannot be any mechanism in any system which equalises 'human brain' in operation, this inequality or command-differential is a natural consequence. Unequal participation cannot bring about a permanent consensus. The problem is aggravated since the stake of the non-participants is least in non-cooperation in any system. Then the state has to work as a shock-absorber (Hobsbawm, 1996).

Commodity Production Developed Historically

Commodity is the sphere where economic categories like production, exchange, distribution and consumption take shape. Since economic development is an upward movement in the structure of commodity production, and since command-differential as a derivation from application of initial technology by individuals leads to a new set of commodities (and technologies), the question regarding the possibility of economic development as a historical process of participation of man in commodity production is relevant. The question is an old one : "What role do general historical conditions play in production and how is production related to the historical development as a whole?" (Marx, 1978).

Commodity is the sphere where economic categories like production, exchange, distribution and consumption take shape.

The conditions in a logical frame may be given by the following steps :

Step 1: Each capable individual gets involved in commodity production at his own compulsion (need-based). This production is social (exchange-based)

participants and non-participants, between both on the one hand and with nature on the other. This is again the point which warrants state action as a shock absorber.

agro-climatic zones, such as, the Southern Plateau and Hills Zone (Zone 10), the East Coast Plains and Hills one (Zone 2) and West Coast Plains and Hill Region (Zone 12). To minimise heterogeneity in agro climatic factors, the state is further divided into seven sub regions¹. In the present study, data are principally drawn from published sources viz., Season and Crop Report for Tamil Nadu, Tamil Nadu—An Economic Appraisal and Statistical Abstract of Tamil Nadu.

Method of Analysis

Growth Pattern & Source

The pattern of growth in terms of area, production and productivity over the years has been examined by fitting non-linear growth curve (Gujarati, 1992). The analysis of growth indicates the main contributing factors for increased production and the scope for improvement of those factors of growth. To ascertain the effect of various factors on agricultural growth, specifically area and productivity, the decomposition analysis² was attempted.

Findings

Performance of Agriculture

It is seen from table 1 that the area under rice exhibited negative growth rate over the years in all the regions and state except region V. In region V, rice formed 43 per cent (4.25 lakh ha) of the total area under cultivation during 1993-94, remained almost constant over a period of time. The highest negative growth rate was noticed in region VI, which worked out to 1.42 per cent.

1. Region I covers Dharmapuri and Salem; region II represents Coimbatore, Dindugal Anna, Karur Theeran Chinnamalai, Madurai, Perambalur Thiruvalluvar, Periyar, Pudukottai and Trichy Perumbidugu; region III represents Chengalpattu MGR, North Arcot—Ambedkar, Ramasamy Padayachiar, Thiruvannamalai Sambumarayar and South Arcot—Vallalar; region IV covers Nagapattinam Quaid-E-Milleth and Thanjavur; region V represents Chidambaranar, Kamarajar, Nellai Kattabomman, Pasumpon Muthuramalinga Thevar and Ramanathapuram; region VI represents Kanyakumari; and region VII covers The Nilgiris.

2. First degree polynomial function was used and it is given by A_t or $Y_t = a + bt + e_t$, where A_t is area, and Y_t denotes yield, 'a' and 'b' are coefficients and e_t is error term with zero mean and variance σ^2 . Separate regressions were employed for the two periods viz., pre green revolution (1956-57 to 1964-65) and the post-green revolution period (1965-66 to 1990-91) to ensure that $\sum e_t = 0$ for each period. Contribution of each component was analysed with their per cent share to the total change in average production between the two periods.

In terms of yield, rice registered positive growth rate in all the regions and state. The highest positive growth rate in productivity of rice was observed in region II (2.54 per cent) and region III (2.53 per cent). The growth rate of productivity of rice in the state worked out to 2.34 per cent and was found significant at one per cent level. Large scale introduction of high yielding varieties, increased use of fertilizer and pesticides and improved irrigation facilities brought about positive growth rate in yield.

In the case of production of rice, the decline in area was more than compensated by increase in productivity, hence the production registered positive growth in all the regions and state. The highest rate of growth in production of rice was noticed in region II (2.29 per cent) followed by region V (2.07 per cent). The growth rate of production of rice in the state was 1.79 per cent and it was significant of one per cent level.

Among the other cereals, the area under jowar, cumbu and ragi exhibited negative growth rates in the major regions, such as I, II and V (Appendix I). Similarly, the area under these crops significantly decreased over the period in the state. The area under cumbu showed positive growth in rate in region III, but area under jowar and ragi showed declining tendency. On the other hand, area under maize recorded positive growth rates in the all the major regions. Maize, which occupied nearly 1.47 per cent of the total cropped area (0.32 lakh ha) in region II, exhibited highest growth rate in area with 8.92 per cent. The growth rate of area under maize for the state worked out to 5.57 per cent.

With regard to productivity, the other cereal crops registered positive growth in all the major regions and state. Though cumbu showed positive trend in productivity, production level suffered on account of considerable decline in acreage in regions viz., I, II and V. The growth of area and productivity together contributed for higher production in the case of cumbu in region III. The decline in area under cumbu in the state was more than compensated by productivity.

In the case of jowar, the decline in area was more than compensated by productivity, as a result production tended to increase in the regions I, II, III and state. However, the decrease in area under jowar in region V could not be compensated by improvement in yield, consequently production declined at the rate of 0.55 per cent per annum.

Productivity and production of maize registered positive growth rates in all the major regions and state. In the case of ragi, the decline in area was more than

Table 1: Regionwise Performance of Agriculture in Tamil Nadu – Estimated Compound Growth

(per cent)

Crop	Region I			Region II			Region III			Region IV		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y
Rice	-0.38 (0.72)	1.47* (0.83)	1.86*** (0.45)	-0.25 (0.44)	2.29*** (0.56)	2.54*** (0.45)	-0.93 (0.64)	1.58 (0.75)	2.53*** (0.59)	-0.59 (0.30)	1.62*** (0.51)	2.21*** (0.47)
Owar	-0.27** (0.42)	0.49 (0.72)	0.76 (0.78)	-0.66 (0.40)	0.18 (0.67)	0.85 (0.62)	-2.10*** (0.47)	0.59 (0.96)	2.75*** (0.73)	-19.55*** (3.49)	-19.01*** (3.20)	0.67 (1.22)
Cumbu	-4.66*** (0.59)	-1.65 (0.99)	3.16*** (0.83)	-2.63*** (0.45)	-1.97** (0.75)	0.68 (0.65)	1.00 (1.31)	4.71*** (1.43)	3.67* (1.96)	-4.94** (2.08)	-2.06 (2.13)	3.03*** (0.78)
Maize	2.98* (1.67)	4.91*** (1.78)	1.87** (0.82)	8.92*** (1.87)	10.46*** (1.70)	1.42 (0.75)	1.55 (1.70)	3.21* (1.62)	1.63** (0.68)	-3.30* (1.79)	-0.13 (2.15)	3.28 (2.39)
Ragi	-1.01*** (0.31)	1.68* (0.84)	2.72*** (0.71)	-4.05*** (0.43)	3.03*** (0.74)	1.06*** (0.47)	-3.76*** (0.60)	-1.67** (0.74)	2.17** (0.53)	-10.11*** (1.52)	-7.37*** (1.87)	3.05* (1.54)
Cereals	-1.28*** (0.32)	-	-	-1.27*** (0.35)	-	-	-1.55*** (0.54)	-	-	-0.98*** (0.34)	-	-
Blackgram	7.28*** (1.13)	9.16*** (1.70)	1.75** (0.79)	4.36*** (1.05)	5.96*** (1.35)	1.53** (0.61)	6.29*** (1.60)	8.36*** (1.94)	1.94 (0.96)	9.52*** (1.80)	11.34*** (2.26)	1.66 (1.22)
Greengram	4.73*** (1.43)	7.37*** (1.72)	2.52*** (0.99)	4.48*** (1.25)	5.89*** (1.22)	1.35 (0.72)	5.02*** (1.36)	7.00*** (1.55)	1.89*** (0.56)	2.87* (1.44)	4.29* (2.27)	1.39 (1.57)
Redgram	6.64*** (0.84)	8.02*** (1.42)	1.29 (0.99)	1.54** (0.87)	3.01*** (1.07)	1.45** (0.54)	0.87 (0.76)	1.13 (0.77)	0.26 (0.55)	-5.16*** (1.01)	-3.91*** (1.05)	1.31** (0.56)
Pulses	2.14*** (0.74)	-	-	0.59 (0.50)	-	-	3.17** (1.37)	-	-	5.43*** (1.81)	-	-
Foodgrains	-0.45 (0.32)	-	-	-1.04*** (0.33)	-	-	-1.19 (0.50)	-	-	-0.20 (0.36)	-	-
Sugarcane	4.73*** (0.88)	6.72*** (1.01)	1.90*** (0.42)	2.84** (0.79)	4.25*** (0.84)	1.37*** (0.55)	4.85*** (0.70)	6.36*** (0.97)	1.43* (0.77)	5.05*** (0.81)	9.13* (4.76)	3.88 (4.14)
Fruits and vegetables	3.83*** (0.69)	-	-	2.59*** (0.33)	-	-	2.56*** (0.41)	-	-	-1.08** (0.45)	-	-
Groundnut	1.85*** (0.54)	2.39*** (0.74)	0.53 (0.69)	-0.15 (0.47)	0.32 (0.77)	0.47 (0.58)	0.63 (0.39)	0.54 (0.91)	-0.09 (0.74)	1.10 (0.81)	1.95* (1.02)	0.84 (0.90)
Edible and non-edible oils	1.40** (0.52)	-	-	0.42 (0.53)	-	-	0.33 (0.39)	-	-	1.73*** (0.55)	-	-
Cotton	1.21 (1.30)	3.21** (1.48)	1.98** (0.85)	-2.98*** (0.81)	-0.56 (0.93)	2.49** (0.96)	6.16*** (1.31)	9.53*** (1.35)	3.18*** (0.98)	17.13*** (0.64)	22.17*** (3.70)	4.30 (2.64)
Fodder	12.71*** (3.26)	-	-	12.26*** (2.66)	-	-	6.01 (5.33)	-	-	9.07* (5.11)	-	-

(Table 1 Contd.)

(Table 1 Contd.)

Crop	Region V			Region VI			Region VII			State		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y
Rice	0.11 (0.40)	2.07** (0.85)	1.96*** (0.67)	-1.42*** (0.33)	0.31 (0.84)	1.75*** (0.64)	-0.93 (0.81)	0.48 (0.86)	1.42 (1.05)	-0.54 (0.36)	1.79*** (0.45)	2.34*** (0.36)
Jowar	-2.06*** (0.54)	-0.55 (0.82)	1.55* (0.85)	-12.37*** (4.37)	-9.54** (4.48)	3.23 (2.54)	-6.43* (3.52)	-4.91 (3.57)	1.62 (1.83)	-0.83** (0.34)	0.10 (0.55)	0.93* (0.47)
Cumbu	-3.59*** (0.78)	-1.06 (0.83)	2.63*** (0.59)	-6.41 (4.68)	-4.93 (4.26)	1.59 (2.28)	1.12 (3.89)	3.71 (3.67)	2.57 (3.01)	-2.08*** (0.33)	0.06 (0.58)	2.19*** (0.44)
Maize	6.69 (6.23)	7.62 (6.48)	0.87 (1.29)	-5.37*** (1.24)	-2.24 (1.53)	3.30** (1.38)	-3.38 (2.80)	-2.99 (2.82)	0.40 (1.31)	5.57*** (1.32)	7.00*** (1.25)	1.36* (0.76)
Ragi	-3.41*** (0.80)	-1.54* (0.86)	1.93*** (0.65)	-4.71 (3.02)	-4.71 (2.73)	0.002 (2.74)	-11.91*** (4.04)	-7.92*** (2.84)	4.53* (2.52)	-2.48*** (0.31)	-0.38 (0.49)	2.15*** (0.39)
Cereals	-1.59*** (0.37)	-	-	-1.65*** (0.39)	-	-	-4.22*** (0.99)	-	-	-1.06*** (0.29)	1.21*** (0.40)	2.29*** (0.35)
Blackgram	3.40* (1.85)	4.55*** (1.20)	1.11 (1.82)	7.45*** (2.38)	7.30*** (2.57)	-0.14 (0.93)	0.20 (2.76)	-2.18 (1.55)	-2.38 (2.14)	5.91*** (1.03)	7.56*** (1.11)	1.55* (0.79)
Greengram	-0.06 (1.90)	1.99 (2.01)	2.05 (1.82)	-0.45 (5.23)	-0.65 (5.37)	-0.21 (1.72)	-2.46 (1.56)	-1.77 (2.33)	0.71 (2.07)	2.83*** (0.94)	5.10*** (1.14)	2.21*** (0.80)
Redgram	-0.43 (1.32)	1.11 (1.29)	1.55** (0.62)	-12.69** (3.94)	-10.29*** (2.95)	2.75 (2.79)	-2.24 (2.11)	-2.50 (1.60)	-0.27 (1.78)	2.19*** (0.57)	3.46*** (0.78)	1.24** (0.54)
Pulses	0.96 (0.79)	-	-	-1.02 (2.39)	-	-	1.41 (2.38)	-	-	1.71*** (0.39)	3.52*** (0.62)	1.78*** (0.33)
Foodgrains	-1.32*** (0.36)	-	-	-1.57*** (0.41)	-	-	-3.69*** (0.90)	-	-	-0.71*** (0.24)	1.28*** (0.39)	2.00*** (0.31)
Sugarcane	4.53*** (1.07)	6.31*** (1.36)	1.70*** (0.55)	-3.66 (2.67)	-11.24*** (3.66)	-7.86** (3.55)	-11.05** (4.29)	7.71 (7.25)	-3.01 (5.24)	4.04*** (0.65)	5.63*** (0.83)	1.52*** (0.39)
Fruits and vegetables	1.80*** (0.46)	-	-	-1.28*** (0.31)	-	-	-0.28 (0.56)	-	-	-	-	-
Groundnut	0.12 (1.12)	-0.10 (0.87)	-0.21 (1.18)	-2.77 (2.11)	-2.98 (1.93)	-0.22 (0.79)	8.48* (4.82)	8.11* (4.57)	-0.35 (1.49)	0.48 (0.34)	0.94 (0.63)	0.46 (0.51)
Edible and non-edible oils	1.00* (0.55)	-	-	1.26*** (0.22)	-	-	3.85* (2.27)	-	-	0.81 (0.31)	2.23*** (0.57)	1.42 (1.07)
Cotton	-1.68*** (0.45)	0.83 (2.02)	2.55 (1.85)	-8.94** (3.44)	-6.11* (3.54)	3.11 (2.60)	-3.73 (3.33)	-2.55 (2.98)	1.23 (2.37)	-1.68 (0.51)	0.36 (0.94)	2.07*** (0.70)
Fodder	0.08 (1.01)	-	-	-	-	-	-	-	-	-	-	-

(Figures in parentheses denote standard error of compound growth rates)

*** P ≤ 0.01 (two tailed test)

A : Area

** P ≤ 0.05 (two tailed test)

P : Production

* P ≤ 0.10 (two tailed test)

Y : Yield

compensated by increase in productivity, as a result, production tended to increase over the years in regions I and II. However, the decrease in area could not be compensated by increase in productivity, consequently production of ragi declined in the regions III, V and state. Area under cereals registered negative growth rate in all the regions and state. On account of increase in productivity of cereals at the rate of 2.29 per cent per annum, production of cereals increased by 1.21 per cent per annum in the state.

The major pulse crops viz., blackgram, greengram and redgram exhibited positive growth rates in terms of area, production and productivity in the major regions, such as, I, II and III and the state as a whole. Area, production and productivity of blackgram registered positive growth rate in region V. Though there has been a fall in area under greengram and redgram in region V, production of these crops increased over the years at the rate of 1.99 per cent and 1.11 per cent annum, respectively, on account of productivity gains. Blackgram and greengram were found major pulse crops in region IV and area, production and productivity of these crops tended to increase over years in this region. Similarly, blackgram was found a major pulse crop in region VI, where production of blackgram registered positive growth rate on account of increase in area, though the productivity showed declining tendency.

Area under total pulses increased in all the regions and state except region VI. Both area and productivity of pulses contributed for higher production in the state. In the case of foodgrains, area declined over the years in all the regions and state. The increase in productivity of foodgrains contributed for positive growth rate in production, though area showed declining tendency. In the case of sugarcane, all the three performance parameters, namely, area, production and productivity exhibited positive growth rates in all the major regions and state.

Area under fruits and vegetables registered positive growth rate in regions I, II, III and V. Tapioca is a major vegetable in region I, which occupied nearly four per cent (0.47 lakh ha) of gross cropped area during 1993-94. Similarly in region VII, potato is a major vegetable crop, which constituted nearly five per cent (0.03 lakh ha) of gross cropped area during 1993-94. The production of potato increased in this region at the rate of 1.41 per cent per annum, inspite of decrease in area by 2.46 per cent, indicating that decline in area was more than compensated by increase in productivity (3.97 per cent).

Fruits occupied nearly four per cent (2.55 lakh ha) of the total cropped area in the state during 1993-94, while vegetable constituted two per cent (1.71 lakh ha)

of the total cropped area during the same period. The performance parameters, such as, area, production and productivity of fruits registered positive growth rates with 3.53, 3.76 and 0.23 per cent, respectively. Similarly, area, production and productivity of vegetables exhibited positive growth rate with 3.21, 7.72 and 4.51 per cent, respectively.

With regard to groundnut, area, production and productivity registered positive growth rate in the regions I and IV and state. The increase in production of groundnut in region I was mainly contributed by increase in area as compared to productivity gain. On the other hand, the increase in production of groundnut in region IV and state was almost equally contributed by increased in area and productivity. The decline in area (-0.51 per cent) under groundnut in region II was more than compensated by increase in productivity (0.47 per cent), and consequently production showed increasing tendency (0.32 per cent). However, the decline in productivity of groundnut (-0.09 per cent) in region III was more than compensated by increase in area (0.63 per cent), as a result production showed a marginal increase with 0.54 per cent. A marginal decline in productivity (-0.21 per cent) of groundnut in region V, could not be compensated by a marginal increase in area (0.12 per cent), as a result production declined marginally by 0.10 per cent.

In the case of total oilseeds, area showed increasing tendency in all the regions and state. The increase in area (0.81 per cent) and productivity (1.42 per cent) together contributed for higher production (2.23 per cent) in the state. Area, production and productivity of cotton registered positive growth rates in regions I, III and IV. The decline in area under cotton could not be compensated by increase in productivity, consequently production tended to decrease in region II. However, the decrease in area under cotton was more than compensated by increase in productivity, as a result production exhibited positive growth rate in the region V and state. Area under fodder tended to increase in all the regions.

Performance of Agriculture—Comparison of Pre and Post Green Revolution Period

To capture the changing pace and pattern of growth momentum and to understand the relative magnitude of sources of growth, the period of analysis was disaggregated into pre and post green revolution period and examined. The compound growth rates estimated separately for pre and post green revolution periods are set out in table 2.

Foodgrains exhibited significant growth rates in terms of production and productivity during the post

green revolution period. Though there was negative growth (1.13 per cent) in terms of acreage under foodgrains, production trend was positive and significant with 1.24 per cent on account on positive, significant and moderate growth trend in productivity with 2.40 per cent. This phenomenon is in contrast to non-significant positive trend in area (0.32 per cent), production (1.42 per cent) and productivity (1.10 per cent) during pre-green revolution period. The break-up of foodgrains, cereals in particular, reveal similar picture in terms of productivity (2.79 per cent) and acreage (-1.59 per cent), though the production trend (1.15 per cent) was positive, but not significant during the post-green revolution period. The trends were more encouraging in the case of pulses during the post-green revolution period; both area (1.88 per cent) and productivity (2.36 per cent) trends were positive and significant and contributed to substantial increase in production (4.28 per cent).

During the post-green revolution period, the area under cereals, such as, rice, jowar, cumbu and ragi showed negative trend with 1.13, 1.18, 2.71 and 2.98 per cent, respectively; maize exhibited positive growth rate with 4.16 per cent. The productivity growth rates of rice, jowar, cumbu and ragi were positive and significant with 2.81, 1.36, 2.38, 2.74 per cent, respectively; in the case of maize, the growth rate of productivity was positive with 2.23 per cent, though not significant. In terms of production, rice and maize showed positive and significant trend with 1.65 per cent and 6.48 per cent, respectively; the growth rate was positive in the case of jowar with 0.71 per cent, though not significant. Production growth rates of cumbu and ragi were negative with 0.39 per cent and 0.32 per cent, respectively.

An encouraging growth trend was witnessed in the case of pulses during the post-green revolution period. The productivity trend of blackgram, greengram and redgram, which were negative during pre-green revolution period turned positive during post-green revolution period with 2.51, 2.83 and 1.29 per cent (not significant), respectively; in terms of area, growth trend was positive in all the three pulse crops and significant in blackgram and redgram during the post-green revolution period.

The productivity trend of blackgram, greengram and redgram, which were negative during pre-green revolution period turned positive during post-green revolution period.

Table 2: Performance of Agriculture in Tamil Nadu—Comparison of Pre and Post-Green Revolution periods

Crop	I			II		
	A	P	Y	A	P	Y
Rice	1.75 ^{***} (0.29)	2.55 (1.74)	0.78 (0.94)	-1.13 ^{**} (0.54)	1.65 ^{**} (0.81)	2.81 ^{***} (0.59)
Jowar	0.27 (0.89)	0.51 (2.45)	0.23 (2.26)	-1.18 [*] (0.59)	0.17 (0.99)	1.36 [*] (0.79)
Cumbu	-2.55 ^{**} (1.02)	0.29 (3.00)	2.91 (2.61)	-0.71 ^{***} (0.48)	-0.39 (0.98)	2.38 ^{***} (0.75)
Maize	-8.16 (8.76)	-8.15 (8.65)	0.01 (0.26)	4.16 ^{***} (1.25)	6.48 ^{***} (1.12)	2.23 (1.33)
Ragi	-1.31 (0.92)	-1.69 (1.34)	-0.39 (1.02)	-2.98 ^{***} (0.48)	-0.32 (0.89)	2.74 ^{***} (0.60)
Cereals	0.49 (0.70)	1.48 (1.54)	0.99 (1.03)	-1.59 ^{***} (0.41)	1.15 (0.72)	2.79 ^{***} (0.57)
Blackgram	0.84 (2.88)	0.63 (2.91)	-0.21 (0.57)	5.84 ^{***} (1.82)	8.50 ^{***} (1.87)	2.51 [*] (1.37)
Greengram	2.85 (2.25)	2.65 (2.38)	-0.19 (0.44)	2.06 (1.66)	4.95 ^{**} (2.09)	2.83 [*] (1.44)
Redgram	-0.36 (1.60)	-1.73 (3.42)	-1.38 (2.28)	2.43 ^{**} (1.01)	3.75 ^{***} (1.29)	1.29 (0.94)
Pulses	-1.42 (0.81)	-1.35 (0.77)	0.07 (0.41)	1.88 ^{***} (0.66)	4.28 ^{***} (0.97)	2.36 ^{***} (0.51)
Foodgrains	0.32 (0.61)	1.42 (1.51)	1.10 (1.03)	-1.13 ^{***} (0.37)	1.24 [*] (0.71)	2.40 ^{***} (0.51)
Sugarcane	7.45 (4.23)	11.90 ^{**} (4.90)	4.14 (4.74)	2.72 ^{***} (0.73)	3.79 ^{***} (0.82)	1.04 ^{***} (0.31)
Cotton	-2.15 (1.18)	-0.72 (1.84)	1.47 (1.37)	-0.95 (0.85)	0.56 (1.74)	1.52 (1.25)
Groundnut	2.68 ^{**} (0.82)	0.50 (2.98)	-2.13 (2.37)	0.11 (0.56)	1.69 (1.04)	1.58 ^{**} (0.62)

(Figures in parantheses are standard error of compound growth rates)

I Period from 1956-1957 to 1965-66

II Period from 1966-67 to 1993-94

*** $P \leq 0.01$ (two tailed test)

** $P \leq 0.05$ (two tailed test)

* $P \leq 0.10$ (two tailed test)

A : Area

P : Production

Y : Yield

Production trend of blackgram, greengram and redgram were positive and significant with 8.50, 4.95 and 3.75 per cent.

The growth performance in sugarcane was more encouraging during post-green revolution period with positive and significant growth rate in area, productivity and production. There are signs of recovery with respect to cotton; production trend has become positive; the trend in fall in acreage is coming down; there has been improvement in productivity trend, which is positive.

In the case of groundnut, the major oil seed crop of the state, there has been a significant breakthrough in productivity during post-green revolution period, the growth rate being 1.58 per cent; this situation is in contrast to negative trend in productivity during pre-green revolution (2.13 per cent, not significant). However, growth rate in area has fallen sharply from 2.8 per cent (significant) to 0.11 per cent (not significant). Production of groundnut has increased from 0.50 per cent to 1.69 per cent, though not significant.

In the case of groundnut, the major oil seed crop of the state, there has been a significant breakthrough in productivity during post-green revolution period.

One might be concerned as to whether the growth momentum of the seed-fertilizer-water revolution, which ushered in a break-through in productivity of crops during mid-sixties is still maintainable? It is, in this context, that the post-green revolution period was broken up into periods, namely, 1965-66 to 1979-80 and 1980-81 to 1993-94 and analysed. The results are presented in table 3. It is seen from the table that productivity of cereals during period II has increased from, 2.71 per cent to 4.74 per cent. Among the cereals, similar tendency was observed in the case of rice (4.53 per cent from 2.79 per cent), jowar (3.55 per cent from 2.13 per cent), ragi (3.70 per cent from 3.52 per cent).

Among the pulses, productivity trend of blackgram and greengram showed substantial increase. The productivity growth rate of food grains as a whole increased from 2.49 per cent to 4.01 per cent. There has been substantial increase in the case of groundnut from 1.65 per cent (not significant) to 3.30 per cent in period II. Cotton exhibited increasing trend in productivity from 1.56 per cent to 2.50 per cent. Sugarcane showed a fall in growth from 2.51 per cent to 0.71 per cent, but positive. Thus, the statistics reveal that the growth momentum in productivity of major crops is maintained during 80's.

Table 3: Performance of Agriculture in Tamil Nadu During Post-Green Revolution Period—Estimated Compound Growth Rates

(per cent)

Crop	I			II		
	A	P	Y	A	P	Y
Rice	0.36 (1.09)	3.17 (2.11)	2.79** (1.33)	-0.98 (1.54)	3.50* (1.64)	4.53** (1.56)
Jowar	0.04 (1.04)	2.17 (2.23)	2.13 (1.63)	-2.76 (1.62)	0.69 (2.87)	3.55 (2.16)
Cumbu	-0.49 (1.10)	2.63 (2.59)	3.14 (2.23)	-3.24*** (0.91)	-0.61 (2.27)	2.73 (1.67)
Maize	9.79** (3.66)	9.39** (4.10)	-0.36 (1.86)	6.92* (3.49)	6.90* (3.42)	-0.02 (4.27)
Ragi	-1.07 (0.76)	2.41 (1.62)	3.52** (1.20)	-2.21** (0.83)	1.41 (2.11)	3.70* (1.90)
Cereals	0.01 (0.65)	2.72 (1.73)	2.71** (1.22)	-1.84* (1.04)	2.82* (1.54)	4.74*** (1.36)
Blackgram	11.32** (4.25)	11.97** (5.53)	0.59 (2.12)	3.89 (4.36)	8.37* (4.00)	4.31 (4.93)
Greengram	6.89* (3.26)	10.20* (5.15)	3.10 (2.41)	3.56 (4.76)	9.03* (4.57)	5.29 (5.14)
Redgram	3.83 (3.18)	6.78* (3.53)	2.84* (1.49)	4.05** (1.65)	3.12 (3.56)	-0.90 (3.19)
Pulses	2.73 (1.79)	4.94 (2.96)	2.15 (1.32)	3.16* (1.52)	5.06** (2.12)	1.84 (1.41)
Foodgrains	0.28 (0.67)	2.78 (1.74)	2.49 (1.14)	-1.07 (0.89)	2.90* (1.57)	4.01*** (1.22)
Sugarcane	3.17 (2.40)	4.88* (2.46)	1.66** (0.69)	2.51* (1.36)	3.24* (1.73)	0.71 (0.89)
Cotton	-0.63 (1.90)	0.92 (4.86)	1.56 (3.92)	1.88** (0.83)	4.43 (3.93)	2.50 (2.67)
Groundnut	-0.17 (1.07)	1.47 (2.03)	1.65 (1.53)	2.69*** (0.90)	6.07** (2.10)	3.30** (1.48)

(Figures in parentheses are standard error of compound growth rates)

I Period from 1965-66 to 1979-80 A : Area
 II Period from 1980-81 to 1993-94 P : Production
 *** P ≤ 0.01 (two tailed test) Y : Yield
 ** P ≤ 0.05 (two tailed test)
 * P ≤ 0.10 (two tailed test)

Sources of Growth

Tamil Nadu has witnessed significant acceleration in growth of production, particularly in the post-green

Table 4: Components of Change in Production of Major Agricultural Commodities in Tamil Nadu - Regionwise

(per cent)

Crop/Components of change	Region							State
	I	II	III	IV	V	VI	VII	
Rice								
i. $\Delta \bar{Y}$	54.55	99.59	97.95	109.23	81.37	497.13	-94.56	105.56
ii. $\Delta \bar{A}$	35.06	0.10	1.74	-6.25	12.75	-337.28	-10.88	-3.96
iii. $\Delta \text{cov}(A, Y)$	1.30	-0.01	-0.13	-0.30	1.47	24.47	3.40	0.26
iv. $\Delta \bar{A} \Delta \bar{Y}$	9.09	0.02	0.27	-2.68	4.41	-84.32	2.04	-1.85
Cholam								
i. $\Delta \bar{Y}$	-	118.18	139.72	17.86	53.54	-	-	323.81
ii. $\Delta \bar{A}$	133.33	-20.78	-20.59	-103.57	36.16	-	-	-195.24
iii. $\Delta \text{cov}(A, Y)$	-33.33	7.79	0.24	0.21	0.41	-	-	-4.76
iv. $\Delta \bar{A} \Delta \bar{Y}$	-	-5.19	-19.36	-14.29	9.88	-	-	-23.81
Cumbu								
i. $\Delta \bar{Y}$	492.31	284.21	76.93	166.67	654.73	-	-	347.22
ii. $\Delta \bar{A}$	-338.46	-315.79	9.77	-42.42	-377.27	-	-	-175.00
iii. $\Delta \text{cov}(A, Y)$	-7.69	5.26	-0.69	6.06	1.33	-	-	2.78
iv. $\Delta \bar{A} \Delta \bar{Y}$	-246.15	-73.68	14.00	-30.00	-178.79	-	-	-75.00
Maize								
i. $\Delta \bar{Y}$	0.33	2.56	28.32	62.73e	4.00	-	-	6.27
ii. $\Delta \bar{A}$	76.37	84.56	73.20	33.54	-108.00	-	-	84.99
iii. $\Delta \text{cov}(A, Y)$	-0.43	-3.41	-21.79	-14.29	6.00	-	-	-6.10
iv. $\Delta \bar{A} \Delta \bar{Y}$	23.73	15.90	20.26	18.01	-2.00	-	-	14.83
Ragi								
i. $\Delta \bar{Y}$	133.33	185.70	610.09	124.65	1935.48	-	13.66	1290.00
ii. $\Delta \bar{A}$	-20.00	-209.34	-475.56	-136.74	-1240.86	-	24.53	-1020.00
iii. $\Delta \text{cov}(A, Y)$	-2.22	1.65	5.44	-6.05	-74.16	-	30.64	10.00
iv. $\Delta \bar{A} \Delta \bar{Y}$	-11.11	-78.01	-239.97	-81.86	-520.43	-	31.16	-380.00
Blackgram								
i. $\Delta \bar{Y}$	25.00	16.11	13.49	4.38	-5.93	-43.90	-	9.05
ii. $\Delta \bar{A}$	16.67	54.82	61.04	60.76	111.45	165.85	-	78.82
iii. $\Delta \text{cov}(A, Y)$	-	10.74	-0.06	-1.56	2.62	-0.73	-	19.71
iv. $\Delta \bar{A} \Delta \bar{Y}$	58.33	18.33	25.54	36.42	-8.14	-21.95	-	19.71
Greengram								
i. $\Delta \bar{Y}$	25.00	21.38	19.88	21.71	128.79	-1.56	-	34.23
ii. $\Delta \bar{A}$	50.00	60.86	57.47	52.89	-36.36	85.94	-	47.98
iii. $\Delta \text{cov}(A, Y)$	-	-4.93	-0.34	-3.41	18.18	22.66	-	-6.16
iv. $\Delta \bar{A} \Delta \bar{Y}$	25.00	22.70	23.00	28.82	-10.61	-7.03	-	23.96
Redgram								
i. $\Delta \bar{Y}$	10.99	30.88	53.92	1100.00	124.44	250.00	-	33.68
ii. $\Delta \bar{A}$	65.93	48.87	50.41	-1650.00	-6.67	-125.00	-	55.18
iii. $\Delta \text{cov}(A, Y)$	1.10	3.51	-12.73	-50.00	-15.56	-18.75	-	-3.59
iv. $\Delta \bar{A} \Delta \bar{Y}$	21.98	16.74	8.40	500.00	-2.22	-206.25	-	14.73

(Table 4 Contd.)

(Table 4 Contd.)

Crop/Components of change	Region							State
	I	II	III	IV	V	VI	VII	
Sugarcane								
i. $\Delta\bar{Y}$	14.34	51.17	12.91	-4.05	17.05	-	-	17.31
ii. $\Delta\bar{A}$	58.33	0.20	65.59	102.78	58.29	-	-	60.27
iii. $\Delta\text{cov}(A,Y)$	0.50	-0.80	0.60	7.55	-0.10	-	-	0.50
iv. $\Delta\bar{A} \Delta\bar{Y}$	26.84	49.43	20.87	-6.28	24.78	-	-	21.89
Groundnut								
i. $\Delta\bar{Y}$	-28.33	-97.49	57.87	-	-154.04	-87.50	-	-1380.00
ii. $\Delta\bar{A}$	103.33	-7.95	28.43	97.32	23.03	-34.09	-	1480.00
iii. $\Delta\text{cov}(A,Y)$	-	0.10	6.09	2.68	37.47	10.23	-	100.00
iv. $\Delta\bar{A} \Delta\bar{Y}$	25.00	5.44	7.61	-	-6.46	11.36	-	-100.00
Cotton								
i. $\Delta\bar{Y}$	163.04	-37.85	35.20	-	-64.29	-	-	-99.48
ii. $\Delta\bar{A}$	-38.04	2126.11	22.31	-	-60.71	-	-	-25.33
iii. $\Delta\text{cov}(A,Y)$	2.17	-2.84	1.95	-	7.14	-	-	-0.50
iv. $\Delta\bar{A} \Delta\bar{Y}$	-27.17	-1985.42	40.55	-	17.86	-	-	25.59

$\Delta\bar{Y}$: Change in mean yield

$\Delta\bar{A}$: Change in mean area

$\Delta\text{cov}(A, Y)$: Change in area-yield covariance

$\Delta\bar{A} \Delta\bar{Y}$: Interaction between changes in mean area and mean yield

The components of change were estimated between two periods viz., 1956-57 to 1965-66 (first period) and 1966-67 to 1990-91 (second period).

revolution period due to improvement in yield facilitated by seed-fertilizer-water technology. However, one could notice co-existence of acceleration and deceleration during the growth phase of Tamil Nadu's agriculture. To examine quantitatively the effect of area, yield and their variability on production of various agricultural commodities over years, decomposition analysis was attempted. For better understanding, the analysis was made regionwise covering the two time period, pre and post-revolution phases. The results are presented in table 4.

Tamil Nadu has witnessed significant acceleration in growth of production, particularly in the post-green revolution period due to improvement in yield facilitated by seed-fertilizer-water technology.

The analysis of sources of growth indicated that it was the yield factor which contributed for increased production of rice in almost all the regions and the state as a whole, eventhough the area showed declining

trend in all the regions. In regions I and V, both area and productivity contributed for incremental production of rice. In the case of cholam, the increase in production was mainly attributed by productivity. The contribution of the area for incremental production was negative in the regions I and V. The average production of cumbu increased in all the regions except in I and II, due to decline in area in these regions. However, yeild has positively contributed to production increase in cumbu across the regions.

With respect to maize, both area and productivity attributed for the increased production except in region V, where the area contribution was negative. Production of ragi decreased in the the regions except in the regions I, V and VII. The area under ragi decreased during the post-green revolution period except in region VII, while productivity tended to increase in all the regions.

Among the pulses, contribution of area to production increase in blackgram was substantial as compared to productivity in all the regions of Tamil Nadu. However, productivity contribution towards increased production of blackgram was negative in the regions V and VI. In the case of greengram, the yield and area were the

Table 5: The Share of Each Region in Total Average Change in Production of Major Agricultural Commodities*

(per cent)

Crop	Region							State
	I	II	III	IV	V	VI	VII	
Rice	2.97	38.09	23.63	12.95	7.86	20.16	-5.67	100.00
Cholam	-	0.11	96.73	-0.19	3.36	-	-	100.00
Cumbu	-0.01	-0.02	99.13	0.03	0.84	-	-	100.00
Maize	72.33	20.54	5.74	2.01	-0.63	-	-	100.00
Ragi	2.89	-108.74	-48.39	-13.82	5.98	-	62.08	-100.00
Blackgram	0.13	6.62	64.47	20.77	7.59	0.43	-	100.00
Greengram	0.05	9.17	53.11	31.82	1.99	3.86	-	100.00
Redgram	0.20	20.27	78.91	-0.05	1.03	-0.40	-	100.00
Sugarcane	0.20	54.67	39.37	1.54	4.32	-	-	100.00
Groundnut	8.67	-34.53	28.47	253.18	-144.36	-12.72	-	100.00
Cotton	0.04	52.65	45.65	2.26	-0.60	-	-	100.00

* For two periods (1956-57 to 1965-66 and 1966-67 to 1990-91).

major factors for increased production in all the regions except V and VI. The increase in production of redgram in the regions I, II and III was mainly due to area and yield effect. On the other hand, the contribution of area was negative in regions IV, V and VI, though the productivity of redgram positively contributed in these regions.

In the case of sugarcane, both the area and yield were the contributing factors for increased production in all the regions except region IV. Moreover, the area effect was more as compared to yield in all regions except II and IV. In region II, the productivity effect was relatively higher as compared to area. The increase in production of sugarcane in the region IV was solely due to increase in area because productivity showed negative effect.

The increase in production of groundnut was contributed only by the area. In general, contribution of yield was negative in all the regions except in the region III. With regard to cotton, the productivity effect was negative in major cotton producing regions viz., region II and V. The maximum contribution of yield for increase in production was noticed in region I while the area effect was found maximum in region II.

The share of each regions in incremental aggregate change in production of major agricultural commodities are set out in table 5.

With respect to rice, region II contributed to 38.09 per cent of incremental production followed by region III (23.63), region VI (20.16) and region IV (12.95). With regard to jowar and cumbu, region III shared as high as

96.73 per cent and 99.13 per cent in the change in production, respectively.

In the aggregate incremental production of maize at state level, region I claimed the highest share of 72.33 per cent followed by region II (20.54 per cent) and region III (5.74 per cent). With regard to pulses, region III contributed the maximum, accounting for 64.67 per cent in blackgram, 53.11 per cent in greengram and 78.91 per cent in redgram. In the case of sugarcane, region II accounted for 54.67 per cent of the production increase followed by region III. With 39.37 per cent. Region IV accounted for a major share in the increased production of groundnut with 253.18 per cent. With respect to cotton, region II and III were the main contributing regions to the additional production with 52.65 per cent and 45.65 per cent respectively.

Conclusions & Policy Implications

Area under rice showed declining tendency; however positive growth trend in productivity was found. It was found that in the case of rice, the regions VI, II, I and IV are high productivity regions in that order and the tempo should be maintained through strengthening the extension support. As regards other cereals, area shows declining tendency except maize. In region I, Dharmapuri district is the major ragi producing district. It was found that area under ragi showed a negative tendency. The district is prone to frequent droughts and as a result, the farmers exhibit risk aversion behaviour. Drought resistant varieties of ragi should be popularised and crop insurance scheme extended to cover ragi. More emphasis should be given to regions I, II and III in

augmenting production of millets. To sustain growth in area under millets, alternative uses of millets in terms of feed for cattle, poultry and fisheries should be explored. Area, production and productivity of pulses showed encouraging trend. To augment pulses production, cultivation of pulses should be encouraged in rice fallows. Productivity of pulses under rice fallows could be enhanced through improved management practices. Redgram showed positive trend in area in regions I and II. Since this tract is suitable for redgram, mixed cropping with groundnut could be encouraged.

To augment pulses production, cultivation of pulses should be encouraged in rice fallows. Productivity of pulses under rice fallows could be enhanced through improved management practices.

Sugarcane exhibited positive growth in terms of area, production and productivity. This calls for modernisation and diversification of sugar industry in the state, which could facilitate more remunerative price to sugarcane. In the case of groundnut, there was a marginal increase in area, production and productivity. The productivity gain is not keeping pace with acreage growth. Efforts have to be made to remove yield constraints and popularise drought resistant high yielding varieties of groundnut suitable for the regions I, II and III. Area under cotton shows declining tendency. Hence, emphasis should be given for evolving new hybrid varieties of cotton and popularising technological practices including IPM.

Sugarcane exhibited positive growth in terms of area, production and productivity. This calls for modernisation and diversification of sugar industry in the state, which could facilitate more remunerative price to sugarcane.

Fruits show increasing tendency in area, while productivity increase is marginal. Crash programmes for increasing the productivity of fruit crops are necessary. Fruits require proper handling, storage and processing to enhance export. In region I, acreage response for fruits is encouraging. Thus, processing plants especially for mangoes should be encouraged to keep pace with increasing export demand for mango pulp and juice.

Feasibility of starting such units should be explored.

Cashewnut production could be increased especially in regions II, III and IV through improved agronomical practices. Crash programmes for cashew should be taken up to meet export demand. In this context, a cashew corporation can also be established to encourage production and export. Production of banana could be encouraged in regions II, III and IV. In region V, more emphasis should be given to horticulture and fodder development through diversifying agriculture.

Area and productivity of vegetables show increasing tendency. Vegetable production could be enhanced in all the regions through organising production around the cities with the infrastructural facilities, which could help the peasantry and motivate the farmers to take up vegetable cultivation. Vegetable co-operatives could help in production, procurement, marketing, processing and distribution of vegetables. Facilities for handling storage and processing can be created to minimise post harvest losses. Efforts should be made to divert part of the production for processing, since there is good demand for processed vegetables in international markets.

Vegetable production could be enhanced in all the regions by organising production around the cities with the infrastructural facilities, which could motivate the farmers to take up vegetable cultivation.

To maintain area and production of tapioca in region I, a separate study is necessary to explore the various industrial uses of tapioca. Feasibility studies also could be taken up to explore the possibility of starting up of such industries. Modernisation of agro industries is necessary to improve quality standards to meet the export requirement. In this regard, institutional finance would help to greater extent.

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Production Potentialities of Export Oriented Horticulture Crops of Maharashtra

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Horticulture production has grown much faster in the state of Maharashtra than in the rest of the country, particularly for various fruits like grapes, oranges and cashewnuts. Nevertheless, there has also been declining trend in the share of Maharashtra in the nation's total production of banana and onions. The falling trend in the share of Maharashtra in the total national production of these two high value crops could be construed as depressing since India have been at the forefront of export of these commodities for long. The findings and estimates of this study indicate that the supply of fruits in general in India is likely to fall short of the domestic demand after the year 2001.

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Over the years, horticultural production of India has undergone remarkable change due mainly to significant shift in consumption pattern and as a result of other associated factors like changes in liberalized export-import policies, and exchange rate adjustment. Although many since long have suggested horticultural production promotion as one of the crucial component of strategies for diversified agricultural production, development of this sector received a major thrust only in the Eighth Five Year Plan when total plan allocation for horticultural development was stepped upto Rs. 1000 crore that accounted for an increase of a whopping 4000 per cent over the Seventh Plan¹ (Uppal, 1995). According to Islam (1990), horticultural products have a high income elasticity of demand. As income goes up, demand rises rapidly. It is due to this reason that demand for these high value products have increased sharply in due course of time.

As per the estimates reported by Singhal (1995), horticultural crops of India had about 12 million hectares of land under its cultivation during the year 1993-94, and the production of fruits and vegetables during this year was estimated at about 100 million tonnes. Of this, fruits accounted for about 35 million tonnes and the rest 65 million tonnes owed it to vegetables. In terms of fruits and vegetable production, Maharashtra is the most important state. This is due to the fact that the state is blessed with diverse agro-climatic conditions and so has the potentiality to produce a wide variety of fruits, flowers, vegetables and a host of other agro-based products round the year. In the pro-liberalization environment, the produc-

1. Until the Fourth Plan period, horticultural crops did not receive any significant attention. This is evident from the fact that the budgetary allocation for horticultural crops stood at a meagre Rs. 5 lakh in the Fourth Plan. A breakthrough was achieved in horticultural development in the Seventh Plan when the allocation for horticultural development activities went up to Rs. 24 crores from 7.6 crore in the Fifth Plan.

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In the pro-liberalization environment, the production of horticultural commodities without doubt have gained inherent export advantages.

Against this background, the present paper ventures to probe into the structural changes in the production pattern of various horticultural crops in the state of Maharashtra and India as a whole with a view to evaluate the underlying growth trends and instabilities in share of the state in the country, apart from examining the growth and instability in area, production and productivity of principal horticultural crops of Maharashtra. The paper also seeks to examine the relative contribution of effects of basic component (area, yield and their interaction) to the production of horticultural crops with a view to assess the factors responsible for rise or fall in various horticultural crop production in the state over time.

Data & Methodology

Time series data for thirteen years (1981-82 to 1993-94) on area, production and yield of major horticultural crops of Maharashtra, coupled with production figures for selected horticultural crops of the country as a whole, were collected from the annual publications of 'Districtwise Agricultural Statistical Information of Maharashtra' (Part II), Commissionerate of Agriculture, Pune and 'Production Yearbook' of Food and Agricultural Organisation of the United Nations (FAO). To this time series data, exponential trend equations have been fitted in order to compute compound rates of growth that were also tested for their significance by the Student t-statistics².

Since the time series data often contain trend component, an index of instability as suggested by Cuddy and Della (1979) and subsequently used by Gunjanana and Sharma (1990) was incorporated into the exponential analysis in order to take care of the trend com-

ponent in the data³. Decomposition of production increase in the current period (1991/92 – 1993/94) over the base period (1981/82 – 1983/84) was done using the method outlined by Vidya Sagar (1977, 1980) in order to measure the relative importance of area, yield and their interaction on the changes in production⁴. Three year average has been taken on each end.

The results of the study are presented in two sections. The first section examines the changing structure of selected horticultural crop production in Maharashtra vis-à-vis India and thereby evaluates the growth trends and instabilities in the share of the state in the country's total output over time. The second section seeks to provide an account of growth and instability in area, production and yield of principal horticultural crops of Maharashtra, besides an analysis into decomposition of production increase.

Changing Horticultural Production Scenario

The sustained thrust to planned development has vastly transformed the horticultural scene of India in general and in the state of Maharashtra in particular, turning it into an economically viable industry. From Table 1 it is seen that various fruits and vegetables produced in Maharashtra as well as in India as a whole got a real boost only during the period between the late eighties and the early nineties, that is, in the face of more liberal market environment. Between the early eighties and the early nineties period, while oranges and cashewnuts produced in Maharashtra recorded more than two fold overall increase in their production levels, grape production of the state expanded by leaps and bound during this period so much so that by early nineties it showed nearly ten fold increase in production over its earlier level during the early eighties. Banana

3. The formula for Instability Index (P) is as follows:

$$P = C.V. \sqrt{(1-R^2)}$$

Where C.V. is the coefficient of variation and $(1-R^2)$ is the unexplained portion of the variation in the trend equation.

4. Decomposition of production increase can be given as

$$Q^j - Q^0 = A^j Y^j - A^0 Y^0 \quad (1)$$

$$= (A^j - A^0) Y^0 + (Y^j - Y^0) A^j \quad (2)$$

The RHS of the identity (2) can be further decomposed as

$$Q^j - Q^0 = (A^j - A^0) Y^0 + (Y^j - Y^0) A^0 + (A^j - A^0) (Y^j - Y^0) \text{ or}$$

$$\Delta Q = \Delta A Y^0 + \Delta Y A^0 + \Delta A \Delta Y$$

Change in production = Area effect + Yield effect + Interaction effect

Here, (Q^j, Q^0) , (A^j, A^0) and (Y^j, Y^0) represent current and base period of production, area and yield, respectively.

2. The compound growth rates $(r) = (e^b - 1) \times 100$ were tested for their significance by the Student t-statistics given by

$$t = r / \text{S.E. } (r) \text{ where}$$

$$\text{S.E. } (r) = (100 b / \log e_{10}) \times \text{S.E. } (b)$$

Table 1: Changing Structure of Horticultural Production in Maharashtra and India (1981/82 – 1993/94)

(Quantity in '000 MT)

Crop	Triennium Average			% Change		
	Periods			2 Over 1	3 Over 2	3 Over 1
	1	2	3			
Maharashtra						
Banana	1252	1390	1915	11.02	37.77	52.96
Grapes	37	112	384	202.70	242.86	937.84
Oranges	86	165	201	91.86	21.82	133.72
Cashewnut	7	10	15	42.86	50.00	114.29
Onions	812	670	961	-17.49	43.43	18.35
India						
Banana	4483	5505	7610	22.80	38.24	69.75
Grapes	227	328	699	44.49	113.11	207.93
Oranges	1106	1473	1930	33.18	31.03	74.50
Cashewnut	195	150	265	-23.08	76.67	35.90
Onions	2591	2923	3725	12.81	27.44	43.77
Share of Maharashtra in India (%)						
Banana	27.93	25.25	25.16	-9.60	-0.36	-9.92
Grapes	16.30	34.15	54.94	109.51	60.88	237.06
Oranges	7.78	11.20	10.41	43.96	-7.05	33.80
Cashewnut	3.59	6.67	5.66	85.79	-15.14	57.66
Onions	31.34	22.92	25.80	-26.87	12.57	-17.68

Note: 1. Period I = 1981/82 – 1983/84; Period II = 1986/87 – 1988/89; Period III = 1991/92 – 1993/94.

and onions produced in the state have shown moderate overall increase in their production levels during this period. Most of the production increase for these two commodities was noticed in the second half of the overall period considered. A decline in onion production of Maharashtra was noticed between the early and the late eighties. Nevertheless, in the post late eighties period, onion production of Maharashtra increased sharply. The overall expansion in production levels for grapes, oranges and cashewnuts was found to be much higher in Maharashtra compared to the country as a whole. As for India, a fall in cashewnut production was noticed during the late eighties but thereafter its production increased perceptibly. Contrary to this, the production of oranges in the country was found to slow down in the second half of the overall period.

The share of Maharashtra in total banana production of the country has indeed come down from 28 per cent during the early eighties to about 25 per cent by the early

nineties. Despite this, Maharashtra still accounts for the lion's share in country's total banana production. The other major banana producing states of India are Tamil Nadu, Gujarat, Andhra Pradesh and Assam (Appendix 1). A steep decline in Maharashtra's share of onion production in India was also noticed during the late eighties, only to pick up in the subsequent period. In dismal contrast to this scenario, the share of grape production of Maharashtra in the nation's production has increased from a low of 16 per cent during the early eighties to 55 per cent by the early nineties. It is noteworthy that at present almost all the grapes produced in the country comes from four major states namely, Maharashtra, Karnataka, Punjab and Tamil Nadu (Appendix 1). As for oranges and cashewnuts, it is noticed that these two fruits produced in Maharashtra have shown similar trends over time in terms of fluctuations in their share in the country's total production, that is, a sharp increase in their share between the early and the late eighties and a marginal decline thereafter.

Horticultural Production

There is not an iota of doubt about the fact that in Maharashtra the horticulture sector has grown phenomenally and that the production of many of the fruits and vegetables of this state has grown many folds over time. The adoption of several liberal policy measures by the Government in more recent times has indeed boosted the state's horticultural production. However, in spite of all this, the share of various fruits and vegetable production of the State in the country has tended to fluctuate widely over time.

Table 2: Growth and Instability in Horticultural Production in Maharashtra and India (1981/82 - 1993/94)

Crops	CGR (%)	t-Statistic	R ² (%)	I (%)
Maharashtra				
Bananas	4.42***	4.51	64.93	14.04
Grapes	25.28***	14.79	95.22	17.13
Oranges	11.57**	2.55	37.19	45.69
Cashewnut	7.02***	5.20	71.10	15.50
Onions	1.81	1.40	15.10	17.40
India				
Bananas	5.71***	7.40	83.28	9.36
Grapes	11.45***	9.34	88.81	15.51
Oranges	6.01***	9.63	89.40	7.22
Cashewnut	1.02	0.45	1.81	32.57
Onions	3.37***	6.19	77.72	3.20
Share of Maharashtra in India (%)				
Banana	-1.22	0.96	7.66	16.57
Grapes	12.41***	7.31	82.92	17.32
Oranges	5.26	1.27	12.79	40.63
Cashewnut	5.93**	2.46	35.41	29.70
Onions	-1.51	1.46	16.30	13.73

Note: 1. CGR = Compound Growth Rate; I = Instability Index
2. ***, ** significant at 1 and 5 per cent level respectively.

Thus table 2 reveals a much faster rate of growth in production in Maharashtra than in India for various fruits like grapes, oranges and cashewnuts. During the period between 1981-82 and 1993-94, while grape production of Maharashtra grew at an annual compound growth rate of 25 per cent, the growth in the production of this high value fruit crop for the country as a whole was much lower at 11 per cent. Similarly, during the same period, the production of oranges is estimated to have grown at the rate of about 12 per cent per annum in Maharashtra as against only 6 per cent annual growth for India. Cashewnut production of Maharashtra has also grown appreciably over time, though for India the growth in production of this crop has been very slow. In

dismal contrast to very high rate of growth in production for various fruits like grapes, oranges and cashewnuts, the production growth of other commodities like bananas and onions in Maharashtra is estimated to have been much below the national average rate of growth. And, as a result of this, the share of Maharashtra in nation's total production is estimated to have declined at the rate of 1.2 per cent a year for banana and 1.5 per cent a year for onions during 1981-82 and 1993-94 periods. As against this, during the same period, the share of Maharashtra in the country's total output has grown at the rate of 12 per cent per annum for grapes, 5 per cent per annum for oranges and nearly 6 per cent per annum for cashewnuts.

As for instability in rate of growth in production, oranges showed the highest year to year fluctuation in output growth in Maharashtra. The fluctuations in output growth for other commodities produced in Maharashtra like bananas, grapes, cashewnuts and onions are seen to waver in the range of 14 to 17 per cent. By and large, Maharashtra has shown much higher instability in production growth than the nation as a whole.

In the following section, we examine the rates of growth in area, production and productivity of not only these selected crops but also two more fruit crops namely, mosambi and arecanut. These two crops, of late, have shown considerable expansion in their production levels in the state of Maharashtra.

Growth and instability in area, production & productivity

Growth trends in area, production and productivity along with instability in rates of growth for various horticultural crops of Maharashtra are provided in table 3. The observance of trend over the past decade or so reveals that compared to yield, production growth is faster for all the selected horticultural crops with cashewnuts and arecanuts which have shown higher growth in yield than in production being the only aberrations in this scenario. As a matter of fact, acreage under cashewnut and arecanut has declined over time in Maharashtra⁵. Nevertheless,

5. Acreage under arecanut cultivation in Maharashtra is seen to decline from 2120 hectares during 1981-82 to 1900 hectares in 1993-94 showing, thereby, an overall 10 per cent slide down over the past 13 years. Similarly, during the same period, acreage under cashewnut cultivation has declined from 17100 hectares to 14600 hectares—15 per cent overall fall in area during the past 13 years. As against this, the overall increase in area under the crop for the state as a whole during the same period is seen to be 91 per cent for banana, 468 per cent for grapes, 293 per cent for oranges, 589 per cent for mosambi (between 1985-86 and 1993-94), and 65 per cent for onions.

Table 3: Growth and Instability in Area, Production and Productivity of Horticultural Crops in Maharashtra and (1981/82 -'93/94)

Crops	CGR (%)	t-Statistic	R ² (%)	I (%)
<i>Area</i>				
Bananas	3.08***	3.17	47.80	14.28
Grapes	18.78***	14.27	94.88	13.91
Oranges	5.14***	9.98	90.05	6.59
Mosambi@	28.42	8.13	90.41	19.24
Cashewnut	-1.43	1.74	21.51	10.31
Arecanut	-1.30*	1.89	24.54	8.68
Onions	2.57***	2.49	36.14	15.94
<i>Production</i>				
Bananas	4.42***	4.51	64.93	14.04
Grapes	25.28***	14.79	95.22	17.13
Oranges	11.57**	2.55	37.19	45.69
Mosambi@	44.32***	9.34	92.56	19.91
Cashewnut	7.02***	5.20	71.10	15.50
Arecanut	3.72***	3.72	55.73	12.91
Onions	1.81	1.40	15.10	17.40
<i>Productivity</i>				
Banana	1.27***	4.90	68.61	3.17
Grapes	5.81**	4.63	66.08	14.09
Oranges	6.12	1.40	15.11	40.16
Mosambi@	12.39***	3.36	61.76	13.89
Cashewnut	8.56***	7.54	83.78	12.48
Arecanut	5.09***	5.07	70.07	12.29
Onions	-0.74	1.08	3.58	8.50

- Note:** 1. CGR = Compound Growth Rate; I = Instability Index
 2. ***, ** significant at 1 and 5 per cent level respectively.
 3. @ Growth and instability are estimated for the period 1985-86 to 1993-94 due to non-availability of data for the preceding years.

due to various technological efforts, yield of these two crops has improved significantly in due course of time. This apparently has resulted in higher production growth of these two crops despite decrease in acreage under the crops. The analysis also shows that there are large differences in growth rates across different crops. Between 1981-82 and 1993-94, grape output grew at the rate of 25 per cent a year, which is seen to be more than twice the output growth of oranges but half the output growth of mosambi. Both area as well as yield per hectare contributed to this higher rate of growth in output. Among the various horticultural crops, yield growth is seen to be the

highest for mosambi followed by cashewnuts, oranges, grapes, arecanut and banana. The productivity of onion is seen to have declined marginally with the passage of time. This is despite the fact that the acreage under onion has increased significantly. A decline in productivity inspite of reasonable growth in acreage under the crop has resulted in slower growth of onion production in the state of Maharashtra.

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In general output instability is seen to be much higher than area and yield instabilities across various selected crops. This held true of all the selected fruits and vegetables. Among various fruits and vegetables, output as well as yield growth of oranges is seen to be highly unstable. However, so far as area is concerned, mosambi has shown higher instability in its acreage compared to instabilities in acreage under other fruits and vegetables. Thus, fluctuations in output growth as well as in area and yield growth are seen to be much higher for various citrus fruits compared to other horticultural crops grown in Maharashtra.

Decomposition of Production Increase

The effect of yield, area and their interaction in the increase/decrease of total production for all the selected horticultural crops of Maharashtra have been worked out and are given in table 4.

It is seen that the rise in banana, grape, oranges and mosambi output in Maharashtra is due mainly to acreage expansion rather than yield. At the same time, there is no denying the fact that in the case of banana and oranges, yield expansion has also played a significant role towards rise in output. The effect of interaction between area and yield is found to be

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about 40 per cent for grapes and mosambi. The output increase in the case of onion is seen to be due to acreage expansion as the effects of yield and interaction of area and yield towards rise in production appeared to have been negative. As regards cashewnut and arecanut, the yield effect outweighed area as well as interaction effects. Both area and interaction between area and yield have shown a negative effect on rise in production of cashewnuts and arecanuts.

Table 4: Contribution of Area, Productivity and Their Interaction Towards Increasing Production of Horticultural Crops in Maharashtra

(Per cent)

Crop	Yield Effect	Area Effect	Interaction Effect
Banana	19.47	73.01	7.52
Grapes	8.67	50.50	40.83
Oranges	27.08	53.34	19.58
Mosambi	10.11	51.82	38.07
Cashewnut	133.56	-14.30	-19.26
Arecanut	151.85	-30.56	-21.29
Onion	-36.74	146.53	-9.79

Thus, decline in share of Maharashtra in the nation's total output of banana and onion could be traced in slower growth in the output of these two high value crops in the state. This is despite significant increase in acreage under these crops. The effect of yield towards rise in production is seen to be very low for banana and, in fact, is negative for onion.

Decline in share of Maharashtra in the nation's total output of banana and onion could be traced in the output of these two high value crops in the state.

Demand-Supply Perspective for Fruits & Vegetables

According to Gulati and others (1994), horticultural commodities of India such as banana, grapes, sapota, lychee, onion, tomato and mushroom are highly competitive in the international export market. This makes it necessary to examine the future export potentiality of India in fruits and vegetables.

At the prevailing rate of growth in production during the period 1989-94 and depending upon the annual average quantity produced during 1992-94 period, the

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total projected supply⁶ is estimated to be 43.01 million tonnes of fruits and 97.38 million tonnes of vegetables in the year 2001 and 52.79 million tonnes of fruits and 130.88 million tonnes of vegetables in the year 2006 (table 5). As against this, the total domestic requirement will be 52.60 million tonnes of fruits and 91.70 million tonnes of vegetables in 2001 and 69.10 million tonnes of fruits and 108.50 million tonnes of vegetables in 2006 (Kumar & Mathur, 1996). This implies that India will be able to generate exportable surplus of vegetables to the tune of 5.68 million tonnes by the year 2001 and 22.38 million tonnes in 2006. Nevertheless, fruit production will

Table 5: Demand-Supply of Fruits and Vegetables in 2001

(in million tonnes)

		Production ^a	Demand ^b	Surplus/ Deficit
Fruits	2001	43.01	52.60	-9.59
	2006	52.79	69.10	-16.31
Vegetables	2001	97.38	91.70	5.68
	2006	130.88	108.50	22.38

Note: a. Supply projections are based on applying rate of growth in production between 1989 and 1994 on annual average quantity produced during 1992-94 period. Production figures for Fruits and Vegetables are obtained from 'FAO Production Year-Book', various years.

b. Demand estimates provided by Praduman Kumar and V.C. Mathur (1996).

6. Between 1989 and 1994, while fruit production of India was found to grow at the rate of 4.18 per cent a year, the growth in vegetable production was 6.19 per cent a year. During 1992-94 period, the annual average quantity of fruits and vegetable production was 32.29 million tonnes and 64.38 million tonnes, respectively.

The projected supply of fruits and vegetables in the country for the year 2001 and 2006 has been estimated on the basis of trends as under:

$$X_t = X_0 [1 + (r/100)]^n$$

where,

X_t = Supply of X commodity in t th period (2001-2006).

X_0 = Annual average production of X commodity during 1992-94.

r = Rate of growth in production of X commodity between 1989 and 1994.

fall short of domestic demand and a deficit in the range of 10 to 15 million tonnes will be witnessed between 2001 and 2006. Poor growth in productivity improvements of various fruits may further hamper demand—supply situation and make the matter worse in years to come unless efforts are made to raise the productivity through various technological back up.

India will be able to generate exportable surplus of vegetables to the tune of 5.68 million tonnes by the year 2001 and 22.38 million tonnes in 2006.

Conclusions

Evidently, various fruits and vegetables produced in Maharashtra have undergone some major changes over the past decade or so. The analysis here shows that the share of Maharashtra in India for various horticultural crop production has fluctuated to a considerable extent. In due course of time, the share of Maharashtra has increased perceptibly in India in the production of various fruits like grapes, oranges and cashewnuts. Nevertheless, the period gone by is also marked with steady decline in the state's share for commodities like banana and onion, though a time-scale deceleration in this declining trend is also evident. This unseemly trend is noticed despite the fact that Maharashtra accounts for bulk of the nation's total production of banana and onion. Slower growth in production of these two high value crops in the state of Maharashtra could be considered alarming in view of their export competitiveness. The fact that the demand for fruits will fall short of supply by the turn of the century and thereafter makes it necessary to launch real concerted efforts towards rise in production levels of these high value crops. Efforts should also be made towards reducing post-harvest losses. The need of the hour is also to improve the efficiency of marketing so that producers could get their due

The fact that the demand for fruits will fall short of supply by the turn of the century and thereafter real concerted efforts towards high value crops.

share in the price paid by the ultimate consumers. In brief, horticultural production in country should be increased through proper technological back up, area extension, productivity improvement, marketing and price support and appropriate extension efforts.

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Share of Different States in Horticultural Production of India (1991-92)

(in per cent)

Crop	Share in Production
Banana	Andhra Pradesh (6.94); Assam (6.65); Goa (4.49); Gujarat (12.84); Karnataka (1.57); Kerala (3.80); Madhya Pradesh (9.04); Maharashtra (26.72); Orissa (3.53); Tamil Nadu (20.05); West Bengal (2.27); Others (2.10)
Grapes	Andhra Pradesh (0.97); Haryana (3.23); Karnataka (22.94); Maharashtra (55.25); Punjab (9.69); Tamil Nadu (7.59); Others (0.33)
Citrus	Arunachal Pradesh (1.1); Assam (9.01); Haryana (8.20); Madhya Pradesh (7.53); Maharashtra (13.88); Manipur (0.99); Meghalaya (2.53); Mizoram (0.99); Punjab (14.13); Rajasthan (7.77); Sikkim (1.05); Tamil Nadu (10.05); Tripura (2.28); West Bengal (7.46); Others (13.02)
Cashewnut	Andhra Pradesh (13.07); Gujarat (4.57); Karnataka (8.82); Kerala (46.73); Maharashtra (10.46); Orissa (10.46); Tamil Nadu (4.25); West Bengal (1.31); Others (0.33)
Onions	Arunachal Pradesh (4.14); Assam (0.27); Bihar (10.07); Gujarat (10.32); Haryana (1.51); Karnataka (19.48); Madhya Pradesh (4.09); Maharashtra (35.18); Punjab (1.13); Rajasthan (0.42); Tamil Nadu (5.60); Uttar Pradesh (6.85); Others (0.94)

Note: Shares have been computed on the basis of statewise production data obtained from (i) Singhal, Vikas (1995), Handbook of Indian Agriculture, Vikas Publishing House Pvt. Ltd., New Delhi and (ii) Agricultural Situation in India (1993), Vol. XLVIII (5), August.

Economic Potential of Agroforestry Systems for Sustainable Production

Vijay Paul Sharma & Gurbachan Singh

Agro-forestry is the only land use system that fulfills all the basic needs of rural poor by providing foodgrains and fodder from field crops and fuelwood and timber from trees. Agro-forestry also generates additional employment opportunities. There are significant changes in the productivity of soils. Integration of trees into land use system provides several benefits for soil fertility and nutrient cycling. The economic profitability of agroforestry practice relative to alternative farming systems based on field experiment, complimented by documented information on costs and prices has been studied. The farming systems consisted of three commercial tree species, namely, Eucalyptus, Acacia and Poplar, alone and in combination with different crop rotations viz., rice-wheat for 4 years followed by guinea grass and oats in 5th year; rice-berseem for four years followed by cowpea-berseem. The results of financial analysis of different land use systems showed that Poplar based agroforestry system was the most profitable and financially viable system. The benefit-cost ratio was highest in case on Poplar + rice + wheat. Thus agroforestry should not be viewed merely as a better and economically viable food, fodder, timber and firewood production system for rural poor but also as a promising land use system to maintain long-term sustainability.

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Introduction

Agriculture is one of the most important sectors in the Indian economy. In 1996-97 this sector generated 29.4 per cent of gross domestic product (GDP) and employed about two-third of the labour force in addition to contributing about 20 per cent of the export goods in the country (Govt. of India, 1997). The value of production in the forestry sub-sector contributes only 0.5 per cent of the total gross national product (Banerjee, *et al*, 1997). This percentage underestimates the economic contribution of the subsector because: (a) calculating the household consumption of fuelwood is difficult, and (b) many economic benefits in the subsector mainly ecological, aesthetic and tourism value of forests and wildlife and the protection and conservation of soil and water resources, can not be valued by the market.

The per capita forest area in 1951 was 0.20 ha. Between 1951 and 1991, the per capita area under forests was reduced by about 55 per cent. Current fuelwood consumption in the country is estimated at 230 million tons per year, about ten times the amount of recorded extraction (Molnar *et al*, 1995). Similarly the present gap between demand and supply of industrial wood is to the extent of 35 million cu.m. The pressure from livestock is too heavy to allow regeneration.

The growing population in the country is expected to aggravate the usual causes of deforestation, conversion of forest land to agricultural uses, demand for fuelwood, fodder and timber. Considering the fast increasing multiple demands and scarcity of the tree products and environmental degradation on fragile agricultural lands, agroforestry system may be projected as an ideal alternative. This is not only to help fulfill vast demands of fast growing population on sustainable basis but also to ensure environment stability and economic security to the rural poor. Agroforestry system is defined as an ideal combination of trees or shrubs with agricultural or horticultural

crops or livestock for optimizing land productivity, conserving soil, environment, reducing risks and producing timber, fuelwood and forage on a sustainable basis.

Agroforestry provides flexible alternatives to enhance the family farm owner's opportunity to improve economic incomes and survive in poor markets which increase the food and fibre supplies for the nation. Crop farming and wood product enterprises have been and are continuing to undergird the rural community development and food and fibre production for the nation. But due to lack of information on the efficiency of various enterprises with regard to their income and employment generating capabilities, it will not be possible to examine the potentiality of agroforestry system for augmenting the income and labour employment. Realising the importance and feasibility, three farming systems, namely, agriculture, forestry and agroforestry have been examined. The specific objectives of the study were: (i) to assess the profitability of the agroforestry practice relative to alternative systems using benefit: cost and related analyses, and (ii) to identify the role of trees in a household's livelihood and management of labour, land and other resources.

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Overview of Agroforestry Efforts

Agroforestry is an age-old land use system which has been practiced by farmers in various forms like shifting cultivation, taungya system, lease system, agri-silviculture system, agri-horticulture system, silvi-pastoral system, agri-silvi-pastoral system, cocoa based system, homestead system, alley cropping system, shelterbelts and windbreaks, in different parts of India. The policy framework of present agroforestry programmes is based on the report of the National Commission on Agriculture formulated in 1976, which recommended using private farm and community lands to meet growing fuelwood and fodder needs for self consumption of rural households and relieve pressure on forests. More thrust to agroforestry was given under National Forest Policy of 1988 to ensure environmental stability and maintenance of ecological balance. The national goal was set to have a minimum of one-third of total land

area of the country under tree cover. A massive need based and time-bound programmes of afforestations and tree plantings, with particular emphasis on fuelwood and fodder production, on all degraded lands in the country, with people's participation was stressed. In order to reduce pressure on natural forests, the new policy redefined the priorities in which it was advocated that as far as possible, private sector should interact with the people for growing trees through social/agroforestry for supply of raw material for wood based industries.

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Experimental Data

The present study is based on the data collected during 6 years (1989-95) at the Central Soil Salinity Research Institute, Karnal. Three commercial tree species, namely, Eucalyptus, Acacia and Poplar alone and in combination with different crop rotations viz., rice-wheat for 4 years followed by guinea grass and oats in 5th year; rice-berseem for four years followed by cowpea-berseem, were planted on moderately alkali soils in 20 cm wide and 100-120 cm deep holes dug out with tractor-mounted post-hole digger. These augerholes were refilled with a mixture of original dug out soil plus 3 kg gypsum and 8 kg FYM per auger-hole. All the inter crops included in the experiment were also grown in an adjacent field to assess their productivity in open without tree canopies. Observations on survival, height and girth of trees were recorded every year and after harvesting the biomass was separated into bole, branches and foliage biomass and air dried weight was recorded. Soil samples were also collected and analyzed for pH, EC, OC available N, P and K contents before the start of the experiment and after 5 years.

Financial Analysis

Economic benefits of agroforestry have been identified and detailed information on costs of different systems has also been gathered. In particular, benefit-cost ratio (B-C ratio), net present value (NPV) and payback period for a specific system have been computed. The following conventions were used in performing the financial analysis: (i) A real discount rate of 18 per cent was used in presenting results; (ii) The inputs were

Table 1: Influence of Tree Species on the Yield of Crops (t/ha) during 4 years

Tree species	Rice					Berseem/Wheat				
	I	II	III	IV	Avg.	I	II	III	IV	Avg.
Acacia [@]	4.2	3.7	3.3	1.3	3.1	72.4	77.8	34.3	18.2	50.7
Eucalyptus [@]	4.1	3.5	4.0	2.8	3.6	71.0	80.2	39.2	26.8	54.3
Poplar [@]	3.6	3.3	2.9	2.0	2.9	63.8	72.6	41.4	32.8	52.6
Open [@] (Control)	4.6	5.3	5.8	5.0	4.6	4.6	5.2	3.6	3.1	4.1
Acacia*	4.6	3.6	2.6	1.0	2.9	4.0	3.2	0.6	0.3	2.0
Eucalyptus*	3.6	3.7	3.7	2.4	3.4	3.6	3.0	1.4	1.0	2.2
Poplar*	2.8	3.5	2.4	1.6	2.6	2.6	3.0	1.6	1.2	2.1
Open* (Control)	4.6	5.3	5.8	5.0	5.2	4.6	5.2	3.6	3.1	4.1

[@] Rice-berseem crop rotation followed, *Rice-wheat crop rotation followed

valued at their market price and (iii) No cost was assigned to land because the systems compared were in the same land base.

The benefit: cost ratio (BCR), the net present value (NPV) and the payback period (PBP) were worked out by conventional methods. For example,

$$\text{Benefit-Cost Ratio} = \frac{\sum_{t=1}^n \frac{B_t}{(1+r)^t}}{\sum_{t=0}^n \frac{C_t}{(1+r)^t}}$$

$$\text{Net Present Value} = \sum_{t=0}^n \frac{B_t - C_t}{(1+r)^t}$$

Where B_t is the cash inflow from the investment over the time period t ; C_t is the initial investment or the cost of the project in t th period; n is the duration of the system and r is the discount rate.

Results & Discussion

Crop Yield

None of the trees had significant adverse effects on the crop yields during the first two years of transplant (table 1). However, for the third year, rice yield on *Eucalyptus*, *Acacia* and *Poplar* plots were only 59.7, 49.3 and 43.3 per cent of that of control under rice-berseem crop rotation. During the fourth year, compared with the control, *Eucalyptus* significantly reduced rice yield by 50 per cent, *Acacia* by about 77 per cent and *Poplar* by 64 per cent. Similarly, berseem yield was also 47 per cent lower on *Eucalyptus* plots and 35 per cent under *Poplar* based agroforestry land use system. The average rice grain yield in four years was 67, 58 and 53 per cent under

Eucalyptus, *Acacia* and *Poplar*, respectively, compared to its yield in open without trees. Similarly, berseem fodder yield on *Eucalyptus*, *Acacia* and *Poplar* plots was about 62, 55 and 60 per cent of that of control.

In the second crop rotation of rice-wheat, the rice yield was maximum under *Eucalyptus* trees and minimum under *poplar*. The wheat yields under tree canopies were from 49 to 54 per cent of its yields in open. The adverse effects of tree canopies on inter-crops started appearing after two years and increased significantly upto fourth year. Shah (1988) also reported that the yields of cultivated fodder and grains (field crops) were adversely affected second year onwards in agroforestry systems.

From the above results it is seen that in the initial 2-3 years, rice-wheat or rice-berseem crop rotations can be grown successfully as inter-crops with *Eucalyptus*, *Acacia* and *Poplar*. After three years, these crops may be replaced with other crops like guinea grass and oats (for fodder) and turmeric.

Performance & Yield of Trees

Yearly observations on survival, height and girth of the trees were recorded. The tree survival recorded after five years was significantly higher in *Acacia* and *Eucalyptus* compared to *Poplar* trees (table 2). The lower survival in *Poplar* probably indicated its sensitivity to alkali soil conditions. However, inter-crops did not have any significant negative impact on the survival rate of the trees. In general, the survival percentage was lower without crops. In sole trees, survival of the *Poplar* trees was only 57 per cent. The low survival was probably due to moisture stress, because the total

amount of water supplied to sole trees was 1/4th or 1/10th of that applied in agroforestry land use system.

Table 2: Survival Rate of Different Tree Species as Affected by Inter-Crops

Tree species	Crop rotations			Mean
	Rice-berseem	Rice-wheat	Sole trees	
Acacia	98	98	96	97
Eucalyptus	94	91	98	94
Poplar	91	87	57	78
Mean	94	92	84	90

The girth and biomass production of trees under different land use patterns are shown in table 3. The girth at breast height ranged from 33.8 cm (*acacia* + rice + berseem) to 61.7 cm (*poplar* + rice + wheat). Biomass yield of different tree species nearly six years after planting showed that the average biomass accumulated in bole, branches and foliage was highest in *Acacia* and minimum in *Eucalyptus*. More biomass accumulation in *Acacia* is due to its greater tolerance to soil alkalinity compared to *Eucalyptus* and *Poplar*. Similar findings have been reported by Grewal (1984) and Gill *et al.*, (1987).

Table 3: Effect of Inter-Crops on Girth (cm) and Biomass of Eucalyptus, Acacia and Poplar Trees

Land use systems	GBH* (cm)	Total biomass (Kg/tree)
Acacia (Sole trees)	41.0	185
Acacia + rice + wheat	39.6	127
Acacia + rice + berseem	33.8	98
Eucalyptus (Sole trees)	40.4	102
Eucalyptus + rice + wheat	44.3	127
Eucalyptus + rice + berseem	41.9	136
Poplar (Sole trees)	47.1	76
Poplar + rice + wheat	61.7	152
Poplar + rice + berseem	51.6	126

*GBH : Girth at breast height

The total biomass production in *Eucalyptus* was maximum (136 kg/tree) when grown with rice and berseem and minimum (102 kg/tree) when planted as sole tree. However, *Acacia* biomass was maximum (185 kg/tree) as a sole tree followed by *acacia* + rice + wheat (127 kg/tree) and minimum under *acacia* + rice + berseem. On the other hand, *Poplar* produced maximum biomass (152 kg/tree) when planted in association with rice and wheat and minimum (76 kg/tree) as sole plantation.

Financial Analysis of Different Land Use Systems

Based on field research, complimented by documented information on costs and prices, a financial analysis has been carried out for different farming systems. The analysis was ex-post on the basis of yields already observed. Costs per hectare of different land use systems were worked out. The major expenditure for establishing tree plantations was on site preparation which included land leveling and bunding, digging of augerholes, cost of amendment, FYM, cost of saplings, ploughing, irrigation, etc. The average cost of planting *Acacia* on one hectare of moderately alkali soil was worked out to be about Rs. 8,996. The corresponding figures for *Eucalyptus* and *Poplar* were Rs. 7,496 and Rs. 7,021 respectively. Routine maintenance costs were incurred in other years and harvesting cost was incurred in the last year.

Direct benefits from different land use systems were worked out on per hectare basis. For calculation of direct benefits, i.e. timber from trees, prevailing market prices were taken while in valuation of crop output, farm harvest prices were used. The results of financial analysis of different systems showing benefit: cost ratio, net present value and payback period are presented in table 4.

Without Trees: Under this scenario, where rice-wheat and rice-berseem were grown, the production resulted in an average net present value of Rs. 49,007 and 53,724, respectively. The benefit: cost ratio was 2.79 in case of rice-wheat and 2.39 in case of rice-berseem crop rotations at 18 per cent discount rate.

With Trees: All the systems analyzed under this category were profitable at 18 per cent discount rate, with most profitable systems generally associated with quicker pay back periods. Dividing the systems into tree and tree + agricultural (agroforestry) components, a pattern is very evident in the financial indicators. The benefit: cost ratios for the agroforestry systems were always higher than those for tree components in case eucalyptus and poplar. The net present value in all the cases was also higher for agroforestry systems than trees alone. The benefit-cost ratio was highest (3.30) in case of Poplar + rice + wheat land use system followed by Poplar + rice + berseem and lowest (1.76) in *Acacia* with rice and berseem. In case of trees poplar was the most profitable tree followed by *Acacia* and the lowest in case of *Eucalyptus*. The net present value varied from Rs. 13,618 in *Eucalyptus* to Rs. 81,804 under Poplar + rice + wheat agroforestry system. The pay back period criterion also indicated that whole cost of sys-

Table 4: Financial Indicators for Different Land Use Systems

Indicators	Description of Systems										
	Acacia			Eucalyptus			Poplar		Agricultural Crops		
	Tree only	Intercropped with		Tree only	Intercropped with		Tree only	Intercropped with	Tree only	Intercropped with	Tree only
Description	Acacia alone	Rice and wheat	Rice and Berseem	Eucalyptus alone	Rice and wheat	Rice and berseem	Poplar alone	Rice and wheat	Rice and berseem	Rice and wheat	Rice and berseem
Main products/services	Timber, fuelwood, soil enrichment	Timber, fuelwood, soil enrichment, crop production	Timber, fuelwood, soil enrichment, crop production, fodder production	Timber, fuelwood, soil enrichment	Timber, fuelwood, soil enrichment, crop production	Timber, fuelwood, soil enrichment, crop production, fodder production	Timber, fuelwood, soil enrichment	Timber, fuelwood, soil enrichment, crop production	Timber, fuelwood, soil enrichment, crop production, fodder production	Crop production	Crop production, fodder production
NPV(Rs.)	22,569	29,347	31,033	13,618	34,820	48,797	15,807	81,804	80,668	49,007	53,724
Incremental NPV*	-	6,778	8,464	-	21,202	35,179	-	65,997	64,861	-	-
B:C ratio	2.02	1.80	1.76	1.99	2.06	2.23	2.38	3.30	2.95	2.79	2.39
Payback period (Yrs.)	6.0	1.9	2.0	6.0	2.0	2.3	5.6	2.3	2.0	-	-

* Incremental NPV is the difference between NPV of sole trees (without agroforestry case) and the NPV of the agroforestry systems.

tem can be recovered within two to three years in case of agroforestry land use system. The results showed that Poplar based agroforestry system is the most profitable and financially viable land use system.

Household Benefits from Agroforestry

Fulfillment of basic needs of rural poor: Most of the rural poor feel that availability of sufficient foodgrains is their first basic need. Other basic needs of the rural household are energy (fuel wood), fodder (for increased milk production and cash) and shelter (for housing). Agroforestry is the only land use system which can fulfill all the basic needs of the rural poor by providing foodgrains and fodder from field crops and fuelwood and timber from tree species.

Agroforestry can fulfill basic needs of the rural poor by providing foodgrains and fodder from field crops and fuelwood and timber from tree species.

Employment potential: Agroforestry can generate additional employment in two ways. Firstly, farmers have to put additional labour to maintain trees and to harvest the produce and secondly, agroforestry can support new areas of employment.

Improvement in soil fertility: Several benefits for soil fertility and nutrient cycling are expected from the integration of trees into land use systems. Agroforestry is a useful component of systems for the reclamation of degraded soils. The results also showed that trees helped to decrease the pH and EC of the soil. The average decrease in pH was maximum in Poplar based system and minimum when crops were grown without trees. Larger decrease in pH and EC in poplar based system was mainly due to higher leaf litter addition as compared to *Acacia* and *Eucalyptus* based system (table 5).

Agroforestry systems play an important role of the organic carbon accretion in the soil. Maximum build up of the carbon occurred under *Acacia* base land use system followed by *Poplar* and *Eucalyptus*. Earlier investigations at the same site by Singh and Gill (1992) and Singh, *et al* (1994) also showed a considerable build up in the organic carbon status of alkali soils when planted to trees. In all the agroforestry systems, maximum organic carbon build up was observed under rice-berseem crop rotation. Trees can also provide additional nitrogen fixation and deep nutrient capture. The N accretion to the soil was maximum in *Acacia* based system and the minimum under crops grown without trees. The maximum increase in available N was observed under rice-berseem crop rotation.

The status of available P also improved under agroforestry land use system, whereas, slightly deple-

Table 5: Effect of Different Tree Crop Combinations on Properties and Available Nutrients of 0-30 cm Soil

Land use	Soil properties			Available nutrients		
	pH ₂	EC ₂ (dS/m)	OC (%)	N	P (kg/ha)	K
<i>A. Without trees</i>						
Fallow	-0.90	-0.17	+0.12	+9.0	+2.1	+32.0
Rice-Wheat	-0.40	-0.16	+0.40	+5.0	+5.1	-48.0
Rice-Berseem	-0.50	-0.22	+0.09	+19.0	+4.0	-59.0
<i>B. With Acacia</i>						
Sole tree	-0.90	-0.35	+0.17	+34.0	+24.7	+138.0
Rice-Wheat	-0.60	-0.22	+0.22	+27.0	+18.6	+59.0
Rice-Berseem	-0.70	-0.23	+0.25	+36.0	+10.8	+54.0
<i>C. With Eucalyptus</i>						
Sole tree	-0.70	-0.38	+0.11	+20.0	+4.3	+115.0
Rice-Wheat	-0.07	-0.16	+0.11	+24.0	+4.1	+5.0
Rice-Berseem	-0.09	-0.50	+0.17	+27.0	+5.4	-5.0
<i>D. With Poplar</i>						
Sole tree	-0.50	-0.21	+0.09	+13.0	+10.0	+119.0
Rice-Wheat	-1.00	-0.44	-0.23	+30.0	+8.6	+66.0
Rice-Berseem	-0.80	-0.24	+0.28	+34.0	+3.4	+43.0

(-) indicates decrease and (+) increase

tion of available P occurred when sole crops were grown. The highest increase (18.3 kg/ha) in available P was in *Acacia* based land use system. Agroforestry land use system also increased the available K status of the soil, ranging from 35 kg/ha in eucalyptus based system to 84 kg/ha in poplar based system. However, there was depletion of K @30 kg/ha when crops were grown without trees. Agroforestry systems can also control soil erosion.

Risk management: Adoption of agroforestry systems can both reduce and increase risks to household livelihood security. The major positive benefit was income diversification. There are, however, also significant risk factors associated with some agroforestry systems. For example, there are risks associated with tree establishment ventures that were unsuccessful because of poor planting material, lack of knowledge, unusual draught conditions and risks of market prospects.

Social and environmental benefits: There is little quantitative data available on social and environmental benefits provided by agroforestry systems. However, some anecdotal evidence indicates that agroforestry is making social and environmental contributions that

could justify further promotion for these purposes. Agroforestry may replace less stable systems, protect remaining forest resources by providing the alternative supply of tree products, and provide employment and income for rural poor and thus help to slow migration from rural to urban areas.

Agroforestry may replace less stable systems, protect remaining forest resources by providing the alternative supply of tree products, and provide help to slow migration from rural to urban areas.

Conclusion

The results show that the output from agroforestry system can be diversified and higher economic returns obtained by this land use pattern. None of the trees had a significant adverse effects on crop yields during the first two years. However, the yields of cultivated field crops were adversely affected third year onwards under agroforestry system. But the reported

losses in agricultural production were typically offset by the benefits received from the trees. Positive effects of trees on crops were observed for agroforestry systems that improve organic carbon, available N, P and K contents in the soil. Agroforestry land use system also helped to reclaim the degraded soils: for example trees helped to decrease the pH and EC of the soil.

The results of financial analysis showed that all the systems analyzed were profitable at a 18 per cent discount rate, with most profitable systems generally associated with quicker payback periods. The net present values (NPVs) were positive for all the systems examined. Benefit: Cost ratios were above 1.5 in all the cases. Payback periods were quite long for block plantations, but for agroforestry systems they ranged between 1.9 to 2.3 years. Thus, the long gestation period, which is commonly assumed for tree based systems, does not seem to be problem for the most of agroforestry systems analyzed. Poplar based agroforestry systems were financially superior to other land use systems. Popular + rice + wheat land use system gave the best economic returns in terms of benefit-cost ratio, net present worth and pay back period. All the socio-economic indicators analyzed showed that agroforestry is an ideal land use system for small farmers and rural poor. The study concluded that agroforestry should not be viewed as a better and economically viable food, fodder, timber and firewood production system but also as a promising option to maintain long-term sustainability and also a practical solution for sequestering C in the soil. It is hoped that

the findings of this study will be valuable for project planners, policy makers and practitioners.

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An Economic Profile of Migrant Agricultural Labour in Punjab

M.S. Sidhu, P.S. Rangi & Karam Singh

The post Green Revolution period saw an increasing trend of agricultural labour migration in Punjab. Over the years a discernible pattern is emerging in that the State is employing migrant labour for about one-tenth of the labour requirement. Besides the economic aspects of labour migration, the phenomenon has several other social bearings like changes in language, food habits, dress customs etc. with a few negative effects like increasing incidence of smoking, zarda chewing also being observed. The paper highlights the various important socio-economic aspects of agricultural labour migration both in Punjab and in the States where the migrant labour comes from. Drawing from a recently concluded study as well as other major studies on the subject, the paper concludes that the overall impact of labour migration in Punjab has been beneficial to all the sections of the society.

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There has been an influx of migrant agricultural labour to Punjab from the neighbouring states, especially after the initiation of the process of green revolution, consequent to widespread adoption of wheat-paddy crop system. The increasing inflow of migrant labour in the agricultural sector has far-reaching consequences both positive and negative. The positive aspect is that the migrant farm labourers improve their economic position, acquire new farming skills and supply labour to meet the increasing demand for the same in the peak periods. However, the increased influx of migrant labourers to Punjab might have depressed the wages and employment levels of the local labour. Besides, this process has much wider policy implications in the context of ongoing land reforms and modernization of agriculture in the country. The present paper examines these implications.

Objectives

The data from three comprehensive studies on migrant agricultural labour in Punjab undertaken by the Department of Economics and Sociology, Punjab Agricultural University, Ludhiana during the years 1978-79, 1983-84 and 1995-96 (Grewal, 1979; Sidhu and Grewal, 1984 and Sidhu *et al*, 1997) have been considered. All these three studies were conducted in Ludhiana, Patiala, Faridkot and Amritsar districts of the State. The former two districts were known to have the highest concentration of migrant labour and the latter two attracted relatively less number of these migrants. Simple random sampling, therefore, was used for selecting the blocks and villages. Three blocks from each of the selected districts were taken randomly. Two villages from each selected block were also chosen randomly. It may be mentioned that to examine the temporal changes in the number of migrant labourers, their wage rates, employment, etc., the selected districts, blocks as well as villages were kept the same for these three studies. However, the

selected migrant labourers, farmers and local labourers were different in all the three surveys. During the 1978-79 survey, the ultimate sample consisted of 70 migrant labourers and 120 farmers and local labourers each. For the 1983-84 study, the total sample consisted of 210 migrant labourers against 120 farmers and local labourers each. However, during the 1995-96 study, the sample consisted of 330 migrant labourers, 120 local labourers and 120 farmers. The data used in this paper related mainly to the year 1995-96.

Socio-economic background of the migrant labour

The study showed that about 75 per cent of the respondents belonged to Bihar State and about 18 per cent hailed from Uttar Pradesh. About five per cent of the migrant labourers who came to rural Punjab were from Nepal and 1.21 per cent from Rajasthan. The major reason behind large scale migration of labour force was the stark poverty and lack of gainful employment opportunities in their home states. It may be mentioned that Bihar has the highest ratio of poor (55 per cent) with 50 million persons below the poverty line, second only to Uttar Pradesh with 60 million people (41 per cent) recorded. Rural poverty is predominant in both the states involving some 95 million people. Of the total poor in the country during the year 1993-94, Uttar Pradesh and Bihar accounted for one-third (Sethuraman, 1997).

The major reason behind large scale migration of labour force was the stark poverty and lack of gainful employment opportunities in their home states.

The study indicated that about 75 per cent of the labour force fell in the most labour productive age group of 20-40 years. About 87 per cent of them belonged to the lower castes. Among this group, about 68 per cent were scheduled castes and about 18 per cent belonged to the backward castes. About 72 per cent of the migrant labourers were married, although only about two per cent brought their families along with them. A vast majority of the migrants (about 71 per cent) were totally illiterate.

Furthermore, out of 330 migrant labourers, 123 had some land at their native places. Those who owned land, about 70 per cent had land holdings up to two acres only which was usually not much productive. About 48 per cent of the respondents were found to be under debt. The migrant labourers incurred debt mostly

for meeting their consumption needs and other social obligations. The rate of interest charged on this amount was exorbitant.

The wage rates of the migrant labourers in their native areas were quite low both for casual as well permanently employed labour. The average wage rate for casual employment at the native places of migrant labourers worked out to be Rs. 21.73 per day during 1995-96. Considering the employment even for 15 days a month, the average daily earning during 1995-96 worked out to be Rs. 10.87. For the permanently employed labour, the average wage rate in their native villages worked out to Rs. 332 per month during 1995-96. Besides, the low wage rates, the demand for labour was also for short periods during the year in these states.

The wage rates of the migrant labourers in their native areas were quite low both for casual as well permanently employed labour.

Factors associated with migration

The influx of migrant farm labour started in the wake of green revolution in Punjab and has picked up during the course of time. The data given in table 1 show the period of migration of the respondents of the different surveys in Punjab. It is interesting to note that annual surveys during 1978-79, 1983-84 and 1995-96 migrant labour came to Punjab invariably in a time span of 10 years or so.

Number of migrant labourers

The task of estimating the exact number of migrant agricultural labourers in Punjab is difficult. This is because, firstly, their number is highly variable during different parts of the year. Secondly, they are not uniformly distributed in different areas of the State. They are mostly concentrated along the Sher Shah Suri Marg (G.T. Road). Thirdly, there are no recorded statistics about the number of migrant agricultural labourers in Punjab except some evidence available from earlier studies undertaken in this regard.

In table 2 the estimates of migrant labour at different times are given. An earlier study conducted at PAU, Ludhiana during 1978-79 showed that the number of migrant agricultural labourers has been 2.19 lakhs, which formed 7.60 per cent of the total agricultural labour force in the State. In their next study (1983-84), the number of migrant labourers was 2.86

Table 1: Period of migration of respondents

Period	1978-79 survey	1983-84 survey	1995-96 survey
	Number of Respondents		
Before 1965	5 (7.14)	6 (2.85)	-
1965-70	4 (5.72)	2 (0.95)	5(1.52)
1970-75	11 (15.71)	12 (5.72)	3 (0.91)
1975-80	50 (71.43)*	59 (28.10)	15 (4.55)
1980-85	-	131 (62.38)**	35 (10.60)
1985-90	-	-	72 (21.82)
1990 and afterwards	-	-	200(60.60)
Total	70(100.00)	210(100.00)	330(100.00)

* The respondents migrated from 1975 to 1978-79.

** The respondents migrated from 1980 to 1983-84.

Note: Figures in parantheses indicate the percentage to total.

Table 2: Estimates of migrant agricultural labourers in Punjab

Year of reference	Estimated No. of migrants (in lakhs)
1978-79	1.00
1978-79	1.50
1978-79	1.35
1983-84	4.00 to 5.00
1978-79	2.19
1983-84	2.86 (Lean period) 5.72 (Peak period)
1995-96	3.87 (Lean period) 7.74 (Peak period)

Sources: Chum (1984); Grewal and Sidhu (1979); Johl (1975); Munro (1979); Rupal (1979); Sidhu and Grewal (1974); Sidhu *et al* (1997).

lakhs in the forming about 10 per cent of the total labour force and about 25 per cent of the landless agricultural labourers. The third study conducted by PAU, gave an estimate of migrant labour employment at 3.87 lakhs during the lean season and 7.74 lakhs during peak season. The number of migrant labourers in the lean period comes to about 11 per cent of the total agricultural labour force in the State and about 25 per cent of the landless agricultural labourers. The number of migrant labourers was estimated to be almost double in the peak period of work load, i.e.,

during the paddy harvesting and threshing of paddy etc. and formed about 21 per cent of the total agricultural labour force in the State and about 50 per cent of the landless agricultural labour employed at peak periods.

It may be pointed out here that there has been a 35.31 per cent increase in the number of migrant agricultural labour force in the State during the year 1995-96 as compared to their number during 1983-84. This increase seems to be low as compared to the period between 1978-79 and 1983-84. The number of migrant labourers had increased by 30.33 per cent in 1983-84 in comparison to 1978-79 in the State. This may be attributed mainly to the increase in paddy area of the State. Between 1978-79 and 1983-84, the annual increase in paddy area was 86 thousand hectares whereas in the later period, i.e., 1983-84 to 1995-96, this increase declined to 57 thousand hectares. Moreover, the cropping intensity has become almost stagnant at around 183 per cent for the last few years and there is little scope for its increase in the near future. This analysis showed that in the initial period, the rate of increase in the number of migrant labourers was fast which slowed down subsequently. However, in proportionate terms (local and migrants), the increase has been from 7.60 per cent in 1978-79 to 9.57 per cent in 1983-84 and about 11 per cent during 1995-96. This means, the Punjab agriculture has developed a structure and system of employing almost one-tenth of its total labour use for the migrant labourers. The Punjab agriculture having become more or less saturated in proportionate terms, as an avenue of employment for migrant labourers, the additional employment in absolute terms would only be coming from the increase in total employment in the sector, which in any case presents a scenario of sluggish growth; some avenue through structural shift from family labour to hired labour not withstanding. This too has a very limited scope, the leisure preference does have an opportunity cost and there does occur a point of tangency where further substitution becomes irrational.

Given the above scenario, the migrant agricultural labour force has also started looking for new employment opportunities in the State in the non-agricultural sector, viz., richshaw pulling, construction workers, skilled and unskilled workers in factories, petty shopkeepers like vegetable and fruit vendors, tea-stall, pan, bidi, cigarette sellers, shop attendants, cooks or waiters in hotels/restaurants/halwai shops, shoe repairing, masons, carpenters, gardeners, presswalas, etc. Most of these employment opportunities are available to these labourers in the urban areas of the State where being in larger groups, they also consider themselves to be more secure.

Employment and wages of migrant labour

The migrant labourers generally preferred to work in those villages where they had worked earlier. Their inter-village and inter-district migration in Punjab is comparatively low. The study showed that fifty per cent of the migrant labourers had worked only in the villages under study while about 27 per cent had worked earlier in other villages too but in the same district. About 23 per cent of the migrant labourers had reported that they had earlier worked in other districts of the State also. Some of the factors behind changing the place of work were better employment opportunities in other villages, minor conflicts between the labourers and farmers and change of village to work with the relatives of the previous employer, which of course, took place at the instance of the former employer. Sometimes, these labourers also indulged in petty fights among themselves and therefore, preferred to leave that particular village just to avoid such incidents in future.

The migrant labourers generally preferred to work in those villages where they had worked earlier. Their inter-village and inter-district migration in Punjab is comparatively low.

In Punjab, majority of the migrant labourers (52.12 per cent) worked on casual basis and 16.06 per cent worked on yearly contract (called permanent) basis. The permanent labourers were engaged mostly by large and medium sized land holders. About 32 per cent were seasonal migrant farm labourers. These seasonal labourers worked mostly on work contract basis (per acre basis farm operations) or on casual, i.e., on day-to-day employment basis. It may be mentioned that during the peak period of work load, i.e., harvesting of wheat, transplanting of paddy, harvesting and threshing of paddy, the casual labourers also preferred to work on contract basis. The main reason for working on casual/contract basis was that these labourers wanted to go back to their native places in the lean periods.

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The wage rates in 1995-96 for casually employed migrant farm labour varied from Rs. 30 to Rs. 40 per day during the lean periods to Rs. 50 to Rs. 70 per day during the peak periods of work load. Besides, food was served to these labourers 2-3 times a day. Hence, food and tea was in addition to the cash wages paid to these labourers. A comparison of wage rates over time showed that wage rates for casual migrant labour during the lean period in the study area, on an average, were Rs. 5.71, Rs. 8.71 and Rs. 39.55 during 1978-79, 1983-84 and 1995-96 respectively. Thus, the wage rates have increased by 5.93 times and 3.54 times by 1995-96 in comparison to the years 1978-79 and 1983-84 respectively. The growth rate in nominal wages has increased from 8.8 per cent year during the period 1978-79 to 1983-84 to 13.4 per cent per year during 1983-84 to 1995-96.

Further, a comparative analysis of the wage rates during the peak period showed that the casual labourers got 5.52 times and 3.50 times higher wages in 1995-96 as compared to the years 1978-79 and 1983-84 respectively. The average wage rate which was Rs. 9.86 per day in 1978-79 increased to Rs. 14.29 per day in 1983-84. This further increased to Rs. 64.32 per day during the year 1995-96. This was due to the heavy demand for labour in peak periods of work load. Again, the growth rate in nominal wages has increased over time. It was 7.7 per cent per annum during the period 1978-79 to 1983-84 and 13.4 per cent per annum during 1983-84 to 1995-96. It is worthwhile to mention that wage rate largely depended on the forces of demand for and supply of labour. That the growth rate in the wage rates during the lean and peak seasons are close to each other is not a mere coincidence; it points out the phenomenon of the supply of labour getting adjusted to the demand for labour through back and forth travel during the year by the migrant labourers.

The study brought out that wage rates of permanently employed migrant agricultural labour varied from Rs. 10,000 to Rs. 12,000 per annum in about 77 per cent of the cases during the year 1995-96. The wage rates for migrant labour in Amritsar and Faridkot districts were higher as compared to Ludhiana and Patiala districts. This may be due to low concentration of migrant labourers in Amritsar and Faridkot districts. Over time, the average wage rate for permanent labour which was Rs. 1514 per annum in the year 1978-79 increased to Rs. 3071 per annum during 1983-84. This gave an increase of 102.80 per cent. This wage rate further increased to Rs. 11091 per annum during 1995-96 indicating an increase of 633 per cent and 261 per cent over the years 1978-79 and 1983-84 respectively. This may be attributed to the increased demand for labour, more bargaining power of the migrants, general

price hike, etc. However, the growth rate in nominal wages for permanently employed labourers has decreased from 15.2 per cent per annum during the period 1978-79 to 1983-84 to only 11.3 per cent per annum during 1983-84 to 1995-96. This may be attributed to the typical phenomenon of increasing casualisation of agricultural labour in Punjab during the latter period.

Farmers and the migrant labour

The study showed that about 58 and 34 per cent of the sample farmers employed the local and migrant labour respectively on permanent basis during the year 1995-96. The respective figures for the year 1978-79 were 46 and 24 per cent. During the year 1983-84, these figures for the local and migrant labour were 41 and 30 per cent respectively. This comparison showed that over time, the percentage share of the migrant labour has increased by 10 per cent in 1995-96 as compared to 1978-79. This change may be attributed partly to the increase in the aggregate demand for labour overstepping the supply of family labour and partly to the fact that the increase in the leisure preference of the farmers of Punjab has increased their dependence upon the hired labour over time. Thus, various studies have shown that the share of family labour in agriculture has declined over time in the State (Prihar and Sidhu (1986); Sidhu and Grewal (1990); and Sidhu and Sidhu (1992)). The change in favour of migrant labour may be attributed to the better skills attained by them with the passage of time and a little lower wages as compared to local labour.

The number of local as well as migrant labourers employed by the Punjab farmers on permanent basis during the year 1978-79, 1983-84 and 1995-96 are given in table 3. About 72 per cent farmers who employed local labourers had employed one each and this figure was about 83 per cent for the farmers engaging migrant labour on permanent basis during the year 1995-96. Further, 17.39 per cent of the farmers employed two local labourers each on permanent basis whereas, two migrant labourers each were employed by 17.07 per cent of the farmers. About six per cent of the farmers employed three local labourers each, 1.45 per cent employed four local labourers each and 2.90 per cent farmers employed five local labourers each. On the other hand, none of the selected farmers employed more than two migrant labourers. Similar was the position even in 1978-79 and 1983-84 which showed that the farmers had employed more number of local labourers on permanent basis. The farmers' preference for the local labour on permanent basis may be attributed to the thinking on the part of the farmers that local labour was little more efficient as compared to the migrant

labour particularly in the handling of farm machinery and equipment. However, majority of the selected farmers preferred migrant labour for the important farm operations like transplanting, harvesting and threshing of paddy, harvesting of wheat, etc. for which the job is undertaken on the contract basis by the local as well as migrant labour.

Table 3: Number of farmers employing different number of permanent labourers

Number of farmers employing labour					
Local labour			Migrant labour		
1978-79	1983-84	1995-96	1978-79	1983-84	1995-96
33 (60.00)	25 (51.02)	50 (72.46)	22 (75.87)	33 (91.67)	34 (82.93)
15 (27.27)	13 (26.53)	12 (17.39)	7 (24.13)	3 (8.33)	7 (17.07)
2 (3.64)	7 (14.29)	4 (5.80)	-	-	-
5 (9.09)	2 (4.08)	1 (1.45)	-	-	-
-	2 (4.04)	2 (2.90)	-	-	-
55 (100.00)	49 (100.00)	69 (100.00)	29 (100.00)	36 (100.00)	41 (100.00)

Note: Figures in parantheses indicate the percentages to total labour.

Share of migrant labour in important farm operations

The data given in table 4 show the migrant and local labour employed by the selected farmers for important farm operations. During the year 1995-96, about 54 and 46 per cent of the migrant and local labour respectively was employed by the selected farmers for harvesting of wheat. These figures were about 82 and 18 per cent respectively for transplanting of paddy. Likewise, for harvesting and threshing of paddy, the selected farmers employed about 55 and 45 per cent migrant and local labour respectively. It is evident that for important farm operations for paddy and wheat which are more labour intensive, the employment of migrant labour was fairly high.

It may be mentioned that during the year 1983-84, about 69 per cent farmers employed migrant labour for transplanting of paddy. As already mentioned, this percentage increased to about 82 per cent during 1995-96 which may be attributed to more efficient transplanting of paddy operation done by the migrant labour since they belonged to the traditional rice growing states of India. The major reasons for employing large number of migrant labour for different farm operations were that these operations were mostly got done on contract

Table 4: Extent of employment of local and migrant labour for important farm operations, 1983-84 and 1995-96

(man days per farm)

Farm operation	Local labour		Migrant labour		Total	
	1983-84	1995-96	1983-84	1995-96	1983-84	1995-96
Harvesting of wheat	35.00 (47.30)	40.89 (48.30)	39.00 (52.70)	47.43 (53.70)	74.00 (100.00)	88.32 (100.00)
Transplanting of paddy	25.00 (30.86)	18.96 (17.84)	56.00 (69.14)	87.32 (82.16)	81.00 (100.00)	106.28 (100.00)
Harvesting and threshing of paddy	22.00 (32.84)	97.67 (45.15)	45.00 (67.16)	118.67 (54.85)	67.00 (100.00)	216.34 (100.00)

Note: Figures in parantheses indicate the percentages to total employment.

basis which necessitated working of labourers in a group and the migrant labour invariably worked in groups of 15 to 20 persons. Moreover, the migrant labourers work for longer hours because they mostly stayed at the farm itself. Besides, they did not ask for wheat bhusa in addition to their wages in case of wheat harvesting and threshing. Also, as already discussed, the migrant labour was considered more efficient for different operations of paddy. It was also pointed out by the farmers that migrant labour planted more paddy seedlings per square metre of area as compared to the local labour. Above all, the local labour was also negligent in performing work and it was also reported by the farmers that during threshing of paddy, the local labour left a number of grains with the paddy plant un-threshed.

Method of recruitment of migrant labour

Migrant labourers were employed by the farmers through direct negotiation with them. No intermediaries or contractors were involved. The practice of contacting the migrant labour at important railway stations was very popular. The farmers negotiated with the team leader of the migrant labourers whom they generally called 'lambardar'.

Comparative wage rates of local and migrant labour

The wage rates prevalent for permanently employed local and migrant labourers are shown in table 5.

The data given in table 5 indicates that in about 55 per cent of the selected villages, the wage rate for permanently employed local labour was Rs. 12000 and above per annum whereas this figure was given to only about 14 per cent for the migrant labour. In about 36 per cent of the villages, the wage rate varied between Rs. 10000 and Rs. 12000 per annum for local labour whereas this figure was about 77 per cent for the migrant labour. The wage rate was the same, i.e. Rs. 9000 to Rs. 10000 per annum for

the local as well as migrant labour in about nine per cent of the villages. This comparison of the wage rates showed that the wages of the permanent local labour were on the high side as compared to the migrant labour in the sample villages.

Table 5: Wage rates in villages for local and migrant labour, 1995-96

Wage rate (Rs. per annum)	Number of villages	
	Local labour	Migrant labour
9000-10000	2 (9.09)	2 (9.09)
10000-11000	5 (22.73)	8 (36.36)
11000-12000	3 (13.64)	9 (40.91)
12000 and above	12 (54.54)	3 (13.64)
Total	22 (100.00)	22 (100.00)

Note: Figures in parentheses indicate percentages to total.

Table 6: Wage rates for casual labour, 1995-96.

Wage rate (Rs. per day)	Number of villages	
	Local labour	Migrant labour
30-35	—	6 (27.27)
35-40	2 (9.09)	7 (31.82)
40-45	3 (13.64)	3 (13.64)
45-50	4 (18.18)	6 (27.27)
50-55	8 (36.36)	—
55-60	5 (22.73)	—
Total	22 (100.00)	22 (100.00)

Note: Figures in parentheses indicate the percentages to the total.

Table 7: Wage rates of casual and permanent labour in different districts of Punjab (in Rs.)

Name of the district	Concentration of migrant labour	Casual labour (per day)			Permanent labour (per annum)		
		1978-79	1983-84	1995-96	1978-79	1983-84	1995-96
Ludhiana	High	6.33	10.33	42.50	2166.67	3333.33	10833.33
Patiala	High	7.33	10.66	51.67	2083.33	3410.00	11000.00
Faridkot	Low	8.00	14.00	53.33	2250.00	3666.67	11166.67
Amritsar	Low	9.00	12.33	55.83	2666.67	3500.00	11833.33
Average		7.67	11.83	50.83	2291.67	3477.50	11208.33

The comparison of daily wages for casual labour, as given in table 6, indicates that in about 27 per cent of the sample villages, the migrant labour was getting Rs. 30 to Rs. 35 per day whereas there was no local labourer in this category. On the other hand, in about 59 per cent of the villages, the local labour was getting between Rs. 50 and Rs. 60 per day whereas none of the migrant labourers was getting this wage rate in the sample villages. In about nine per cent of the villages, the local labour got between Rs. 35 and Rs. 40 while this figure was applicable to about 32 per cent for the migrant labour. In about 14 per cent of the villages, the local and migrant labour got the same wage rate, i.e., Rs. 40 to Rs. 45 per day. In about 27 per cent of the villages, the migrant labour was getting Rs. 45 to Rs. 50 per day whereas this figure was about 18 per cent for the local labour. A similar difference in wage rates for the casual local and migrant labour was found during earlier studies for 1978-79 and 1983-84.

Local labour's reaction

The study brought out that a vast majority of the local labourers, i.e., about 92 per cent did not view the influx of the migrant labour favourably. They thought the migrant labourers to be their competitors in narrowing down the farm employment opportunities for them and also depressing the wage rates. The local labour was having this bitter feeling although there was no open manifestation of this in the form of any disputes/confrontations between two types of labour. It was found that wage rates in the districts which have relatively high concentration of migrant labour were relatively low as compared to the districts where their number was small. The total supply of labour as well as its composition was one of the major determinants of wage rates.

It is seen from table 7 that Ludhiana and Patiala districts having the highest concentration of migrant labour had relatively low wage rates both for casual and permanently employed local labour. On the other hand, Faridkot and Amritsar districts had higher wage rates for casual as well as permanent local labour.

The major reason was the lower concentration of migrant labour in these districts and as such the local labour commanded much better bargaining power for higher wages. This is illustrated by the fact that the wage rates in case of casually employed local labour were Rs. 6.33, Rs. 7.33, Rs. 8.00 and Rs. 9.00 per day in Ludhiana, Patiala, Faridkot and Amritsar districts respectively in the year 1978-79. The same trend was noticed in the year 1983-84 when these wage rates were Rs. 10.33, Rs. 10.66, Rs. 14.00 and 12.33 per day for these four districts respectively. Even after a gap of 12 years, it is interesting to point that the same trend was observed; thus in the year 1995-96 the wage rates were Rs. 42.50, Rs. 51.67, Rs. 53.33 and Rs. 55.83 per day for these districts respectively.

It is also important to note that the difference between the highest and the lowest wage rate has narrowed down relatively over time. The wage rate in a less labour supply district where it was the highest was higher by 42 per cent in 1979-80 which came down to 36 per cent in 1983-84 and further to 31 per cent in 1995-96 than the wage rate prevalent in the high labour supply district where the wage rate was the lowest.

Similarly, the wage rates paid to permanently employed local labour were also lower in Ludhiana and Patiala districts being Rs. 2166.67 and Rs. 2083.33 per annum respectively during the year 1978-79 as compared to Rs. 2250.00 and Rs. 2666.67 per annum for Faridkot and Amritsar districts respectively. A similar trend was seen in 1983-84, in 1995-96.

Again in relative terms, the highest wage rate was higher by 28.00, 10.00 and 9.23 per cent than the lowest wage rate in 1979-80, 1983-84 and 1995-96 respectively, thereby, showing the narrowing down the spatial difference in wage rate over time. These figures brought out that higher concentration of migrant labour was one of the major reasons for low wages in these areas, although there could be other factors also operating on both the demand and supply side in depressing the wage rates of local labour in these areas.

Higher concentration of migrant labour was one of the major reasons for low wages in some areas, although there could be other factors also operating on both demand and supply side in labour in these areas.

Annual earnings and savings of migrant labourers

The study revealed that about 69 per cent of the migrant labourers earned between Rs. 7000 and Rs. 12000 per annum; about 13 per cent of them earned between Rs. 5000 and Rs. 7000 annually; about 12 per cent earned between Rs. 12000 and Rs. 15000 per annum and about 6 per cent of them were having annual earnings of less than Rs. 5000 during the year 1995-96. It may be pointed out here that annual earnings of less than Rs. 5000 were of seasonal labourers who went back immediately after the completion of the peak period. The annual earnings had positive correlation with the period of stay in Punjab. Longer the period of stay in a year, the higher was the level of earnings. Again the average annual income of the migrant labourers was only Rs. 1309 and Rs. 2350 in 1978-79 and 1983-84 respectively as compared to Rs. 9197 during the year 1995-96. This brought out that the earnings of the migrant labour increased by 602.6 per cent and 291.4 per cent in 1995-96 as compared to 1978-79 and 1983-84 respectively. This increase in income may be attributed to the increased demand for labour at the farms, more bargaining power of the migrants, general price rise and longer stay by them in the State.

It is worthwhile to point out here that total earnings of the migrant agricultural labour force in Punjab worked out to be Rs. 100.82 crores during 1983-84. This figure increased to Rs. 534.35 crores in 1995-96. This showed that total earnings of the entire migrant agricultural labour force in Punjab increased by about four times in 1995-96 as compared to 1983-84. This gives a growth rate of about 36 per cent per annum. It needs to be compared with the growth rate of gross domestic product (GDP) at current prices in the country which is 6.66 per cent. Thus, the migrant labourers in Punjab as a group in itself has become relatively much better off than an average Indian.

The study brought out that on an average, each migrant labourer spent Rs. 3091 per annum during his stay in Punjab in the year 1995-96. Generally, this expenditure was incurred on food during the period when they were unemployed but in some cases, the migrants

also purchased durable goods like transistors, wrist watches, etc.

The study revealed that about 58 per cent of the migrant labourers saved between Rs. 4000 and Rs. 8000 annually. Another 22 per cent saved between Rs. 8000 and Rs. 10000 and about five per cent of them saved between Rs. 10000 and Rs. 12000 per annum. On the other hand, about five per cent of the labourers saved less than Rs. 2000 and about 11 per cent between Rs. 2000 and Rs. 4000. It is pointed out here that smaller savings were with those labourers who were coming to Punjab on seasonal basis because their income was also less than that of the casually and permanently employed labour. It was estimated that annual savings of the entire migrant agricultural labour force worked out to Rs. 354.76 crores and their annual expenditure was Rs. 179.59 crores. It means that about Rs. 355 crores went out of the State of Punjab per year to other states namely, Bihar, Uttar Pradesh, etc. in lieu of supplying labour in the agricultural sector of Punjab.

Socio-economic change in migrant labour

As a result of working in Punjab, there has been some change in the language, food habits, dress, customs, etc. of the migrant labourers. A change in the language was reported by about 76 per cent of the migrant labourers during the year 1995-96. On the other hand, about 33 and 40 per cent of the migrant labourers had reported change in their language in 1978-79 and 1983-84 respectively. About 78 per cent of the respondents reported change in their food habits as long as they were in Punjab during the year 1995-96. This figure was 67 per cent in 1983-84.

Further, about 73 per cent of the migrant labourers reported change in the dress during the year 1995-96 whereas about 25 and 62 per cent of the migrants reported change in the dress in 1978-79 and 1983-84 respectively. About eight per cent of the migrant labourers in the study sample changed their names and their stay was relatively longer in the State. About six per cent of the migrant labourers were also found wearing Karas (iron bangles) in their right arm which is a religious symbol for the Sikhs. About four per cent of the migrants studied had grown long beards and about two per cent had long hair and it was very difficult to recognize them as bhaias.

It was reported by 96 per cent of the migrants that they utilised their savings for the purchase of television, radio, stereo, bicycle, garments, sewing machines, etc. About 18 per cent utilised their savings from Punjab on

the repairs of their houses in the native villages and construction of new houses. One per cent used the savings for leasing in land for enhancing their operational holdings and 0.61 per cent purchased landed property with these savings at their native villages in the year 1995-96. The saving of these migrant labourers were also utilised for routine consumption expenditure at their native places.

Conclusions

Overall impact of the migration phenomenon

The most visible impact of migration is that it has resulted in enhanced incomes for the migrants. Besides, the migrants have acquired new skills with the passage of time especially in the handling of machinery and equipment; they have become more efficient also in various farm operations. The process of migration has not only created employment opportunities for the migrants in Punjab but has also released pressure on employment opportunities for the remaining population in the States of Bihar, Uttar Pradesh, etc. Consequently, the overall economic status of a significant proportion of the population has improved. The facts and methods learnt by the migrants in Punjab about intensive cultivation, share cropping, wage rates, terms of contract, perquisites, etc. might be beneficial for them in their native places. Further, the migrant labourers carry with them new skills regarding input-use which are likely to help in the dissemination of new technology in various parts of the country. Moreover, the migration phenomenon has helped the cause of national integration, better understanding of each other's culture and socio-economic problems and brought out the advantages of inter-dependence.

The migrants have acquired new skills with the passage of time especially in the handling of machinery and equipment; they have become more efficient also in various farm operations.

In the wake of the green revolution in Punjab and the widespread adoption of wheat and paddy, rotation of crops which are quite labour intensive, the farmers of Punjab State have become largely dependent on migrant labour. During the peak periods of work, the completion of important farm operations, i.e., harvesting and threshing of wheat, transplanting, harvesting and threshing of paddy is not possible without the participa-

tion of migrant labour. The wage rates for local agricultural labour have been checked from increasing sharply due to the increased influx of migrant labour. This development is viewed favourably by the farmers in Punjab. The occasional scarcity of migrant labour has forced the farmers to adopt labour saving innovations. As a result, the number of tractor operated harvest-combines has increased in Punjab in the recent years. The process of migration has reduced trade unionism among the local labourers and has indirectly resulted in eliminating some tension between the farmers and local labour which was noticeable in earlier years.

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The negative aspect of migration manifests itself in the form of lower wages and lesser employment opportunities for the local agricultural labour in rural areas. There has been evidence of occupational diversification in the employment pattern of local labour consequent upon the influx of migrant labour. This might force the local labour to work in already overpopulated and congested urban areas with manifold problems for them. Another negative aspect has been the spread of habit of smoking bidies, chewing zarda and betal nuts among the residents of Punjab which is widely prevalent among the migrants.

Overall, migrant agricultural labourers to Punjab have become relatively much better off than an average Indian during the last 12 years up to 1995-96. Their earnings in Punjab have increased by 36 per cent per annum compared to the growth rate of current prices. And they remitted as much as Rs. 355 crores as savings from their earnings in Punjab to outside Punjab.

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Appropriate Poultry Practices for Small & Marginal Farmers

N. Khandekar and R.P. Sharma

Technological advancement has transformed poultry farming into a sophisticated agri-business industry. Small and marginal poultry farmers often are ignorant of the practices they should adopt to achieve higher productivity as well as bigger profit margins. A study was made to judge the practices essential for small/marginal poultry farmers. The data revealed that all the scientific management practices were judged as essential by 70 per cent of the judges. Feeding of balanced ration and feeding of different poultry ration at different stages were also judged to be highly essential. Regarding the frequency of feeding, 58 per cent of the judges were of the opinion that it should be done three times a day. With regard to healthcare, vaccination against Marek's and Ranikhet (F1) were judged to be highly essential in both layers and broilers.

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Introduction

Poultry farming has in the past few decades achieved the status of an industry where highly sophisticated techniques have come to be used. Since 70 per cent of our country's population lives in villages with limited sources of income, poultry farming offers an avenue for additional income and employment especially for small and marginal farmers. Commercial poultry farming requires special practices of management, feeding, health care etc. which are generally not known to the rural people. They try to rear the improved varieties in backyard conditions resulting in poor productivity or use too sophisticated techniques which give them lesser profit margin. Since the success of any enterprise depends on the adoption of appropriate practices according to their requirements, the present study was taken up in an attempt to rate the practices from highly essential to not essential, to achieve improved body weight and egg production i.e., better productivity for small and marginal farmers.

Methodology

A list of important poultry practices was prepared in consultation with experts and sent to 40 judges for scoring on a five point continuum from *highly essential* (5) to *not essential* (1) with the mid-point being *undecided* (3). The judges were asked to rate each of the practices according to its importance in affecting the productivity of poultry birds and make any suggestions. Twenty four fully filled forms were received and the results were coded and analysed using simple frequencies and percentages.

Results and Discussion

Management practices

Management is an important aspect for gaining good productivity. In all, 16 practices were enumerated

and as shown in table 1, about 83 per cent respondents said that it was highly essential to purchase chicks from commercial hatcheries of repute and the rest said that it was essential. This shows that the quality of chicks purchased determines to a large extent the future performance of the stock and to achieve good results only quality chicks should be purchased by the farmers.

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Regarding the location of the poultry farm, nearly 80 per cent of the respondents stated that it was highly essential that the farm should be located in less crowded places, whereas 16 per cent regarded it as essential and 4 per cent were undecided. The main problem of poultry farms in crowded places is the environmental noise which causes stress. Apart from this, there is also problem of litter and dead bird disposal. The farm also causes public nuisance as the smell offends the neighbours and creates an unpleasant atmosphere.

Transportation of birds and feed poses a major problem to small poultry farmers. In remote areas with poor communication facilities there is not only problem of timely transportation and also increased cost. Since the per bird profit is little, this increased cost reduces the profit margin. Thus, majority of the judges felt that it was highly essential (58 per cent) and essential (25 per cent) for the farm to be well connected with roads for easy transportation. However, 17 per cent respondents were undecided about the aspect.

Many types of housing systems are recommended for poultry farming. Small farmers generally keep their birds in simply constructed houses, on floor, in litter system. As we observe from table 1, about 79.16 per cent and 54 per cent respondents respectively, were of the opinion that it is highly essential that farm building and the number and size of windows be according to the recommended measurements. Adult birds may be passive carriers of various diseases. Thus nearly 70 per cent respondents stated that it was highly essential that the brooder house be situated away from adult farm since chicks are more susceptible to diseases. Fifty eight per cent respondents said that they were undecided about the proposal that the farm building should be above ground level since this would essentially depend on the climatic conditions of the place as well the general watertable and rainfall received.

Trees act as barrier to wind draft and dust. They provide shade and coolness in summers. More than 50 per cent of the respondents opined it is necessary that trees should be planted around farm, whereas 25 per cent were undecided and were of the opinion that shrubs and green lawn could also be of use.

Light and heat affect the productivity of birds to a large extent. Nearly all the respondents judged electricity as necessary except one who stated that in places where the duration of natural light is long, one could make use of some alternate source of light and heat if the farm was not electrified.

Further as we see from table 1 alternate arrangement in the absence of electricity for chicks was highly essential (79 per cent), essential (21 per cent) whereas for adult birds it was judged as highly essential by 54 per cent and essential by 8 per cent, 4 per cent were undecided and 33 per cent thought it not essential unless there were regular power cuts at nights. Thus all the respondents were of the opinion that optimum natural plus artificial light should be provided to get good body weight and egg production.

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There are some special arrangements to be made before bringing a new flock, which were judged as very essential like-changing litter (100 per cent) whitewashing room (71 per cent) disinfection of rooms (83.33 per cent) and cleaning and disinfection of equipments (100 per cent). This ensures a clean and hygienic environment which is essentially diseases free and with future precautions would prevent diseases and improve productivity of birds. Additional arrangements are also necessary for day old chicks which were rated as highly essential. The practices were chick guards to be arranged (96 per cent), hover to be arranged (96 per cent), optimum room temperature to be ensured (88 per cent) and lastly optimum number and types of equipments to be arranged (83 per cent).

The litter system of rearing birds poses the problem of ammonia production, especially in case of adult birds in humid climate. Apart from raking, the respondents felt it was highly essential to open the windows and ventilators (100 per cent), add lime (79 per cent), add dry litter (76 per cent) and use exhaust (42 per cent).

Table 1: Responses of judges about the recommended management practices to be followed by farmers

List of Recommended Practices	Highly Essential (%)	Essential (%)	Undecided (%)	Somewhat Essential (%)	Not Essential (%)
Purchase of chicks from commercial hatchery of repute	83.33	16.67	-	-	-
Farm located in less crowded places.	79.16	16.67	4.17	-	-
Farm well connected with road	58.33	25.00	16.67	-	-
Farm building in accordance to recommended measurements.	79.16	16.67	4.17	-	-
Number and size of windows according to recommended measurements	54.17	33.33	12.50	-	-
Brooder house situated away from adult farm.	70.83	29.17	-	-	-
Farm building above ground level.	25.00	16.67	58.33	-	-
Plant trees around farm.	45.83	25.00	25.00	-	4.17
Electricity arrangement at farm.	87.50	8.33	-	-	4.17
Alternate arrangement in the absence of electricity					
(a) For chicks	79.17	20.83	-	-	-
(b) For adult birds					
Optimum natural and artificial light to be provided for 16 hrs.	75.00	25.00	-	-	-
Arrangements to be made before bring new flocks :					
(a) Change litter	100.00	-	-	-	-
(b) Whitewash room	70.83	16.67	8.33	4.17	-
(c) Disinfect room	83.33	16.67	8.33	4.17	-
(d) Clean and disinfect equipments	100.00	-	-	-	-
Arrangements to be made for chicks					
(a) Chick guard	95.83	4.17	-	-	-
(b) Hoover	95.83	-	4.17	-	-
(c) Optimum temperature	87.50	12.50	-	-	-
(d) Optimum equipments	83.33	16.67	-	-	-
In case of ammonia gas produced					
(a) Addition of lime	79.17	12.50	8.33	-	-
(b) Addition of dry litter	45.83	25.00	12.50	-	16.67
(c) Use of exhaust	41.67	25.00	12.50	8.33	12.50
(d) Opening window & ventilator	100.00	-	-	-	-

Feeding

Nearly 70 per cent of the total expenditure incurred in poultry farming is on feeding. The dietary requirement of the birds is highly specific and it is an important factor which determines the body weight as well as egg production. Type of feed, frequency of feeding and the equipments used are some of the important factors that have to be taken care of. In table 2, the responses of three judges regarding some aspects of feeding are given. It is evident that 100 per cent respondents felt that feeding of balanced ration was essential, feeding of different poultry ration at different stages of growth (83

per cent), frequency of feeding; ad-lib (17 per cent), twice a day (25 per cent), thrice a day (58 per cent) and optimum number and size of feeders and waterers (79.16 per cent) were highly essential.

Health

Poultry birds are highly susceptible to various deadly diseases. The vaccination schedule of broilers and layers differ since broilers are to be disposed off in a short period, where as layers are kept at the farm for a longer period and are more likely to get infected if proper care is not taken.

Performance Based Assessments—External, internal and self-assessment tools for Total Quality Management by Paul F Wildson & Richard D Pearson, Tata McGraw Hill Publishing Co., New Delhi, p. 202.

In the recent past, literature on Total Quality Management (TQM) has grown rapidly. The central theme of TQM is improving the management process to achieve customer satisfaction.

The most common question asked by the management desirous of implementing TQM is "Where to start?" This is exactly the issue, the book under review addresses. Arguably, the first step would be to conduct an objective assessment of the performance of the process in satisfying the customers' needs and expectations. In the first chapter, the authors bring out clearly the difference between compliance oriented audits (which generally leaves a trace of distaste in the auditees) and the performance based audits (whose intent is to bring about real improvements) under a new management paradigm, whereby the essential management activities of planning, directing, organizing and controlling are redirected to have newer role imperatives as follows: Planning (creating a vision, futuring, setting goals and objectives); Directing (aiming, focusing, prompting action, encouraging, persuading); Organizing (removing barriers and road blocks, facilitating, allocating resources); and Controlling (checking results, identifying improvements). Under this new management setting, the performance based assessments can function as a starting step towards TQM implementation.

After establishing a new management paradigm in Chapter 2 for performance based assessment, the authors deal with long-term organizational commitments, team approach and a collaborative organizational culture are strongly emphasized for ensuring success of performance audits. This setting is continued in Chapter 3 for developing meaningful performance measurement. A three step approach is suggested for performance measurement: (i) Direct observation of a process, (ii) Development of cause and effect relationship and (iii) Development of firm criteria, based primarily on customer expectations. Incorporating customers' expectations in performance measurement can form a powerful chain of activities in mapping the process and attuning it to improve its effectiveness. Unfortunately the authors make only a passing reference to performance measurement. No effort is devoted to identify and obtain customer focussed performance measures.

Chapter 4 deals with the necessary conditions to be satisfied for initiating the assessment efforts and the usuals such as work and team effort are underlined.

After stipulating the necessary conditions in Chapter 4, a systematic approach to designing an assessment strategy is developed in the next chapter. It begins with a discussion of the importance of "planning" and goes on to touch upon the tools and techniques of problem solving-without any elaboration. Regrettably, development and application of problem solving tools, vital for performance measurement are dealt inadequately. Of course, the chapter concludes with the pragmatic recommendation that the performance assessments must aim for one or more of the following: faster, easier, better ways to do the same thing, increase in effectiveness, efficiency, productivity and promoting excellence.

In Chapter 6, the importance of involving customers in the assessment effort is emphasized. In the succeeding three chapters, the ways of presenting the results of the assessment efforts, traps to avoid when crafting solutions, criteria for evaluating improvement opportunities and developing action plan for implementation-including change management are indicated. And in the final chapter a summary of the quintessence of all the preceding nine chapters is given.

The intent of the book is apparently to present an overview of continuous improvement concepts and some techniques of the performance assessment. The usefulness of the book would have been greatly enhanced had the authors presented some real life case studies. Development of a performance assessment model would have helped the readers in consolidating their understanding of the process. After reading the book, the reader is educated about a lot of do's and don't's on performance assessment. An exclusive chapter on "Performance Measurement in World Class Status" seems essential to feel a sense of completion. Perhaps this book should be studied in conjunction with other books on problem solving and performance measurement to appreciate the whole gamut of TQM.

In spite of all these, the authors have done well in motivating the readers to develop the desire for continuous improvement.

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Steering Business Toward Sustainability by Fritjof Capra and Gunter Pauli (Ed.), Response Books, Sage Publications, New Delhi, 1996, p. 191, Rs. 195.

Sustainability, having both ecological and social

components, poses in business an inescapable challenge. Today's business activities are either directly or indirectly responsible for most impacts on the earth systems. Unless the business considers it as a serious issue to protect environment, sustainability is too far to reach.

This book by Capra and Paulli makes an excellent attempt to comprehensively compile the ideas of multidisciplinary experts like Environment Ministers, management thinkers, high profile businessmen, ecological designers, publishers and entrepreneurs towards attaining sustainability in the business. Fritjof Capra, is the author of renowned books like *The Tao of Physics*, *The Turning Point* and as script writer for the film *Mindwalk*. Gunter Pauli is an economist turned businessman who is responsible for building the world's first zero emission factory at Belgium. He is now establishing a zero emission research programme at the United Nations University, in Tokyo. With their diverse knowledge and experience, the Editors have divided the book into three parts as: Part I: Education, Part II: Incentives and Part III: Implementation, which they feel are vital for any organization to sustain in future. The Indian edition of the book has been forwarded by Sri Jamshyd N Godrej, a pioneer of diversified business in India.

In the first chapter, the editors have pinpointed the challenges to achieve Ecological sustainability. They are of the opinion that, if the corporate world does not play an active role in redefining its own operations, moving toward sustainability, the world as a whole will never succeed in that task. Today, the companies are expected to excel simultaneously in all six elements : Marketing, Productivity, Quality, Just-in-time, Services and Reengineering. If the business succeeds in integrating the moral, ethical and environmental factors, then it will definitely have a formidable, respected and sustainable presence in harmony with the community and Earth.

A major driving force to create an awareness toward sustainability is the existence of Non Government Organizations (NGOs). The NGOs are now available in many countries putting pressure on the Government to improve the standard of living. Jose Lutzenberger, an agronomist and engineer and also the former minister of Environment in Brazil has focussed the role of NGO's. In his opinion, the most urgent and noble task of NGO's now is to mobilize all the forces that can contribute to the necessary change in the world's view.

Kris McDvitt, former CEO of Patagonia in the third chapter of the book has emphasized the necessity of educating the executives and students to attain a sus-

tainable world. She suggests that, the courses offered in business schools must bridge several fields of study. Each student along with the profit and loss account of finance, must also be taught courses on accounting for our natural resources: forests, soils, rivers, air, oceans, mountains, lakes etc. Those case studies should be used that exemplify the real nature of our business and the world we are doing business in.

Recognizing that the transition to sustainability is arduous, the CEO of the Amanakey group in Brazil, Oscar Motumura offers in chapter 4, a flexible repertoire of techniques that companies and executives can benefit from in acquiring the new information, planning techniques and learning and coaching strategies they need. The author has differentiated "learning" as something that comes from the inside of the person and "being educated" implies that the learning is coming from the outside. As we quickly approach a new world, where resources are no longer the leverage factor for change, where values, ideas, knowledge and human talent are the new factors to success, we also become conscious of the new possibilities open for the human being. The chapter ends with the concepts from Amanakey's systematic Executive development program.

The business media are realizing that there is a urgent need for providing corporate executives with relevant environmental data. Thus Alice Tepper Marlin and her colleagues Charles Fombrun and Luis Martins of the Stern School of Business in New York city have in Chapter 5 compiled information on aspects like award selection, corporate shortcomings in environmental responsibility, rating establishments etc. and show how these techniques combine both in influencing consumer buying behaviour and in helping corporations achieve more satisfactory environmental performance.

The relationships between the business and the multiple media e.g. print, electronic and on-line media like internet are complex and difficult to identify. Eric Utne, the founder and Editor-in-Chief of the Minneapolis based Utne Reader has emphasized in chapter 6 the characteristics of these media to influence business in a substantial way. He focuses on the relationships between the media and community and is convinced that, playing an active role in community building will provide one of the most effective and most rewarding activities of business on the path toward sustainability.

The role of Government has been presented in chapter 7 by Monica Griefahan, a former leading Green Peace activist and founder member of the Green party in Germany, who subsequently served as minister of the Environment in Niedersachsen. She has considered

different approaches such as: advanced research on product redesign, reorientation of energy policy and forums bringing together problem solving groups drawn from management, labour, science, the environmental movement and the political world. She is of the opinion that, environmental politics must be preventive politics and aim at developing and enforcing products and production procedures, incorporating the ideas of environmental soundness 'from cradle to the grave'.

In chapter 8, Herman Dally, a distinguished economist, formerly with the World Bank, has argued that, it is possible to design a radically different economic system, one that incorporates the basic principles of Ecology. He provides a careful analysis of an ecological tax reform, the type that is now under study in several European countries. He demonstrates that, economic arguments can be used to reinforce the status quo, but to create a tax system that would provide powerful incentives for business to move towards sustainability. He is of the opinion that, Ecological tax reform can make scale more sustainable, allocation more efficient and distribution more equitable.

The new concept of Fiduciary Responsibility has been described in chapter 9 by Edward Tasch and Stephen Viederman, two top executives of the Jessie Smith Noyes foundation. The first part of the subject deals with the recent impressive growth of the social investment movement. The second part covers the illuminating analysis of the values and practices at their foundation. What emerges from this description is an expanded sense of prudence and fiduciary responsibility grounded in ecological literacy and concern for future generation. It is stated that given the magnitude of different challenges, not only must the left hand know what the right hand is doing, but new strategies must be developed and implemented to effectively bring all means at our survival.

The third part of the book describes the implementation strategies. One of the editors Gunter Pauli has visioned the industrial clusters of the twenty first Century. He is of the opinion that, in today's hi-tech world, progress is no longer understood as the improvement in human well being but is glibly identified with technological innovation. In order to achieve ecological sustainability, we must therefore fundamentally redesign our business and our economy. Pauli's talent in spotting emerging trends, his solid business background and his penchant for radical ecological solutions have allowed him to piece together a picture of emerging industrial clusters. One thing is very clear from his essay that, the countries which will envision these new clusters first and stimulate an environment conducive to this change will be the new tigers of the 21st century. The countries who

hang on to the old system will be the Dinosaurs. The difference will be made by the men and women who see this today and who will make it happen tomorrow.

Chapter 11 describes the concept of Living Machines by John Todd, a visionary Biologist & Ecological designer, and Nancy Jack Todd, co-founder of the New Alchemy Institute and Editor of its journal. This chapter is an inspiring introduction to a novel and wonderful branch of ecological design. The authors explain that : A living machine is a contained ecosystem comprising hundreds and even thousands of species of carefully selected organisms. It is a machine because it has been designed and built to perform specific tasks. At the same time, it is fundamentally different from conventional machines. Living machines like natural ecosystems are capable of repairing themselves, replacing their components as they wear out and of responding creatively to the change by evolutionary self-design. The text includes few photographs of living machines to provide an aesthetic appeal to the subject.

The last topic of the book has been written by Yvon Chouinard, Founder of Protagonia, USA. He narrates how he guided his profitable company towards growth, greatly reduced environmental impacts and consistent support for positive social and ecological goals. He believes in the fact that, the perfection is finally attained not when there is no longer anything to take away, when a body has been stripped down to its nakedness.

As we approach the 21st century, it will be essential that the industries must find a balance between Social, Economic and Environmental issues. This integration is the only way in which sustainable development can become a reality. The editors of this book, have put tremendous effort to suitably describe the elements which will steer the business towards sustainability. The book in general is a very good reading for every businessmen.

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Business Communication Today by Sushil Bali, Response Books, Sage Publications, New Delhi, 1996, pp. 199. Rs. 265.

India is witnessing a third industrial revolution namely a communication revolution. The innovativeness and speed in communication has been provided by Computers, Computer-Softwares, Interactive Information Technologies, Satellite and Teleconferencing. This is making a unique impact on our day-today-life. The

parameter of the communication too are evolving in a way that was practically unimaginable till a few years ago. This has also made a significant impact today in organisational and technological environment.

The book consists of sixteen chapters related to various subjects and topics of business communication. The first chapter deals with the meaning, conceptual process and theories of communication. The author has also discussed problems of communication in business organisation. Effective business communication should not be considered as an end in itself, but a means. If business communication principles and theories are properly followed, it will ensure efficiency, productivity and the success of the organisation in achieving its goal.

Chapters 2-7 are devoted to business communication forms, design, contents, key audiences and communication process. These topics have been elaborately discussed and presented. The author has explained all the important aspects related to business communication intelligibly. The basic question i.e. how to communicate effectively has been answered in a very simple and lucid style.

The next three chapters deal basically with the verbal and non-verbal communication including of the written word. As communicators, all of us have developed skills using "body language" and have been using the same without proper understanding the meaning from the point of view of audience. The author has explained very well the role of "body language" in communication. He has also emphasized that an effective communicator should not have only excellent speaking skills but also listening skills. The written word as most effective means of communication has contributed more to the progress of our society than any other mode. In business it is the only means by which an organisation can define and record its structure, aims and make them known to everybody. The author has indicated that, "ABC" of written communication is Accuracy, Brevity and Clarity.

Chapters 11-16 include other tools in business communication, qualities of an effective communicator, using the right medium, impact of information technology on communication and the requirements for the future. Today challenge lies in communicating clearly, meaningfully and effectively. In business communication we must learn the skills of communication with internal and external publics efficiently.

A redeeming feature of the book is that at the end of each chapter the author has given a summary which will be very helpful to the readers. He has also provided the

important points in boxes through out the book. These boxes are extremely helpful in drawing attention of the readers. It would have been better if these boxes had got printed in different colours.

This publication will be extremely useful to the scholars of communication, business executives and professionals in advertising, public relations and the media. Fairly good quality of paper has been used for the book. Since it is available for an affordable price, many would like to have a copy of the book.

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**Business Policy and Strategic Management—
Managerial Experiences (AIMA—CME Om Series)
by M.L. Bhasin, Economy Edition 1996, Global Business Press, New Delhi, p. 311, Rs. 250.**

Strategic management receives its due attention from the top management in business organisations. This is so because the survival and the future of organisations largely depend upon appropriate strategic decisions. The students and faculty in business management schools always felt the scarcity of relevant material, in this discipline particularly in the Indian Context. The author's efforts in projecting strategic management would fill up this gap.

The present work is a compendium of 51 cases in the area of business policy and strategic management. The reviewer, based on detailed examination of the work, believes that the case studies presented would be a good supporting material for class room discussions if used in conjunction with a text book.

The presentation of the 51 cases has been systematically grouped under headings of Corporate strategies, Corporate management, Internal resources and SWOT analysis, Strategic cost and financial analysis, Organisational development and change. Growth policy and strategies, Turnaround management, Functional policy and strategies, Implementation and Evaluation of strategies are stated each one as a part of the total work. The whole book is divided into 12 parts.

Part I gives introduction to analysing business policy and case method as a pedagogical tool of the study, besides three illustrated case analysis as an effective and

useful guide for the readers. The DMCC case highlights family feuds and limitations of family control in a large complex sophisticated business. The Dying Fish Case analysis by Rao & Gopalkrishna reveals environmental and pollution problems and strategies used to deal with such situations. The third example of the firm Chiagmai Prasad Ltd. discloses the issues relating to export marketing and the need for diversification strategy to sustain in the market with strategic benefit.

Part II of the book brings forth three cases particularly with reference to corporate planning, in respect of: IOC, BHEL and Neeco Ltd. The cases studied link the performance of the companies with the need for a change in planning process, strategic planning with the operational planning with the operational planning, formal planning process and strategic issues.

Focus on business objectives, policies and strategies is the theme through four cases in Part III. The authors have raised issues like corporate goals and adoption of suitable strategies to achieve it (Asian Paints); defective starting policies and mistakes. (A Billet-doux); loss making unit and strategy to control it (Pentax Ltd); identification of strategic change to achieve goals (Nakamura-AIMA).

The corporate level strategies discussed by the authors in Part IV highlights SWOT analysis and evaluation of competitive strategy (Reliance Industry); need for appropriate comparative information to decide strategy for consolidation of the position (Quality Control Pvt. Ltd.), importance of key variables and implementation problems (AN Co).

Part V contains four cases relating to the functioning style of various management people internal to the organisation are dealt with. The Contrived Crisis case deals with the need for motivation strategy to maintain market leadership; The Durpan Rubber Case presents the complex problem of the Board members and strategic decisions; the case of Modern Industries Ltd. points out the issues of ethics in purchase department; and finally in HML case the implications of tough measures taken are discussed.

Five cases have been incorporated in Part VI to cover the assessment of internal resources and SWOT analysis to meet the challenges from competitors in international market. Thus RB Ltd. and East India hotel cases cover similar issues in Indian context. Whereas ITDC case addresses also the problems of new management, management changes and HRD strategy.

The cost and financial strategies have also been given due recognition by incorporating five relevant

cases in Part VII. Three cases are from the firms: Parminder Investment Portfolio, Simtri Trading Co. and Vitro Electronics on portfolio strategy, lending strategy by Banks and capital structure strategy respectively. The other two cases from Latex Industries highlight company's solvency, liquidity, performance and present capitalisation for diversification and future prosperity. Whereas, case of Rajnagar Steel (SAIL) deals with budget as an strategy for effective production planning & cost control.

The strategic issues with reference to organisational development and change were covered with four cases in Part VIII. The case of New Generator India Ltd. focuses on leadership strategy and use of OD Consultant as a strategist for change. Mysore Food Ltd. raises the issues of restructuring strategy for organisation design. The IBM case penetrates into corporate culture and commitment for use of customer focused service strategy.

Five cases relating to Growth Strategies are included as IX Part of the book. The Twist & Swirl and the Food Corporation cases analyse technological changes and alternative plans for structural readjustment. The case of the public sector undertaking propounds the issue of amalgamation as a strategy for growth within the limitations of government system and control. In the HAL case, takeover strategy is evaluated and discussed. Finally Surdarsan Industries case, the assessment and evaluation of the growth strategy with focus on achievement of objectives in phased and planned manner, are emphasised.

Part X comprises four cases on turnaround strategy in the light of identification of the nature of problems and its causes in functional areas, issues of alternatives in legal, economic, political environment and synergy effects. The firms considered are: HST, Rayalseema Biscuit Co., Shakti India and Voltas (case on ETOP, SAP and synergy effect arising out of takeover strategy). The cases in XI Part of the book concern policies and strategies in functional areas. The power plant case describes issues of scientific inventory policy and optimum investment in Inventory management; AIMA's HCL case offers the scope to examine the role of External Consultant in imparting supervisory skills as a part of HRD programme, the need for training strategy for the top management, whereas the BEL case covers the export marketing strategy and the Pipeline case presents the problems during project implementation & suitable strategic action plan.

The final part of the book emphasises on important aspects of the problems of implementation of strategies and its evaluation by presenting cases of

reputed organisations such as SAIL, Gunjan Electronics, Thermax India, Hindustan Ciba-Geigy and Bajaj Auto. These cases represent different business situations giving adequate opportunity to the readers to view the same problem with reference to different business aspects.

It must be acknowledged that Dr. Bhasin has made all efforts to give full and due coverage of Business Policy & Strategic Management by incorporating a variety of cases. However, few comprehensive cases could have added an additional feather in the cap. Each contributor of the case along with stupendous editorial task of Dr. Bhasin provide excellent opportunities to the readers for creative, analytical and rational thinking to deal with business problems in different situations. From this viewpoint, they all deserve praise for their contribution made in the field of strategic management. The book is therefore strongly recommended as a necessary complementary material to the text for class room discussions.

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Agricultural Co-operatives in the Asia & Pacific: Towards a Brave New World Cooperation by Asian Productivity Organisation, Tokyo, 1996, p. 262.

Cooperatives as farmer organisations has indeed played a pivotal role in enhancing simultaneously the welfare of its clientele, shareholders and management. In the less developed countries of Asia and Pacific, agriculture cooperatives contributed significantly in augmenting productivity by providing the vital production factors-capital and technological inputs. This report of APO is a multi-country study mission in the Asia-Pacific Region is all about the salient features of agricultural cooperatives. The Report analyses current constraints, compulsions and the structural and system reforms which are essential for the cooperatives to sail through in the ocean of competitive world trade.

The report appraises and evaluates the gradual growth of cooperatives from primary credit sources to agents of social development by diversifying their area of operation viz. provision of quality inputs, technological know-how, scientific and professional management, marketing services etc. The prominent strengths and weaknesses of single and multi-purpose cooperatives

have been identified and highlighted towards integrated operation to cope up with the member needs. This further enhances productivity, value addition and market orientation of cooperative activities.

One of the interesting revelations of this report is that the type, structure, target groups and the wider objectives of agricultural cooperatives are almost same across the member countries. Incidentally, the government role in cooperative movement and growth also remains the same-traditional. This is inspite of the significant contribution by the cooperatives directly and indirectly in the national income of the countries and the employment generation, thereby the economic and social mobility of the countries. Therefore, the study mission highlighted the traditional government role towards cooperatives in an era of liberal economic growth through coalitions and collaborations. Consequently, the individual nation's address to areas like upgradation of human resources with a professional touch, establishment and expansion cooperative activities on a commercial lines towards financial viability and self reliance and globalisations are highly appreciated.

In the changing internal and international environment of competitive economic growth and the distribution of social welfare the member countries' are aware of their constraints to accelerate the speed of their activities. The domestic agricultural policies and international trade policies have a bearing on the cooperatives to safeguard the interests of its rural clientele. Therefore, if the government could do a little for the cooperatives to become cooperative establishments and become viable business units, probably it would do wonders in the liberal framework. The study mission, therefore, had the consensus that if the government is unable to do anything tangible for the cooperatives, then it would be appropriate that cooperative be freed from the clutches of government regulation.

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Successful Applications of HRD: Case Studies of Indian Organisations by Ishwar Dayal, Punam Sehgal, Rashmi Jain, Parvinder Gupta & Alok K. Sen, New Concepts, New Delhi, 1996, pp. 218, Price Rs. 300.

The last decade has witnessed an increasing concern for human resource development (HRD) in Indian organisations. The reasons have been two fold, societal and economic. In addition to the changes in social values emphasising human rights and development

But neither the publisher nor the editor has clarified what portions of the original essays and/or which papers have been added anew in the revised version. Secondly a point that comes out implicitly but which needs explicit emphasis, particularly in the context of (legally) unprotected women workers is that, an effective external back-up support is needed to initiate and sustain their struggle. Organisations like SEWA and Pennurimai Lyakkam have performed precisely such roles. However some of the papers have become a bit obsolete because in the interregnum the complexity of the issues have increased manifold making it difficult to state categorically, whether, on balance, things have improved or deteriorated for women workers. What remains undisputed between then and now is that conventional methods of organisation to tackle the diverse nature of women worker-specific issues still need to be evolved.

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Productivity Management, A Systems Approach by Prem Vrat, G.D. Sardana and B.S. Sahay, Narosa Publishing House, New Delhi, 1998, xxviii + p. 300, Rs. 380 (cloth).

The book under review is a well researched volume containing wealth of information on all facets of productivity management. Though considerable literature is available on productivity, the book is unique in providing broader and holistic perspective of productivity with extensive review of productivity measurement models and large number of case studies from manufacturing large, medium and small organisations as well as service systems.

The chief executives of the public and private sector, manufacturing and service systems are on the look out for productivity measurement system for assessing and improving the performance of their enterprises. Concept of productivity, as a ratio of the output to the input considers that productivity follows stimulus-response model of causality. The concept implies that productivity is concerned only with the production function when the output considered is the goods produced (or sold) and inputs generally includes the labour, capital, material, energy etc. This approach represents a narrow and restricted understanding of the concept of productivity.

Traditional methodologies and models of productivity measurement are essentially translations of the

various definitions and concepts of productivity. Most of the approaches are centered around production and function. There is a need of new approach of productivity measurement that should consider an organisation (i) with multiple objectives (ii) to work as a system with interacting sub systems and (iii) under the influence of an external environment acting as a supra-system. The authors have, through an extensive literature review and critical analysis of the major approaches, highlighted the various fallacies and inadequacies of these approaches and a case is established for the need of a more appropriate model of productivity measurement.

The growth of the system theory in recent times has provided a new powerful tool to analyze organizational issues. System theory considers an organisation in its holistic perspective. The components of the system, which in turn are again systems, or sub systems, are inter-related: these interact and are inter-dependent. It is total performance of a system which is important and assumes significance. The authors have applied the principles of systems theory in order to evolve performance objectives of an organisation as well as of its constituents sub-systems.

Using the principles of MBO and systems theory and drawing upon the proven strengths of the techniques of multi-attribute decision analysis and goal programming, the book has proposed a new methodology of productivity measurement termed as Performance Objectives-Productivity (PO-P). It is a multi criteria productivity measurement technique which lays stress on performance against objectivated output. PO-P model meets the task of, one of the primary and most important, providing comparative information of rise or decline in productivity long with identification of opportunities for improvement.

The book under review has 7 chapters in all. Chapter-I introduces the subject and gives an overview of the problem of productivity measurement and brings out the need and advantages of measuring productivity. Chapter-II presents an in-depth study and review of the art and practice of productivity. Existing literature is critically examined and its drawbacks, inadequacies and limitations are brought out. An overview of major measures of productivity and models of productivity measurement is presented.

In chapter-III, relevance of systems approach in developing an appropriate model of productivity measurement is established. A new productivity model termed as 'Performance Objectives-productivity' (PO-P) is presented. A methodology is presented to arrive at Key Performance Areas, Performance Objectives, Objectivated Output and Productivity Indices for various Sub-systems.

One of the striking features of the book is that the authors have demonstrated the applicability of the PO-P approach through six case studies, which have been discussed at length in the book. Three case studies are from service sector, which is largely an ignored area in the field of productivity measurement.

Chapter-IV takes up the case studies of engineering enterprises to measure productivity. Three case studies, one each of small, medium and large sized firms are discussed. The performance objectives of these firms differ in priorities and ranking. In the large sized firm the performance objectives are not confined to only one level of organisation. Performance objectives of the system and its sub-systems are identified and a methodology to arrive at productivity at various levels is demonstrated.

Chapter V examines the application of the model in service sector. The application of the model is demonstrated by taking case of an R&D set-up and two case studies of educational institutions.

Chapter VI examines external environment and its socio-cultural, economic, political and technological sub-systems and brings out the impact of these on productivity of an organisation. Two methodologies are suggested to normalise the impact of these sub-systems to obtain 'net' productivity index. Relevance of this approach in comparing productivities of multi-plant operations belonging to the same organisation but lo-

cated in different external environments is also brought out.

Productivity management encompasses all facets related to the art and practice of productivity. For its successful implementation, it is necessary to have an organisation with the right orientation, an audit system and a monitoring plan. For improvement of productivity, an organisation must focus on improvement plans, identifying actions desired, fixing responsibilities and laying down of time schedules. Chapter VII details these aspects.

An extensive literature review of productivity measurement models with 242 references covering almost all aspects of productivity and productivity measurement, gives a total feel of research efforts made so far in this area and is useful to students and researchers.

The book is a welcome addition to the art and practice of productivity management. It should be quite useful to managers of industrial enterprises, students and researchers.

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