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Adoption of Composite Fish Culture Practices in West Bengal: Nature, Intensity and Effects on Technical Efficiency

*Jaydev Misra**

ABSTRACT: Despite technological and financial support on the part of West Bengal Government, low productivity in fish culture leads us to conclude that composite fish culture practices developed and training services provided were either not producing the desired result or not being adopted by the farmers. Answers to the question of why farmers are tardy regarding adoption must serve as the basis for increasing adoption through modification of the current package. Present study, based on primary survey on 360 fish farmers in West Bengal, attempts to examine the nature and extent of adoption of composite fish culture methodology. In order to investigate the effect of adoption intensity upon technical efficiency of fish farms, meta-frontier data envelopment analysis has been followed in the study. It is found that technical efficiency increased directly with the increase in adoption intensity. Multiple regression analysis has revealed that the level of education, farm size, farm income, and extension contact were positively correlated with adoption of the fish production technologies, while age was negatively correlated. Among others, study suggests reformulation of training and visit system through participatory farmer-group approach. Also, the extension agents should increase the frequency of their visit to fish farmers.

Key Words : *Composite Fish Culture, Determinants of Adoption, Technical Efficiency, FFDA.*

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1. INTRODUCTION

Despite being a relatively minor contributor to the overall economy (0.7 per cent of total GDP and 5.0 per cent of AgGDP at factor cost in 2010-11), aquaculture has become an increasingly important sector in India in terms of its potential for contributing to food security and nutrition, employment and improvements in the socio-economic status of rural communities. Fish production increased from 3.8 million tonnes in 1990-91 to 8.29 million tonnes in 2010-11. This rise in production has been possible due to quantum jump in inland fisheries, especially pond aquaculture, which is now growing at an average annual growth rate of 13.87 per cent. West Bengal is the largest producer of inland fish, contributing 38 per cent of total fish produced in the country (kumar 2010).

But even with this substantial increase in fish production in recent past, the per capita availability of fish in the country is still below the nutritional requirement of 13.8 kg (WHO, 2009). This necessitates concerted effort for further increase in fish production which is assumed to be possible through vertical and horizontal expansion of pond aquaculture sector by bringing more and more water resources under scientific pisciculture and enhancing the efficiencies of fish farmers.

No doubt, among the major states in India, West Bengal has been extending several facilities for expansion of culture fisheries, such as fish seed supply at cheaper rate, training programme for farmers, subsidies for renovation of tanks as also some welfare measures. Along with these, Fish Farmers Development Agencies (FFDAs) have been established to help the fish farmers with necessary financial, technological and extension support in order to increase fish production in tanks and ponds by composite fish culture practices. Such practices involves several steps like pond preparation, pre stocking, use of manure and intoxicants, stocking of recommended schedule of fish species, fish feeding and harvesting. Productivity in water bodies under FFDA programme is sufficiently higher (10-15 mt/ha/yr) than that in non-FFDA ponds. Yet, the mean national pond productivity is as low as 2.4 mt/ha/yr. It indicates that FFDA programme has not been adopted by the farmers or there exists some gap (Ayyappan and Gopalakrishnan, 2008). Hence, it can be considered that the adoption level of composite culture practice is tardy and arbitrary. Now, if adoption of technology is not in accordance with recommendation, farmer's technical efficiency (fish farmer's ability to produce maximum output with the use of existing inputs) will not be optimal (Dey *et al.* 2004).

Apart from the characteristics of the technology which are already known to affect farmer's decision to adopt, it is suspected that the socio-economic characteristics of the farmer play major roles in adoption of decision-making. The farmer's decision for or against the adoption of any science-based production technology was described as a mental process, consisting of several stages (Ofuoku *et al.* 2008; Ghosh *et al.* 1993). The level of education, farm size, farm income, and extension contact all are involved in this process and thereby inter-related with adoption of the fish production technologies. Farmers are sometimes tradition-bound or progressive, which depends closely on their socio-economic background (Wetengere 2010). Hence, decision regarding diffusion of new technology by the fish farmers is usually decided upon interaction between perception on this introduced technology and socio-economic characteristics of the farming households.

Against such a background, the objective of this paper, is to examine the nature and intensity of adoption of fish farming technologies in West Bengal and then to determine how

technology adoption by the farmers affects their technical efficiency in fish production. Efforts have also been made to identify the variables which determine the adoption of composite fish culture practices.

2. MATERIALS AND METHODS

2.1 Sample Selection

The study has been based on primary source of information obtained through field survey from representative respondents. There are six such zones in the state of West Bengal. Excluding hill and terai region, one district has been selected from each of the rest four zones (such as old alluvial region, red and laterite zone, new alluvial region and coastal and saline zone). Now, at first, block-wise full details of fish farming in these 4 districts comprising water area (tanks and ponds), fish production, nature of technology adoption and culture details have been collected for drawing representative sample of blocks. At the second stage, three blocks from each district and two villages from each block has been randomly chosen. In case of non-fulfillment of this condition in a particular village, a nucleus of villages with two or more contiguous villages was constituted. At the final stage, a comprehensive list of pond operators (or fish farmers) from each village in the selected blocks has been prepared and then farmers are categorized into three sub-groups, namely, small (having pond size less than 0.5 acre), medium (pond size between 0.5 to 5 acre) and large pond owner (holding pond of size more than 5 acre). From each village, five fish farmers from each size group (that is, small, medium and large) have been randomly chosen. In this way, the total number of 30 household pond operators from each block has been chosen. The number of sample pond operators from each district is 90 and the total number of ultimate unit of analysis for the state as a whole is, therefore, 360. Observations are made according to the administered pre-designed structured questionnaires to all the fish farmers selected.

2.2. Analytical Framework

In order to investigate the effect of adoption intensity upon technical efficiency of fish farms, the concept of meta-frontier production function based on data envelopment analysis (DEA) has been employed to examine whether there is any systematic difference in the efficiency of the fish firms for different level of technology adoption (Hayami 1969; Hayami and Ruttan 1970). The non-parametric method of DEA introduced by Charnes *et al.* (1978) and further generalized by Banker *et al.* (1984) requires no parametric specification of the production frontier. Using a sample of actually observed input-output data and a number of fairly weak assumptions, it derives a benchmark output quantity with which the actual output of a firm can be compared for (output-oriented) efficiency measurement. Along with this argument, in Meta-frontier analysis, the performance of each individual fish firm in the sample is measured against two different frontiers - one based on firms from all the different groups in the sample and the other based only on firms from the group to which it belongs. The first can be regarded as the 'grand' frontier and the other as the 'group' frontier. The meta-frontier DEA model can be developed as follows -

An input-output bundle (x, y) is feasible when the output bundle y (a nonnegative vector of quantities of outputs) can be produced from the input bundle x (a nonnegative vector of quantities of inputs). The set of all such feasible input-output bundles constitutes the production possibility set T : $T = \{(x, y) : y \text{ can be produced from } x; x \geq 0; y \geq 0\}$

In the single output case, the frontier or the graph of the technology is defined by the production function $g(x)$ representing the maximum quantity of y that can be produced using the input bundle x $g(x) = \text{maximum value of } y, \text{ given } x, \text{ where } (x, y) \in T$.

The corresponding production possibility set is: $T = \{(x, y): y \leq g(x); x \geq 0, y \geq 0\}$.

In the more general, multiple-output multiple-input, case, under the assumptions of convexity of the production possibility set along with free disposability of both inputs and outputs, the production possibility set can be empirically constructed as

$$T = \left\{ (x, y) : x \geq \sum_{j=1}^N \lambda_j x^j; y \leq \sum_{j=1}^N \lambda_j y^j; \sum_{j=1}^N \lambda_j = 1; \lambda_j \geq 0; (j = 1, 2, \dots, N) \right\}$$

where (x^j, y^j) is the observed input-output bundle of an individual firm j in a sample of N firms in the data.

Before one proceeds to construct the production frontier using the DEA in order to measure the technical efficiency of a fish firm, it is necessary to recognize that all of the observed firms may not have access to the same level of technology. Rather, different firms or group of firms may face different production technologies. A variety of institutional, geographical or other factors may give rise to such a situation. Constructing a single production frontier based on all the data points would, in such cases, result in an inappropriate benchmark technology. A way to measure the impact of technological heterogeneity across groups is to construct a separate 'group frontier' for each individual group alongside a single 'grand' or 'meta-frontier' that applies to firms from all the groups.

In order to construct different production possibility sets for different groups, we first group the observed input-output bundles by the adoption intensity of the corresponding firms. Suppose N firms are observed and these firms are classified, according to adoption intensity, into H number of distinct and exhaustive groups.

Define the index set $I = \{1, 2, \dots, N\}$ where each observed data point is an element of I and partition it into non-overlapping subsets $I = \bigcup I_r$, where I_r includes only observations from group r . Then, under the standard assumptions of convexity and free disposability of inputs (x) and outputs (y) the empirically constructed group and grand production possibility sets are:

$$S^r = \{(x, y) : x \geq \sum_{j \in I_r} \lambda_j x^j; y \leq \sum_{j \in I_r} \lambda_j y^j; \sum_{j \in I_r} \lambda_j = 1; \lambda_j \geq 0 (j \in I_r)\} \text{ (For group } r)$$

and

$$S^G = \{(x, y) : x \geq \sum_{j \in \bigcup I_r} \lambda_j x^j; y \leq \sum_{j \in \bigcup I_r} \lambda_j y^j; \sum_{j \in \bigcup I_r} \lambda_j = 1; \lambda_j \geq 0; (j \in \bigcup I_r)\} \text{ respectively.}$$

The set S is the free disposal convex hull of the observed input-output bundles of firms from group r . It may be noted that while each S is a subset of S^G , the latter is bigger than the union of the individual group production possibility sets.

For the overall or grand efficiency of the fish farms in the sample, we solve the following LP problem, including all 360 farms from observation as:

$$\text{Minimize } \theta_G^j$$

Subject to –

$$\sum_{j=1}^{360} \lambda^j Y^j \geq Y_0^j \text{ (output constraints)}$$

$$\sum_{j=1}^{360} \lambda^j X_k^j \leq \theta_G^j X_k^0 \text{ (inputs constraints, k)}$$

$$\sum_{j=1}^{360} \lambda^j = 1$$

$$\lambda^j \geq 0, j = 1, 2, \dots, 360$$

Where, θ_G^j is the dual of the variable indicating proportional increase in output possible by firm j; or Grand technical efficiency, TE_G^j .

λ^j = weight or intensity variable (or, shadow price) used to derive all possible linear combinations of the sample observations.

Y_0^j = Actual output produced by firm j.

X_k^0 = Actual input used by firm j

Similarly, the relevant DEA model for group r with N_r fish farms in the sample is –

$$\text{Minimize } \theta_r^j$$

Subject to –

$$\sum_j \lambda^j Y^j \geq Y_0^j \text{ (output constraints)}$$

$$\sum_j \lambda^j X_k^j \leq \theta_r^j X_k^0 \text{ (input constraints, k)}$$

$$\sum_j \lambda^j = 1, \lambda^j \geq 0,$$

Where, θ_r^j is the dual of the variable indicating proportional increase in output possible by firm j; or the group technical efficiency, TE_r^j . In view of the fact that the grand production possibility set contains every group production possibility set, it is obvious that $\theta_r^j \leq \theta_G^j$ and, hence, $TE_r^j \geq TE_G^j$, for every j and r. In other words, firms cannot be more technical efficient when assessed against the meta-frontier than when evaluated against a group frontier.

A point wise measure of technical efficiency of group r relative to the grand frontier evaluated at the input-output data of farm j is -

$$\beta_r^j = \frac{TE_G^j}{TE_r^j}$$

An overall measure of the efficiency of group r is -

$$TE(r) = \left(\prod_{j \in r} \beta_r^j \right)^{1/N_r}$$

Where, N_r is the number of farms in group r .

Clearly, for any fish farms j in a group r , TE_G^j is a measure of its performance relative to other farms within the same group. On the other hand, β is a measure of its performance compared to all groups in the study. Technical efficiency score of each fish farm within each group was estimated separately based on their individual frontier and also based on the grand frontier comprising all the observations taken together. Index of intensification efficiency broadly reflects the effects of adoption behaviour on the technical efficiency of a fish farm.

3. RESULTS AND DISCUSSIONS

3.1. Level of Adoption of Modern Culture Practices

The livelihoods of a large number of small and marginal farmers are associated with fish farming in the study area. The peak fish farming season is from April to December, a culture period of around nine months. Fish fry are stocked in April to June and harvested primarily from October to December. Culture period is limited to one crop annually. Fish culture practices in the study area include all activities from pre-stocking operations to harvesting of fish through human efforts. Their cultural practices may simply be categorized on the basis of major operations like pre-stocking, stocking input application, application of supplementary feeds and harvesting. Table 1 explains the various levels of adoption of composite fish culture practices.

Pre-stocking operation in the area studied includes cleaning of ponds, eradications of plant weeds, insects, predatory fishes and frogs, netting. This would facilitate the better environment for proper growth and movement of fingerlings. Less than half of total fish farmers have undertaken pre-stocking activities in our study area. Such activity is quite high for medium pond owners (74.2 per cent) and miserably low for small farmers (34.2 per cent).

Stocking refers to applications of external fish seeds into the ponds for the purpose of raising them up to the marketable size. The average size of fingerlings was 5.36 cm in length and 11.8 gms in weight. Farmers did not attempt to stock any specific ratio of different carp species. Even, recommended schedule of stocking have not been followed by huge number of farmers (253 out of 360 farmers studied). For almost 91 per cent of small operators, stocking density is far from recommendation. The highest average stocking density was maintained by large farmers (9237 per acre) followed by medium (5929 per acre) and small fish farmers (3671 per acre). However, along with carp, farmers also stocking small indigenous species, like mola

(*Amblypharyngodon mola*), puti (*Puntius sophore*), koi (*Anabas testudineus*), in their ponds to enhance total fish production. Usually, fingerlings were stocked from local aratdars (33.6 per cent), or hatchery (24.2 per cent). Natural sources, such as old perennial ponds, floodplains and rice fields are also the sources of seed collection. But large farmers generally use seed from their own sources (60 per cent). This is evident from Table 2.

Table 1: Information regarding Adoption of Appropriate Culture Practices

Questions	Small		Medium		Large		All	
	Yes	No	Yes	No	Yes	No	Yes	No
Whether pre stocking done	41 (34.2)	79 (65.8)	89 (74.2)	31 (25.8)	46 (38.3)	74 (61.7)	176 (48.9)	184 (51.1)
Whether recommended schedule of stocking followed	11 (9.2)	109 (90.8)	42 (35.0)	78 (65.0)	54 (45.0)	66 (55.0)	107 (29.7)	253 (70.3)
Whether seed testing done	00 (00.0)	120 (100.0)	7 (5.8)	113 (94.2)	21 (17.5)	99 (82.5)	28 (7.8)	332 (92.2)
Whether lime and intoxicants used	79 (65.8)	41 (34.2)	107 (89.2)	13 (9.8)	102 (85.0)	18 (15.0)	288 (80.0)	72 (20.0)
Whether inorganic fertilizers used	51 (42.5)	69 (57.5)	88 (74.3)	32 (26.7)	118 (98.3)	02 (1.7)	257 (71.4)	103 (28.6)
Whether improved supplementary feed used	10 (8.3)	110 (91.7)	48 (40.0)	72 (60.0)	62 (51.7)	58 (48.3)	120 (33.3)	240 (67.7)

Source: Field Survey, 2008-09

Note: Figures in the parentheses indicate standard deviation values.

Table 2: Size Class-wise Sources of Fish Seed in the Study Area

Size Class	Hatchery	Local Aratdars	Natural Sources	Own Ponds
Small	16 (13.3)	70 (58.3)	34 (28.3)	0.0 (0.00)
Medium	38 (31.7)	36 (30.0)	11 (9.2)	35 (29.1)
Large	33 (27.5)	15 (12.5)	00 (0.00)	72 (60.0)
All	87 (24.2)	121 (33.6)	45 (12.5)	107 (29.7)

Source: Field Survey, 2008-09

Note: Figures in the parentheses indicate standard deviation values.

Fish thrives well in alkaline water. Lime is used in a pond to maintain the appropriate alkaline nature of the fishponds. Toxicants are the substances which are used to eradicate predatory fish, insects and frogs from the ponds. The most common toxicant is mohua oil cake. Usage of lime and other toxicants by the farmers in the region studied vary widely, from 65 per cent for small pond operators to 89 per cent for medium farmers. Manures are not directly consumed by fish. It, in fact, enhances the vegetative growth of green aquatic plants and phytoplankton which are ultimately consumed by fish. Dung is the most commonly used manure. Apart from such organic fertilization, inorganic fertilizers, like urea, single super phosphate are also used by operators in the study area. It also facilitates the growth of micro and macro vegetative plants in the ponds. But such use of inorganic fertilizer is abruptly low for medium farmers (26 per cent) and they often expressed their unawareness in this matter. Almost all the large pond owners (98.3 per cent) are using urea and single super phosphate for pond fertilization.

Another critical input necessary for better and vast growth of fish is the use of commercially manufactured improved supplementary feed like Azolla, soybean flour and fish meal. Rice bran, white bran, mustard oil cakes are most common among the supplementary feeding applied by the farmers. In almost all the ponds, upon enquiry, it was revealed that very few farmers use supplementary feeds as per recommended schedule, rather hit and trial method followed. Sixty per cent of the medium sized farmers generally employed commercially manufactured improved feeds. Surprisingly, almost half of large farmers are not using supplementary diets. Feeds consisting of a mixture of locally available feed ingredients such as rice bran, wheat bran and oil cake or farm-made aqua feed comprising rice bran, wheat bran, oil cake, fish meal, flour, dried fish, salt and vitamins are more common feeding practices in the study region. The most common feeding frequency in extensive farming system was once per day, while all large and 62% of medium farmers reported twice per day feeding.

Overall, in most cases, culture practices have been found not according to the recommended schedule. The composition of different steps was mismatched to the recommendation. A large number of sample farmers expressed their unawareness about different steps of scientific culture practices. Sometimes, acquired knowledge from government extension services have been modified by the farmers to fit with their own constraints.

3.2. Intensity of Adoption of Composite Culture Practices

The intensity of adoption of modern culture practices by the fish farmers has been presented in the Table 3. In this study, adopter-operators has been defined as those operators (or fish farmers) who adopt the practices like pre-stocking, stocking, input applications like lime, toxicants, manures, fertilizers, application of supplementary fish feeds, harvesting, etc. The computation revealed that almost 21 per cent of total farmers had not adopted any modern culture techniques to improve farm productivity. 23 per cent of total sample went for full adoption, but partial adoption of modern culture practices was quite high (more than 55 per cent) among the farmers. Almost 40 per cent of the small farmers had not adopted any scientific culture practice. Adoption of full package of practices is highest (38.33 per cent) among large farmers. Partial implementation of package is highest among medium size of farmers (62.5 per cent). The adoption rate had increased positively with the size of ponds. The results imply that the adoption level was low generally since a total of 76 per cent of the

respondents fell under the low adoption category. This is confirmed by the adoption scores which are likewise low. The adoption score which formed the dependent variable were determined by computing the number of the stages (like pre-stocking, de-weeding, pond preparation, supplementary feeding, etc.) adopted by the fish farmers in the study area. The adoption score was arrived at, by dividing the overall mean adoption score by the number of adoption stages. As such, adoption rate had been found highest among medium farmers (0.53), followed by large (0.46) and small (0.27) farmers. This is attributed to the traditional training and visit system where farmers do not participate in technology development and farmers are not easily reached by extension agents. The low adoption of innovations is an index of the poor extension approach to agricultural development. One important observation in this regard is that most of the fish farmers, even though they tend to adopt, did not use the inputs in accordance with proportions and schedules recommended by the technical experts. They normally chose only those combinations of inputs that suited their resource position best.

Table 3: Percentage Distribution of Fish Farmers Adopting Modern Culture Practices

Adoption Intensity	Frequency			
	Small (N=120)	Medium (N=120)	Large (N=120)	All (N=360)
Full Adoption (Intensive)	07 (5.83)	33 (27.5)	46 (38.33)	86 (23.88)
Partial Adoption (Semi-intensive)	66 (55.00)	75 (62.5)	58 (48.33)	199 (55.27)
No adoption (Traditional)	47 (39.17)	12 (10.0)	16 (13.33)	75 (20.83)
Adoption Score	0.27	0.53	0.46	0.42

Source: Field Survey, 2008-09

Note: Figures in parentheses indicate percentage of respective totals

3.3. Adoption Wise Variation in Technical Efficiency Scores

Now, using meta-frontier methodology, grand (overall) and group (according to intensity of adoption) technical efficiency have been calculated and presented in Table 4. From the Table, it has been revealed that, in general, average TE scores are higher among intensive systems. Based on group frontier, the average TE scores of semi-intensive and intensive farms are 0.649 and 0.907 respectively, but that for extensive farms were only 0.537. The trend of results has appeared almost similar when TE was measured based on grand frontier. Clearly, technical efficiency increased directly with the increase in adoption intensity, so also the adoption efficiency. There are considerable differences in adoption efficiency among the different groups. Adoption efficiency was highest (0.834) for intensive farmers, whereas the respective figure was as low as 0.362 for traditional farmers.

These results have important implications for the development of appropriate and comprehensive extension and research strategies. Such strategies would assist operators (especially those who are less well educated, younger, and new to farming, and are thus technically inefficient) increase human capital by accessing the information needed to increase technical efficiency, to adopt modern farming technologies, and to increase freshwater fish productivity. It is widely stated that the fish farming involves the use of certain 'cultural practices' to obtain the maximum yield. No doubt, intensive composite fish culture involves a high degree of skill. But it is observed that fish culture is practiced in a very neglected and arbitrary manner; as a result of which, technical efficiency had been found measurably low. Only a small percentage of the adopter-operators in our sample have been found to follow strictly the uses of inputs in accordance with the schedules and doses. In the sample studied, only 11 per cent of the adopter-operators followed preparatory operations like de-weeding, desilting and eradication of predators and weed fishes. Only 7 percent cultivators used toxicants; 61 per cent of the water had weeds and only 5 per cent of the water units were renovated. The species-mix in seed and the stocking rate, the two major determinants of yield, were not strictly followed. The operators liberated different species of carps without maintaining right proportions. They could not procure quality fish seed. It was also reported that the average survival from spawn to fry stage is about 30 per cent which is very low. Netting and soil testing were seldom done. It is also to be noted that use of fertilizers and supplementary feed, which indicates the inability of the users to bear higher cash expenses for cultivation and their ability to bear risk, was not made properly. Only 10 percent of the adopter-operators were found to follow the suggestions made in this regard. Manures for maintaining healthy atmosphere in tank were seldom given. Organic manures were used by about 70 per cent of the operators (the most common being cow dung). Unfortunately, it is also observed that about 95 percent of the fish farmers in our sample fed their fish irregularly. The most commonly reported fish feed were rice-bran, leftover cooked rice or fresh cow dung, etc. All these findings lend credence to the fact that the level of technology adoption is inadequate, and the input-mix is sub-optimal.

Table 4: Mean Technical Efficiency of Fish Farms Across Adoption Intensity

Region	No of Fish Farms	Mean Technical Efficiency		Adoption Efficiency
		Based on Grand Frontier	Based on Regional Frontier	
Traditional (No Adoption)	86 (23.88)	0.504	0.537	0.362
Semi Intensive (Partial Adoption)	199 (52.28)	0.623	0.649	0.471
Intensive (Full Adoption)	75 (20.84)	0.854	0.907	0.834

3.4. Determinants of Adoption Practices

Socio-economic characteristics (like age, experiences or education) of the fish farmers sometimes determine the adoption of improved fish production technologies. Pond size (as

proxy of farm size) or extension contacts also affect the level of adoption intensity of fishers. In order to investigate the effects of such variables, multiple regression analytical tool using the ordinary least squares (OLS) method was applied. The linear function was used as the lead equation because its equation indicated goodness-of-fit considering the quality of its coefficient, R-squared, adjusted R-squared, and F-ratio. The adoption levels which formed the dependent variable were determined by computing the number of the technologies adopted by the fish farmers in the study area. The adoption index was arrived at, by dividing the overall mean adoption score by the number of adoption stages. The multiple regression model is implicitly specified as follows:

$$Y = f(X_1; X_2; X_3; X_4; X_5; X_6; U)$$

Where Y = Level of adoption of improved fish farming technologies
(number of technologies adopted).

X₁ = Age of farmers (years)

X₂ = Level of education (years spend in school)

X₃ = Experience of fish farmers (years in Carp Culture)

X₄ = Pond size (population of fish)

X₅ = Financial assistance (Rs)

X₆ = Extension Contact (number of visits by extension agents)

U = Error term

The level of significance used is 0.05.

The parameters of the estimated linear regression model, shown in Table 5, has revealed that the age of the fish farmers (X₁) had a negative correlation with adoption at 0.05 levels of significance. This implied that the older farmers are unwilling to accept improved technologies, because they are afraid of risks involved with new technologies. It has implication for the present extension approach of training and visit as the farmers do not make input in the required technology. The change of approach to a client-driven one will erase the fear-psychosis inherent in the older generation. They will readily accept any technology they contribute to its development.

In developing countries like India, a general characteristic of farmers is that they are tradition bound. They are understandably afraid of costly risk and will not take them until they are convinced that the new methods are safe, will pay off and will not violate their values. As mentioned earlier that there was the contention that most farmers are tradition bound because of their low level of education. In situations like this where farmers are tradition bound, a lot has to be done by the extension agent to erase some of these superstitious beliefs. This calls for the application of the Farmer-Group Approach. This will make agricultural extension service more client-driven thus reducing the risk of introducing an innovation that is at variance with the tradition of the farmers. Perhaps this is the reason, coefficient for experience (X₄) in regression coefficient has not been found significant.

The level of formal education (X₂) was, on the other hand, negatively correlated with the adoption of improved fish farming technology at 0.05 levels of significance. The implication is that educated farmers readily adopt improved fish production technologies.

Formal education enables farmers to obtain useful information from bulletins, agricultural newsletters, radios and other sources. The formal education usually aid farmers and lead them to accept new farm technologies more readily to enhance their income than those farmers without formal education.

Pond size (X_4) revealed a positive correlation with adoption, but it is not significant at five per cent level. T-value was also not strong (0.102). Result has revealed that fish farmers with large farms more readily adopt improved technologies than farmers with small pond sizes, though not always true. This is where economics of scale in aqua cultural production comes in to play. Financial assistance (X_5) has also revealed a positive correlation with adoption of fish farming technologies. Finance and adoption of innovation go hand in hand. This is the reason why even when new technologies are costly to adopt because it requires large amount of money initially, the poor farmers could not able to adopt them. The fish farmers who adopted most of the improved technologies were the rich farmers and this was observed in the study area also.

Extension contact (X_6) has been found positively correlated with the adoption of fish farming technologies. There is no denying the fact that more the extension agents visit the fish farmers and educate them on the recent technologies, the better they understand and adopt them. Such frequent contact by agents is nurtured by a change to the participatory approach of extension delivery, as the participation of the farmers in the technology development, based on adult learning principles and experimental learning motivates them. In the study area, this has perhaps facilitated farmer's demand for knowledge and offered opportunity for them to choose, test and adapt technologies according to their needs.

Table 5: Linear Regression Model Estimates of the determinants of Fish Farming Technologies

Variables	Index	Coefficients	Standard Error	t-Value
Age (10^2)	X_1	-1.15	0.0032	-2.17*
Education (10^2)	X_2	4.543	0.0130	3.415*
Experience (10^2)	X_3	0.427	0.0701	1.112
Pond Size(10^6)	X_4	0.247	0.060	0.102
Financial Assistance	X_5	4.254	0.070	4.612*
Extension Contact	X_6	9.126	0.0006	3.52*
Constant	--	0.927	0.314	3.026*

$R^2 = 0.927$; $F = 91.278$

* significant at 5 percent level

4. CONCLUSION AND POLICY FORMULATIONS

Findings of the study have shown that adoption rates of modern culture practices are miserably low. Farmers allocate resources to those activities, which contribute to household food and income security. For that they sometimes adopt only a part of package of practices and end up with low level of technical efficiency. Though technical efficiency of the farmers under study is positively related with intensity of adoption, diffusion of technology extended by FFDAs and government agents have been found to be limited or sometimes absent. Actually, it has not been taken care of that lab generated technology is not readily applicable and appropriate under varied local conditions. The problem is aggravated by lack of adequate skilled staff, which is further goaded by absence of regular capacity building programs for staff. Absence of coordination among fisheries development officers and other development agencies like financial institutions, NGOs, PRIs has also been observed.

The study also revealed that the level of education, farm size, farm income, and extension contact were positively correlated with adoption of the fish production technologies, while age was negatively correlated with regard to fish production technologies. There is the need to jettison the present training and visit system (closed-in approach) and can be replaced with participatory and farmer-driven approach. Farmers can also be motivated through success stories of adoption. Successful farmers can also be included in extension network. As extension has been found significant effect on adoption, more fisheries extension agents should be employed by FFDAs. Extension agents should increase the frequency of their visit to fish farmers. Adult education programs should be organized for the fish farmers who are not literate.

It should also be mentioned that there is a prospect of FFDAs in facilitating intensive culture practices among the fish farmers and obviously, it has created a positive impact. But it is also essential to know the fish farmers, understand their social, economic and cultural disabilities and understand their local settings and institutions under which low productivity is generated and sustained before solutions can be conceived of and set into action. The programme is required to be area or community specific, taking into account the different development potentials as well as constraints of each area or community. No doubt, it is difficult to 'tend a flock of sheep from the camel's back'. But, to ensure proper planning, adequate supervision, effective implementation and better monitoring, the FFDAs need to be re-evaluated. In the first place, it should be stated that this programme, if it is to succeed completely, calls for the real identification of the beneficiaries. Also, the cumbersome loaning procedure and the transaction costs of loans, like frequent transportations costs for visiting block and bank officials needs to be rationalized so that loan can be reached well in advance at reasonable rate of interest. •

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*Ashoke Mondal**

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Key Words : *Financial Performance, Discriminant Analysis, Cluster Analysis, Solvency.*

1. INTRODUCTION

Banking One of the important research areas in corporate finance is prediction of corporate performance. A large number of researchers have developed performance

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1. INTRODUCTION

Banking One of the important research areas in corporate finance is prediction of corporate performance. A large number of researchers have developed performance

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prediction models over the last fifty years using various statistical techniques. The main reasons are as follows:

Firstly, stakeholders of business firms depend on the firm's success in achieving their individual goals. Market value of the low performing firm declines with the passage of time which adversely affects the interest of the stakeholders of the business. Therefore, from the stakeholder's point of view, prediction of corporate performance is highly necessary.

Secondly, in the recent past the general economic condition of many developed countries has undergone drastic change. It has caused considerable economic slowdown in the economic activities. Unfortunately it has also created significant impact on the economic activities of the developing countries. As a result, business firms of developing countries are currently facing many challenges. If the companies fail to cope up with this challenge, they will be forced into bankruptcy. So, if one can identify the reasons of poor performance, then early actions could be taken to avoid future distress.

It is therefore necessary to identify the factors of poor performance to predict the future happening. Moreover, the availability of statistical techniques has offered increased possibilities for research regarding corporate performance prediction.

In this study, I have predicted corporate performance based on the information provided by the financial statement. From the financial statement financial ratios have been calculated to measure liquidity, solvency, profitability, efficiency of the firm. These financial ratios are then used in this study in prediction of corporate performance.

The objectives of this paper thus are:

- (a) to identify the financial ratios that are important for stock classification
- (b) to develop a model for prediction of business performance.

2 LITERATURE REVIEW

A number of studies have been undertaken to predict corporate failure or success. In this section an attempt has been made to review a few related empirical studies that are proved to be helpful in predicting corporate performance.

Earlier it was observed that corporate success or failure can be predicted on the basis of trends of the financial ratios. In this context, the work of Beaver (1966) is notable. He developed a dichotomous classification test based on simple t-test under a univariate framework. He conducted the study on 79 failed and 79 non-failed firms over the period 1954-64. By comparing the mean ratios of the failed firms and non-failed firms, he concluded that there was a difference in the mean ratios of the failed and non-failed firms.

Altman (1968) conducted an empirical study to predict bankruptcy using Multiple Discriminant Analysis (MDA). Altman selected 66 firms (33 bankrupt firms and 33 non-bankrupt firms). The data from the financial statements were collected over the period 1946-1964. From 22 ratios, 5 ratios were selected as most relevant in predicting bankruptcy. They are working capital/ total asset, earnings before interest and taxes/total asset, market value of equity/total debt, sales/total asset. Z's discriminant score was determined and those companies with a Z score greater than 2.99 fall into Non bankruptcy group, while those companies having a Z score below 1.81 were in the bankruptcy group. The cut off index that made the

most accurate prediction of bankruptcy one year before filing bankruptcy was 2.675. The model was able to provide high predictive accuracy of 95%. For that reason MDA is used frequently in predicting corporate failure.

Since there are some inadequacies in Multiple Discriminant Analysis, Logit analysis was undertaken by Ohlson (1980). He conducted this study on 105 bankrupt and 2058 non bankrupt companies over a period of 1970-1976. His study revealed that financial structure (Total liabilities to Total Asset) and current liquidity were major determinants of bankruptcy.

Mohamed *et al.* (2001) have conducted a study in 2001. He compared MDA model with Logit model. In this study using MDA, debt equity ratio and total asset turnover ratio were found to be significant but using logit analysis an additional variable i. e. interest coverage ratio was also found to be statistically significant.

Puagwatana and Gunawardana (2005) conducted the study to develop a prediction model and the model was developed by using four variables from Altman's model which are working capital to total asset ratio, retained earnings to total asset, EBIT to total asset, sales to total asset and adding one new ratio net income(loss)/ amount of shares. The sample is limited to the year 2001. The sample consists of 33 companies out of which 12 companies are failed companies. Descriptive statistics, correlation, and independent t-tests, stepwise logistic regression were used for the study. Independent t-test is used for testing the significance of those variables as warning signs of the financial health. Mean ratios of one group is compared with another group. It was observed that most ratios of the failed companies had greater fluctuation than the non-failed companies. From the study it was also observed that stepwise logistic regression model have the ability to assist management for predicting corporate problems early enough.

Erdogan (2008) conducted a study on commercial banks after Turkey's financial crisis. 42 commercial banks were selected for the study. Logistic regression model was used to form a prediction model and the model was validated. It was observed that 80% of the failed firm could be predicted a priori. Six ratios were found significant: one capital ratio, two profitability ratios, two income expenditure ratios and a provision for loan losses variable. These variables found to provide reasonably good results in predicting financial distress in Turkey.

Abdullah *et al.* (2008) conducted a study for identifying financially distressed companies. They used Multiple Discriminant Analysis (MDA), logistic regression and the hazard model. 52 companies were selected for the study. From that study, it was observed that though hazard model provides higher accuracy rate on the whole in the estimation model, but when the estimation equation is applied on the holdout sample, MDA gives a higher accuracy rate. Among the ten determinants of corporate failure, it also observed that debt to total asset was a significant predictor of corporate distress.

3. DATA SET AND SELECTION OF VARIABLES

The study was conducted on twenty eight companies belonging to Indian large scale steel industry by taking the monthly share price data of last six years (2006-2011) and financial data for the year 2011. Companies were classified on the basis of average monthly returns of the last six years. In fact, considering a longer time period may invite heterogeneity in the

classification system; on the other hand, if the time period is too short that will ignore variation in the system. To strike a balance, average monthly stock returns of last six years has considered for classification of companies and current year's financial information have been used for developing prediction model. For the purpose of the study large scale industry is considered because it is a basic industry and the performance of this industry influences the performance of other industries. There are fifty nine large cap companies in the steel industry as per BSE but for the purpose of the study twenty eight companies were selected randomly. For collection of financial information and share price data, CMIE PROWESS and BSE website have been used respectively. In this study, eight important ratios are selected on the basis of earlier studies as independent variables. These are:

- 1) **Current Ratio (CR):** It is the ratio of Current Asset and Current Liabilities. It measures the liquidity position of the firm. As a conventional rule, a Current Ratio of 2:1 or more is considered as satisfactory. A high current ratio indicates that liquidity position of the company is good; on the other hand, a low current ratio indicates poor liquidity position.
- 2) **Interest Coverage Ratio (ICR):** It indicates number of times interest is covered by the profits available to pay the interest charges. Generally high interest coverage ratio indicates long term solvency for the firm.
- 3) **Debtor Turnover Ratio (DTR):** Debtor turnover which measures whether the amount of resources tied up in debtors is reasonable and weather the company has been efficient in converting debtors to cash. It is the ratio between credit sales and average debtors. A high debtor turnover ratio indicates the efficiency of collection department.
- 4) **Total Asset Turnover Ratio (TATR):** This ratio indicates efficiency in utilization of total asset in achieving turnover. High ratio indicates the efficiency of total asset in the organization.
- 5) **Current Asset to Total Asset (CATA):** It is the ratio between current assets to total assets. This ratio indicates amount of fund invested in current assets out of total funds.
- 6) **Profit after Tax (PAT):** It is the ratio between earning after interest and taxes and capital employed. This ratio is a measure of profit earning capacity of the organization. It is an important ratio because using this ratio overall efficiency of the business can be measured.
- 7) **Shareholders Fund to Total asset (SFTA):** This ratio indicates amount of shareholders fund in total assets of the organization. It is a structural ratio of an organization.
- 8) **Debt -Equity Ratio (DE):** It is a ratio of total debt to total owner's equity. It measures the long term solvency position of the firm. It also indicates the relationship between loan funds and net worth of the company. A company with high debt capital compared to its equity is known as high geared and vice-versa. This is also used to know the composition of internal and external funds in total funds.

Average monthly returns (over 2006-11) and selected ratios of 28 companies for the year 2011 are presented in Appendix I.

4. METHODOLOGY

From earlier studies, it is observed that researchers have used different statistical techniques such as multiple discriminant analysis (MDA), logistic regression for prediction of corporate distress. Taking cues from these, discriminant analysis is used in the study for prediction of corporate success. For applying any technique, it requires a priori knowledge of group membership to develop a prediction model. From earlier studies, it is also observed that classification of companies into two groups can be done by following a definite rule. But in this study, companies are initially classified based on average annual return during last six years and then again are classified into two groups by applying hierarchical cluster analysis using between groups linkage method. A priori information about the group membership is not required under hierarchical cluster analysis. Groups or cluster are suggested by the data itself in hierarchical cluster analysis. A total of twenty eight companies are selected out of which eighteen companies have been identified as high performing and ten companies as low performing. Descriptive statistics of the variables are used for comparing the financial indicators between the two groups. Independent t test is used for identifying the variables that have the highest ability to differentiate between high performing and low performing group companies. For identifying significant variables and for model building, linear discriminant analysis is used in this study. The linear discriminant can be represented as:-

$$Z_i = W_1X_{i1} + W_2X_{i2} + \dots + W_pX_{ip}$$

Z_i = Discriminant Score for Company i (where $i=1, 2, \dots, 28$)

X_{ip} = Value of p th independent variable for i th company (where $p=1, 2, \dots, 8$)

W_p = Weight for the p th variable.

Dependent variable is binary type and takes value of 0 or 1. That is 1 for high performing companies and 0 for low performing companies.

5. ANALYSIS AND RESEARCH FINDINGS

This section consists of four parts: cluster analysis, descriptive analysis, hypothesis testing, model development.

5.1. Cluster Analysis

Classification of companies in two groups (high performing and low performing) has been done on the basis of average monthly returns of last six years (2005-2011) by applying hierarchical cluster analysis. On the basis of average monthly returns, it is observed that out of the twenty eight companies, eighteen companies are classified as high performing companies and ten companies are classified as low performing companies. This classification is presented in Table 1.

Table 1: Classification of Companies by Cluster Analysis on the basis of Average Return

Sl. No.	Name of the Company	Avg. Monthly Return	Classification of Companies
01	ISMT LTD	2.106	High performance
02	USHA MARTIN LTD	2.544	High performance
03	ZENITH BIRLA(INDIA) LTD	0.706	Low performance
04	WELSPUN CORPORATION LTD	2.581	High performance
05	VALLABH STEELS LTD	0.309	Low performance
06	TULSYAN NEC LTD	1.829	High performance
07	SURYA ROSHNI LTD	2,688	High performance
08	JINDAL SAW LTD	1.861	High performance
09	KALYANI STEELS LTD	2.416	High performance
10	MUKAND LTD	0.792	Low performance
11	MAHINDRA UGINE STEEL CO LTD	0.178	Low performance
12	PANCHMAHAL STEEL LTD	2.499	High performance
13	UTTAM GALVA STEEL LTD	2.703	High performance
14	SHAH ALLOYS LTD	-1.062	Low performance
15	TATA STEEL LTD	2.294	High performance
16	SUNFLAG IRON & STEEL CO LTD	2.458	High performance
17	J S W STEEL LTD	3.343	High performance
18	STEEL AUTHORITY OF INDIA LTD	2.739	High performance
19	BHUWALKA STEEL INDUSTRIES LTD	1.556	High performance
20	BHUSHAN STEEL LTD	3.505	High performance
21	KANISHK STEEL INDUSTRIES LTD	0.247	Low performance
22	STEEL CO GUJARAT LTD	0.42	Low performance
23	STEEL EXCHANGE INDIA LTD	3.603	High performance
24	RATHI STEEL & POWER LTD	2.009	High performance
25	RATNAMANI METAL & TUBES LTD	3.520	High performance
26	P S L LTD	0.468	Low performance
27	NATIONAL STEEL & AGRO INDUSTRIES LTD	0.835	Low performance
28	MODERN STEELS LTD	0.966	Low performance

5.2. Descriptive Statistics and Testing of Equality of Mean between the Two Groups

Descriptive statistics of the variables that are used to estimate the MDA is presented in Table 2. As expected, the mean for current ratio, interest coverage ratio and profit after tax are lower for the low performing group than high performing group. Mean and standard deviation of DE ratio of high performing companies are higher than low performing companies. It indicates that high performing companies are more geared and more relying on debt fund than low performing companies. Moreover, it can be concluded that DTR, TATR, SFTA ratios of low performing group companies are more fluctuating than that of the high performing group companies. Independent t test has also been performed for testing the significance of each of the select independent variables. Test results of equality of mean are shown in Table 3. The results show that variables with a significant mean difference at 5% level are interest coverage ratio (ICR), debtor turnover ratio (DTR), profit after Tax (PAT), current asset to total asset (CATA) and debt equity ratio (DE). This indicates significant differences in these variables between high and low performing groups.

Table 2: Descriptive Statistics

High Performing Group Companies			
Variables	N	Mean	Std. Deviation
CR	18	1.31	0.43
ICR	18	5.13	4.86
DTR	18	40.93	22.60
TATR	18	1.16	0.57
CATA	18	0.43	0.16
PAT	18	5.91	5.44
DE	18	1.74	1.47
SFTA	18	0.33	0.13
Low Performing Group Companies			
Variables	N	Mean	Std. Deviation
CR	10	1.18	0.37
ICR	10	1.15	0.90
DTR	10	59.59	23.16
TATR	10	1.57	0.68
CATA	10	0.60	0.15
PAT	10	-0.48	5.45
DE	10	1.34	1.04
SFTA	10	0.20	0.17

Table 3: t-Test for Equality of Means

Variable	Mean difference	t value	df	Significance Level
CR	0.131	0.81	26	0.43
ICR	3.978	2.55	26	0.02
DTR	-18.662	-2.08	26	0.04
TATR	-0.414	-1.73	26	0.09
CATA	-0.174	-2.85	26	0.01
PAT	6.381	2.97	26	0.01
DE	0.135	2.34	26	0.03
SFTA	0.397	0.75	26	0.46

5.3. Discriminant Analysis

The purpose of discriminant analysis is to classify companies into two groups. Summary of Canonical Discriminant Function is presented in Table 4.

Table 4: Summary of Canonical Discriminant function

Industry	Eigen Value	% of variance	Canonical Correlation	Wilks Lamda	Chi-square	P-Value
Steel Industry	1.863	100.00	.807	0.349	23.14	.001

Table 4 reveals that the discriminant function has a Wilk's Lamda value below than 1. The Lamda has a value between 0 and 1, where value 0 indicates a major difference and the value of 1 means no difference. The Lamda value shows that the function has an ability to distinguish between the two groups. This ability is tested using the Chi Square test. Chi square value is found significant at 1% level. The result shows that both the groups can be discriminated significantly. Table 5 reveals the coefficients of the discriminant function.

Since the variables are unit free, unstandardised coefficients may be used. The discriminant function can be stated as:-

$$Z = -0.012 - 0.0296CR + 0.230ICR + 0.469TATR - 8.126CATA - 0.206PAT + 10.027SFTA - 0.013DTR + 0.893DE$$

The discriminant score is designed for each company to classify it as high performing or low performing company. Following Hair *et al.* (6th edition), the cut off Z score is computed as the weighted mean value of the mean discriminant score of each group for the purpose of classification. The weighted arithmetic mean of the two scores *i.e.*, the cut off score is -0.196. Any company having a Z-score higher than the cut off score is identified as a high performing company; at the same time a company with a Z-score less than the cut off score will be classified as a low performing company. The results of discriminant analysis can be used as a predictor of future performance.

Table 5: Canonical Discriminate Function Coefficient

Variables	Coefficients (Unstandardized)
CR	-0.296
ICR	0.230
TATR	0.469
CATA	-8.126
PAT	-0.206
SFTA	10.027
DTR	-0.013
DE	0.893
Constant	-0.012

Table 6: Value of Function at Centroid (Each Group)

Companies	No. of Companies	Mean Z Value	Z (Cut off value)
High Performing Companies	16	0.980	-0.196
Low Performing Companies	12	-1.764	

In Table 7, Z values are computed with the help of discriminant function. By comparing predicted Z values with the cut-off Z value, companies are classified as high performing and low performing companies. In Table 7, predicted Z values, classification of companies based on cluster and based on discriminant function is presented. From the classification matrix (Table 8), it can be observed that the model has correctly predicted the financial performance of 26 companies accurately out of the 28 companies (92.9%) with the help of the select financial indicators of the year 2011.

Table 7: Predicted Z Value and Group Membership

Sl. No.	Name of the Company	Predicted Z Value	Classification of companies based on predicted Z value	Classification of companies based on cluster analysis
01	ISMT LTD	-0.615	Low Performance	High Performance
02	USHA MARTIN LTD	0.923	High Performance	High Performance
03	ZENITH BIRLA(INDIA) LTD	-2.146	Low Performance	Low Performance
04	WELSPUN CORPORATION LTD	0.861	High Performance	High Performance
05	VALLABH STEELS LTD	-1.836	Low Performance	Low Performance
06	TULSYAN NEC LTD	-0.055	High Performance	High Performance
07	SURYA ROSHNI LTD	0.727	High Performance	High Performance
08	JINDAL SAW LTD	1.96	High Performance	High Performance
09	KALYANI STEELS LTD	-0.162	High Performance	High Performance
10	MUKAND LTD	-1.107	Low Performance	Low Performance
11	MAHINDRA UGINE STEEL CO LTD	-0.714	Low Performance	Low Performance
12	PANCHMAHAL STEEL LTD	0.288	High Performance	High Performance
13	UTTAM GALVA STEEL LTD	-0.168	High Performance	High Performance
14	SHAH ALLOYS LTD	-1.949	Low Performance	Low Performance
15	TATA STEEL LTD	2.319	High Performance	High Performance
16	SUNFLAG IRON & STEEL CO LTD	2.169	High Performance	High Performance
17	J S W STEEL LTD	2.691	High Performance	High Performance
18	STEEL AUTHORITY OF INDIA LTD	2.537	High Performance	High Performance
19	BHUWALKA STEEL INDUSTRIES LTD	1.891	High Performance	High Performance
20	BHUSHAN STEEL LTD	1.974	High Performance	High Performance
21	KANISHK STEEL INDUSTRIES LTD	-0.945	Low Performance	Low Performance
22	STEEL CO GUJARAT LTD	-2.806	Low Performance	Low Performance
23	STEEL EXCHANGE INDIA LTD	-0.672	Low Performance	High Performance
24	RATHI STEEL & POWER LTD	0.919	High Performance	High Performance
25	RATNAMANI METAL & TUBES LTD	0.059	High Performance	High Performance
26	P S L LTD	-2.365	Low Performance	Low Performance
27	NATIONAL STEEL & AGRO INDUSTRIES LTD	-2.344	Low Performance	Low Performance
28	MODERN STEELS LTD	-1.433	Low Performance	Low Performance

Table 8: Classification Matrix

Classification based on Cluster analysis	Prediction based on Discriminant Analysis		Total
	Low Performance	High Performance	
Low Performance	10	0	10
High Performance	2	16	18
Total	12	16	28
Overall accuracy percentage	92.9%		

6. CONCLUSION

From the above study, it is clear that discriminant analysis have the ability to assist stakeholders for predicting corporate performances of large cap steel companies in India. These empirical findings may be a guide to internal and external users of financial statement in planning, controlling and decision making. The model could accurately predict 92.9% of the cases (Table 8). From the empirical study, it is revealed that PAT (Profit After Tax), CATA (Current Asset to Total Asset), ICR (Interest Coverage Ratio), DTR (Debtor Turnover Ratio), SFTA (Shareholders Fund to Total Asset) are important predictors of firm's financial performance. It means that earning power and long term solvency position are the important predictors of corporate performance.

However, this paper is limited to discriminant analysis only. There are different new techniques such as Artificial Neural Network (ANN), CHAID analysis, Decision Tree Analysis which can also be effectively used in forecasting corporate performance of the Indian steel majors. •

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Appendix I

Average Monthly Returns (Over Last Six Years) and Selected Ratios of 28 Companies for the Year 2011

NAME	RETURN	CR	ICR	DTR	TATR	CATA	PAT	SFTA	DE
BHULWAL	1.556	1	1.3	26.7	2.2	0.62	0.57	0.11	5.9
BHUSHAN	3.505	2.1	9.5	29.7	0.4	0.18	13.27	0.23	2.81
ISMT	2.106	1.1	2.3	80.4	0.7	0.4	4.26	0.23	1.95
JINDAL	1.861	1.6	14.6	89	0.7	0.5	10.62	0.58	0.4
JSW	3.343	0.7	4.4	10.4	0.7	0.17	8.01	0.41	0.7
KALYANI	2.416	1.8	4.5	59.8	1.8	0.55	3.78	0.39	0.7
KANISHK	0.247	1.5	1.9	30.8	1.9	0.6	0.72	0.28	0.9
MODERN	0.966	1.2	2	63.2	2	0.69	2.15	0.28	1.8
MUKUND	0.792	1.7	0.8	106.9	0.9	0.42	1.67	0.11	3.2
MUSCU	0.178	0.8	0.7	67.4	1.8	0.56	-0.41	0.2	2.1
NATIONAL	0.835	1.3	1.5	40.7	2.5	0.81	1.22	0.22	1.9
PANCHMAH	2.499	1	4.1	24.5	1.3	0.56	2.69	0.41	0.4
PSL	0.468	0.8	1.6	74.3	0.7	0.62	2.87	0.2	2
RATHI	2.009	1.3	1.3	30.3	1.4	0.43	1.66	0.28	2
RATNAMON	3.52	1.6	12	68.8	0.9	0.57	9.49	0.43	0.6
SAIL	2.739	1.6	16.5	30.9	0.7	0.47	10.4	0.48	0.5
SHAH ALL	-1.062	0.8	-1.1	43.8	0.8	0.33	-15.73	-0.18	0
STEE EXC	3.603	1.1	1.8	40.2	1.7	0.56	1.42	0.23	1.7
STEEL CO	0.42	0.8	1.2	43.8	2.3	0.51	0.46	0.09	0
SUNFLAG	2.458	1.8	0.9	28.6	1.6	0.5	4.14	0.4	3.4
SURYA RO	2.688	1.6	2.2	34.6	1.9	0.44	2.82	0.29	1.7
TATA ST	2.294	0.7	6.8	5.1	0.4	0.07	21.51	0.53	0.6
TULSYAN	1.829	1	1.5	59	1.8	0.57	1.11	0.13	3.8
USHA	2.544	0.8	1.8	32.1	0.6	0.29	3.63	0.31	1
UTTAM	2.703	1	1.7	38.6	1.1	0.45	1.33	0.17	2.2
VALLABH	0.309	1.2	1.3	79.8	1.9	0.72	0.25	0.33	1.1
WELSPUN	2.581	1.8	5.1	48	0.9	0.36	5.58	0.37	0.9
ZENITH	0.706	1.7	1.6	45.2	0.9	0.76	2.04	0.44	0.4



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New Pension Scheme vis-à-vis Traditionally Old Pension Scheme: An Empirical Investigation

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ABSTRACT: In India, number of pension holders is increasing rapidly and obviously, financial burden of the Government on account of paying pension is rising at very first pace. The pension payments at the State government level have also risen sharply during the last two decades. The Government of India has introduced a defined contribution based New Pension Scheme (NPS) for providing retirement income security, especially for the uncovered working population. NPS is available to the new recruitees of Central Government joining in the service on and from 1st January, 2004 and also for Government employees of some States who have adopted the scheme. This scheme is replaced the defined benefit traditional pension scheme. The scheme is now available to all citizens of India w.e.f. 1st May, 2009 on voluntary basis. In this paper, an attempt has been made to provide a brief idea about the benefits under the old and new pension schemes provided by the Government and to make a study of the benefits under both the schemes to Group 'A' and Group 'D' Government employees.

Key Words : *New Pension Scheme, Defined Contribution, Defined Benefit, Retirement Benefit, Old Pension Schemes.*

1. INTRODUCTION

Pension reform is a controversial issue in India. Due to increasing amount of pension payout, increasing number of retired personnel (Palacios and Whitehouse 2006) forced the Government to think about the shifting of traditionally defined benefits of pension to the

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'defined contribution' new pension system. The pension scheme came into force for the central government employee (except the personnel of Armed Forces) with effect from 1st January, 2004.

Traditional pension system is 'defined benefit and inflation indexed' (i.e. amount of pension is guaranteed after retirement and dearness relief, as announced by the Government from time to time, is available to meet the increased cost of living due to inflation) where the government is responsible to pay pension as per the rules, generally 50% of last pay.

In this context, Government of India has started thinking about the pension reform seriously from the last decade of the 20th century. An interim Pension Fund Regulatory and Development Authority (PFRDA) were set up by a resolution passed by the Government on 10th October, 2003, which started functioning from 1st January, 2004. As per the provisions in the Union Budget 2004-05, PFRDA statutorily has started functioning through an Ordinance on 29th December, 2004. Later a Bill was introduced in the Parliament to replace the Ordinance (official website of PFRDA).

In New Pension System (NPS), benefits available to participants will be of 'defined contribution' type and the liability of government is restricted to the contribution only. Amount of pension will be determined on the performance of pension fund where participants will have to bear the entire risk. If the fund loses value in terms of invested amount, participants will have to bear the entire risk of losing value.

In first phase, NPS is applicable to all new entrants (except Defence Forces) to Central Government services joining their services on or after 01.01.2004. Several State Governments have also adopted this scheme for their new recruits from different dates. In second phase, NPS is now available to all Indian citizens on voluntary basis w.e.f 01.05.2009. 26 States and Union territories have already notified introduction of NPS for their new employees; of these 24 states have already signed agreements with the intermediaries for the implementation of NPS. As per the status report published by PFRDA on 05.12.2009, more or less six and a half lakhs of employee of central and state governments have already come under the coverage of NPS. NPS not only helps the Government to reduce its financial burden but also provides an opportunity of higher income to the employee in the future. This paper attempts to analyze the benefits of NPS from employees' perspective and make a comparison of benefit derived from NPS and traditional old pension scheme. It has been observed that there is no significant difference between the benefits of pension under NPS and old pension scheme.

2. AN OVERVIEW OF NEW PENSION SCHEME

With the introduction of new pension scheme, government is now trying to provide adequate retirement income not only to the government employees but also to all citizens of India. As a first step, government has introduced NPS for the employees of central government (except employees of Armed Forces) who have joined their service on or after 01.01.2004. Under the old pension system, employees are eligible to receive guaranteed amount of pension on the basis of salary drawn in last month (or the salary of last 10 months, as the case may be) and the number of years of service of the concerned employee. Employee does not need to contribute any amount to any fund for getting pension after retirement. But

there is no guarantee of any fixed amount of pension from the employer in NPS and the employer's liability is restricted only to contribute a certain percentage of employee's monthly salary to the pension fund and at the same time employee is also bound to contribute to the pension fund. The pension will be depending on the accumulated balance of the pension fund at the time of retirement.

2.1. Need for NPS

Pension expenditure has been increasing rapidly with the hike of salary (both due to implementation of Pay Commissions recommendation from time to time and also due to increasing rate of dearness allowance to tackle the inflation-burden) and increase in life expectancy.

Apart from the Government's financial burden, other major problems of the existing (old) pension scheme in India are low coverage of old age income security, lack of individual choice and portability, absence of reliable and comprehensive database, under performance of provident fund schemes. In order to resolve these problems, Government of India is now implementing this contribution-based pension scheme in place of guaranteed old pension scheme.

Table 1: Central Government's Department-wise Pension Expenditure
(Rs. in Crores)

Year	Post & Telegram	Railways	Defence	Civil	Total
1974-75	9.12	18.99	87.61	19.53	135.25
1979-80	26.57	75.35	192.0	54.89	348.81
1984-85	73.27	278.15	479.88	148.72	980.01
1989-90	216.02	782.01	1878.6	448.02	3324.65
1994-95	409.68	1706.21	2730.84	922.90	5769.63
1999-2000	1118.58	4021.61	11024.03	3261.89	19426.12
2004-05	1208.04	6696.98	11920.95	6379.19	26205.07
Growth Rate (%)	17.39	21.2	19.06	19.7	18.45

Source: Gayithri (2007)

Table 2: Department-wise Pension Expenditure as Percentage of GDP
(Rs. in Crores)

Year	Post & Telegram	Railways	Defence	Civil	Total
1974-75	0.01	0.03	0.12	0.03	0.19
1979-80	0.02	0.07	0.18	0.05	0.32
1984-85	0.03	0.12	0.22	0.07	0.44
1989-90	0.05	0.18	0.43	0.10	0.76
1994-95	0.04	0.19	0.30	0.10	0.63
1999-2000	0.06	0.23	0.63	0.19	1.10
2004-05	0.04	0.24	0.42	0.23	0.93
Average	0.035	0.15	0.385	0.11	0.625

Source: Gayithri (2007)

2.2. Types of Accounts

- i) Tier I Account, and
- ii) Tier II Account

In August 2008, Government had decided to introduce NPS for all citizens of India. Government has announced that the New Pension Scheme, what we may call 2nd phase of NPS, is also available on voluntary basis w.e.f. 01.05.2009. In this phase two types of account would be available to the subscribers - Tire I Account and Tire II Account. Tire I account is non-withdrawable account for the pension holders while Tire II account is a withdrawable savings account. Tire I has already come into force from 01.05.2009 and Tire II will be started in a very short time.

2.2.1. Tier I Account

Tier I account is mandatory for new employees of central government w.e.f. 01.01.2004 and also for employees of some state governments who have introduced NPS from the date from which they opted for the new scheme. Both the employee and the government contribute 10% of salary (Basic +D.A.) to the fund for this purpose. The existing defined benefit pension and General Provident Fund (GPF) would not be available for the employees covered under new pension system.

2.2.2. Key Points of Tier I Account

i) In New Pension Scheme, Tier I account is a non-withdrawable account. No withdrawal is permitted during the period except on certain cases as per the norms subscribed by the PFRDA.

ii) In case of government employee, annuity (at least 40% of pension wealth will be used at the time of retirement age of 60) would provide pension for the lifetime of the

employee. Individuals would have the facility to quit the pension scheme before the age of 60 but they will have to purchase annuity of 80% of pension wealth.

iii) For government employees, compulsory monthly contribution is 10% of salary i.e., 10% of basic plus dearness allowance along with the same matching contribution of the government. Annual minimum contribution of others will be Rs. 6,000 and that will be deposited in at least 4 contributions. Minimum contribution per transaction fixed by PFRDA is Rs. 500.

iv) Three Pension Fund Managers (PFM) are available for government employees while others have the facility to choose any one out of six PFM available for them.

2.2.3. Tier II Account

In India, retirement benefits are available to only 11% of working population (Gillingham and Kanda). Every Indian citizen including self-employed persons, employees of unorganised sectors are also eligible to participate with this Tier II account of NPS. In addition to Tier I account, a government employee can also join in Tier II voluntary withdrawable savings account but government will make no contribution into this account. The assets of Tier II account will be managed in the same manner as managed in Tier I account. But the most important fact is that the NPS is now open for all and it provides a great opportunity for savings for old age income-earners especially for the non-government employees and self-employed people who do not have any facility of pension.

2.2.4. Key Points of Tier II Account

- i) An active Tier I account is the pre-requisite for opening a Tier II account.
- ii) Bank Account and detailed statement of transactions of the account are mandatory for opening of this type of account.
- iii) Contribution can be made through the Point of Preference or Point of Preference-Service Providers.
- iv) A subscriber can draw several times from this account without any restriction.
- v) No separate KYC is required at the time of opening of the account.
- vi) No additional charges will be levied for opening and for annual maintenance of Tier II account. However, separate charge is required for each transaction of this account.
- vii) One-way facility from Tier II account to Tier I account is available.
- viii) Individual, at his/her own choice, could select separate nomination and portfolio in Tier II account.
- ix) Each subscriber will have the option to choose his/her Pension Fund Manager and portfolio of the investment. Auto choice option of the investment will also be available if he/she fails to choose any portfolio.
- x) Minimum age of entry in the new phase of NPS is 18.
- xi) To keep the account active, following points should be remembered by a subscriber:
 - a) Minimum amount required to open the account: Rs. 1,000
 - b) Minimum number of contributions in a year: 4
 - c) Minimum amount per contribution: Rs.250

d) Minimum balance of account to be kept at the end of the financial year: Rs.2, 000.

2.3. Administration of New Pension Scheme

NPS would be administered by the Pension Fund Regulatory and Development Authority (PFRDA). The basic features of the scheme are outlined below:

a) **Central Record Keeping Agency:** It consists of a Central Record-keeping Agency (CRA). The main object of CRA is to maintain and update data available from subscribers and disseminate these data to the respective fund managers in real time. CRA will also allot a unique identification number, Permanent Retirement Account Number (PRAN), to each subscriber. Central Pension Accounting Office (CPAO) will function as central record-keeping agency for NPS. All information about an account would be available by quoting this number in real time.

b) **Pension Fund Manager (PFM):** Pension fund managers play the vital role in the NPS architecture. PFM shall undertake the management of the schemes and make management decisions within the structure of the scheme's objectives as per the guidelines and instructions of PFRDA. They are responsible to prepare different portfolios consisting of different proportion of investments as per the direction of the subscribers and they would purchase and sell investments on behalf of them. The primary objective of the PFMs is to optimize the return on the investments managed by it. Three Pension Fund Managers - The State Bank of India, Life Insurance Corporation of India, and UTI Asset Management Company, have been appointed by the PFRDA to manage the assets of Tire I account. These three entities have already set separate companies i.e., SBI Pension fund Ltd., LIC Pension Fund Ltd, and UTI Retirement Solution Ltd. respectively to manage the pension funds.

To manage the pension funds of Tire II account, six pension fund managers have been selected by the PFRDA. These PFMs are ICICI Prudential Life Insurance Co. Ltd, IDFC asset Management Co. Ltd, Kotak Mahindra Asset Management Co. Ltd, Reliance Capital asset Management Co. Ltd, SBI Pension Fund Ltd, and UTI Retirement Solutions Ltd.

c) **Point of Presence (POP):** Point of Presence is the service provider that deals directly with the subscriber. POPs are responsible for sales and marketing of pension schemes. Pension fund managers will open POPs at different parts of the country; they may use existing set of branches of banks and post offices across the country. Use of existing set up would lead to reduce the costs and also the time of opening new branches. At present, 23 POPs are functioning in India including Allahabad Bank, AXIS Bank, Citi Bank, ICICI Bank, IDBI Bank, SBI, UBI, LIC, UTI Asset Management Co. Ltd., etc.

2.4. Investment Options

Pension Fund Managers are now providing different options consisting of different classes of assets to the subscribers. The subscriber will have the opportunity to select various proportions of assets for investment of his/her pension wealth. At present three options are available to the subscribers.

a) **Growth option:** This option is based on equity. It has a great potential of higher return but at the same time, it carries higher risk of erosion of capital. As per the guidelines of PFRDA, pension fund managers could invest in indexed funds representing BSE sensitivity index or NSE Nifty 50 index. This option is suitable for the young who are just starting their

carrier and the middle-aged people who do not have much responsibility. This class of assets is known as 'E' class of assets.

b) **Moderate Option:** In this option, pension wealth would be invested in corporate debt and credit risk bearing fixed income securities. It has the moderate potentiality of return with moderate risk. This option is suitable for risk-adverse young and middle-aged people. This type of investment is known as 'C' class of assets.

c) **Cautious Option:** It is based on risk-free government security and it would lead to comparatively low rate of return than return of other options. This option is appropriate for those who are approaching the age of retirement or have greater responsibility to bear their families. This type of assets is denoted by 'G'.

A subscriber can distribute his/her wealth between the above options in different proportions in order to make the balance between risky and risk-less options. A subscriber has also the right to change the selected portfolio and also the pension fund manager if he/she is not satisfied with the performance. 'Auto Choice Option' is also available if a subscriber fails to choose his/her portfolio. As per this option, contribution of a subscriber in the age group of 18-35 would be invested in 50% in 'E' class of assets, 30% in 'C' class of assets, and the rest 20% in 'G' class of assets. From the age of 36, investment in 'E' and 'C' classes will go down by 2% and 1% and investment in 'G' class will go up by 3% in each year thereafter.

2.5. Performance of the Pension Fund Managers

Although the New Pension Scheme is launched from 1st January 2004 for the central government employees (except Armed Forces Personnel), all contributions upto 31st March, 2008 were credited into the Public Account yielding return @ 8.25% p.a. Three pension Fund Managers have been appointed by the PFRDA and they have started functioning from 1st April, 2008. As per the data released by the PFRDA, central government employees earned a weighted average return on their investment @ 12.3%, 9.7% and 8% for the year 2008-09, 2009-10 and 2010-11 respectively (economictimes.indiatimes.com/2011-12-29).

3. LITERATURE REVIEW

Several studies have been conducted on the different aspects of New Pension Scheme.

Gillingham and Kanda (2000) have recommended for the reconstruction of employees pension scheme and civil service pension scheme to stop accumulation of actual and contingent liabilities and also expand the coverage of old age income security.

Markandam (2002) observed that flexibility is the key word for pension reform and total experiment about pension should be done to ensure maximum benefits of individuals. She also observed that introduction of private fund managers will ensure large-scale mobilization of savings as well as higher rate of capital accumulation.

Goswami (2001) reiterated the need for pension reform in India to bring about demographic change and remove inequity in benefits. He is in favour of revision in the policy of withdrawal of accumulated balances in provident fund in working life. Presence of liberal, non-refundable lump sum amount often results in inadequate provision during the old age. He also observed that generous treatment of public sector workers along with private sector workers leads to the fragmentation of pension system.

Shah (2003) described pension guarantee as a financial derivative and is associated with the price. This price can be measured in a complete market setting. By using a utility function, he observed some striking results where the poor took equity investment as a chance of escaping poverty; the rich would be comfortable with the riskless assets as they are sure to avoid poverty without taking risk of equity premium.

Gayithri (2007) pointed out the arguments in favour of and against of pension reform. The study estimates the pension liability for the civil service government employees under the old pension scheme. The rapid growth of civil service pension payments has become a subject of serious discussion.

Bhora and Vyas (2008) have made a study to estimate the Post-retirement liability of the state government of Rajasthan. The study has developed a model for estimating pension benefits of the employees belong to different categories. The study estimates the future liability of the Government towards the retirement benefits of the state government employees.

From this brief review of literature it has been observed that most of the studies are descriptive in nature and have analyzed the new pension system from the view point of the employers and the nation as a whole. The benefits and risk associated with the new pension system from the perspective of the participants remain an untouched issue. There is ample scope of research in this aspect and the present study tries to highlight the same.

4. OBJECTIVES OF THE STUDY

- i) Identify the scope, types, benefits and risk of the new pension scheme, and
- ii) Compare benefits of the new pension scheme as compared to the traditional, defined benefit (old) pension scheme applicable for the Government employees.

5. RESEARCH DESIGN

5.1. Sources of Data

This study is based on secondary data. The data have been collected from the Government Service Rules, Death cum Retirement Rules (DCRB), and National Pension Portals for the retirement benefits of the government employees and also from the Official website of Pension Fund Regulatory and Development Authority (PFRDA) for the data regarding new pension Scheme which is implemented for the government employees from 1st January, 2004. Data regarding Pay Scale for the period of 01.04.2004 to 31.12.2005 is taken from the West Bengal Services (Revision of Pay and Allowance) Rules, 1998 i.e. [WBROPA, 1998] and Pay in Pay Band and Grade Pay attached with the concerned pay in pay band are taken from the West Bengal Services (Revision of Pay and Allowance) Rules, 2009 i.e. [WBROPA, 2009] for the rest of the period.

5.2. Sample Design

As per the Service Rules Government employees are classified into four groups:-
Group-'A', Group-'B', Group-'C' and Group-'D'.

In this present study, we are trying to compare and analyse the pension benefits of the government employees belonging to the Group A and Group D under the Old Pension scheme (OPS) and New Pension Scheme (NPS).

With effect from the 1st January, 1996, Government employees have been classified into Group 'A' and Group 'D' as follows:

i) Group-'A'- Employees having a pay or Scale of pay with the maximum above Rs. 10,175 and with effect from 1.1.2006, Pay Band Scale Rs. 9000-40500 with Grade Pay Rs. 4400 or more.

ii) Group-'D'- Employees having a pay or Scale of pay with the maximum Rs. 4,400 or below and with effect from 1.1.2006, Pay Band Scale Rs. 4900-16200 with Grade Pay Rs. 1700 or Rs. 1800.

5.3. Study Period

New pension system (NPS) is implemented with effect from 1st January, 2004 for the employees of central government. Several State Governments too implemented the new system as per their date of notification. The relevant data of the pension benefits are collected for a period of 5 accounting years (2004-2005 to 2008-09) i.e. after the introduction of NPS.

5.4. Hypothesis

Ho: There is no significant difference in the retirement benefits under the Old Pension Scheme and the New Pension Scheme of the government employees (Group A and Group D).

5.5. Tools for Data Analysis

For analysis of data, some descriptive statistics such as mean, standard deviation, coefficient of variation are computed. For determining statistical significance of the pension benefits under the Old Pension Scheme and the New Pension Scheme 't' statistic is computed as follows:

$$t = \frac{x_1 - x_2}{S.E. (x_1 - x_2)}$$

Where, x_1 = mean pension benefit under old pension scheme

x_2 = mean pension benefit of under pension scheme

S.E. ($x_1 - x_2$) = Standard error of ($x_1 - x_2$)

6. THE CASE STUDY

Let us consider an illustration to find out the benefit under New Pension System as compared to the benefit under Old Pension System in respect to an employee belonging to Group A and D cadre of the Government of West Bengal starting with the minimum Grade Pay of each scale. This illustration is based on the following necessary assumptions:

i) Contribution to NPS refers to the monthly payment to the pension fund by the employer; it consists of basic pay and dearness allowance.

ii) Own contribution of the employee to the pension fund is not considered in this study. Data regarding Pay in Pay Band, Grade Pay, and Dearness allowance are taken from the West Bengal Service (Revision of Pay and Allowance) Rules.

iii) The employee will retire at the age of 60 after completion of 33 years of service. As per the present rule, he/she is eligible to get full pension after completion of 20 years of service.

iv) The employee will retire after enjoying the 3rd promotion in 8th, 16th and 25th year under Career Advancement Scheme.

v) It has been revealed from the performance evaluation of the three pension fund managers for the central government employees by PFRDA, return on investments ranged between 8% to 16% during the period of 2008-09 and 2010-11. (economictimes.indiatimes.com/2011-08-25) Keeping in the mind about the volatile capital market and depression in the world economy, we assume that the investor would be able to earn a return on an average of 8% during the service life.

vi) 100% of pension wealth will be used to purchase annuity from IRDA regulated Life Insurance companies.

vii) The monthly pension under OPS is calculated as under:

Last Pay X Qualifying year of service (subject to a maximum of 33) /33 X 50/100

After the implementation of recommendation of 5th Pay Commission, monthly pension will be calculated as follows:

Last Pay X Qualifying year of service (subject to a maximum of 20) /20 X 50/100

ix) The trend of growth rate of Dearness Allowance, as declared by the Government from time to time, is calculated by fitting trend equation which is shown below:

$$Y_t = a + b.X_t$$

Where, Y = Predicted value, a = Intercept, b = Regression Coefficient, t = Time

viii) Retirement benefits of the government employees under Old Pension Scheme (OPS) and New Pension Scheme (NPS) are calculated (as shown in Table 3, 4, 5 & 6) as per the pay scales stated in WBROPA, 1998 and WBROPA, 2009 for Group-A and Group-D employees and dearness allowance as declared by the Govt. of West Bengal from time to time.

Table 3: Retirement Benefits of Government Employees under OPS, Group-A

Ser.Yr	DATE OF JOINING					AVER.
	1.4.2004	1.4.2005	1.4.2006	1.4.2007	1.4.2008	
20	25541	26587	27365	28140	28910	27309
21	27110	28194	28992	29785	30574	28931
22	28743	29866	30684	31496	32304	30618
23	30452	31604	32441	33274	34102	32375
24	32230	33421	34279	35133	35982	34209
25	34075	35309	36188	37062	37933	36113
26	37212	38531	39462	40389	41309	39380
27	39291	40655	41610	42558	43502	41523
28	41447	42857	43834	44806	45772	43743
29	43693	45149	46150	47145	48136	46055
30	46030	47534	48560	49580	50593	48460
31	48462	50016	51066	52110	53148	50960
32	51004	52609	53684	54753	55817	53573
33	53646	55300	56402	57498	58588	56287

Table 4: Retirement Benefits of Government Employees under NPS, Group-A

Ser.Yr	DATE OF JOINING					AVER.
	1.4.2004	1.4.2005	1.4.2006	1.4.2007	1.4.2008	
20	15973	17167	18261	19394	20581	18275
21	18143	19469	20677	21926	23234	20690
22	20541	22010	23341	24717	26157	23353
23	23187	24812	26277	27790	29373	26288
24	26104	27897	29508	31171	32907	29517
25	29314	31292	33060	34885	36789	33068
26	32876	35055	36995	38996	41083	37001
27	36800	39198	41325	43517	45802	41328
28	41109	43746	46074	48474	50973	46075
29	45836	48732	51280	53904	56636	51278
30	51019	54196	56982	59850	62833	56976
31	56697	60179	63222	66354	69610	63212
32	62912	66725	70048	73465	77017	70033
33	69712	73885	77509	81236	85108	77490

Table 5: Retirement Benefits of Government Employees under OPS, Group-D

Ser.Yr	DATE OF JOINING					AVER.
	1.4.2004	1.4.2005	1.4.2006	1.4.2007	1.4.2008	
20	12532	13246	13634	14020	14404	13567
21	13309	14043	14440	14836	15229	14371
22	14118	14883	15291	15695	16098	15217
23	14961	15757	16174	16589	17002	16096
24	15836	16664	17092	17517	17941	17010
25	16746	17606	18045	18481	18915	17959
26	18480	19406	19875	20342	20806	19782
27	19517	20479	20959	21437	21912	20861
28	20592	21589	22081	22571	23058	21978
29	21718	22752	23256	23758	24257	23148
30	22884	23955	24472	24986	25497	24359
31	24103	25214	25743	26269	26793	25625
32	25365	26529	27071	27610	28146	26944
33	26683	27886	28442	28994	29544	28310

Table 6: Retirement Benefits of Government Employee under NPS, Group-D

Ser.Yr	DATE OF JOINING					AVER.
	1.4.2004	1.4.2005	1.4.2006	1.4.2007	1.4.2008	
20	7887	8568	9093	9630	10187	9073
21	8956	9716	10296	10889	11503	10272
22	10138	10983	11623	12277	12954	11595
23	11441	12381	13085	13805	14550	13053
24	12878	13920	14695	15487	16305	14657
25	14460	15613	16465	17334	18232	16421
26	16221	17497	18432	19386	20371	18381
27	18161	19571	20597	21643	22722	20539
28	20292	21848	22971	24117	25299	22906
29	22630	24345	25575	26829	28122	25500
30	25194	27081	28427	29798	31211	28342
31	28004	30078	31549	33047	34590	31454
32	31079	33358	34964	36600	38284	34857
33	34444	36945	38698	40483	42320	38578

Table 7: Comparison of Pension Benefits of Government Employees under Old Pension Scheme and New Pension Scheme

Year of service	Pension benefits under OPS		Pension benefits under NPS	
	Gr. A	Gr. D	Gr. A	Gr. D
20	27309	13567	18275	9073
21	28931	14371	20690	10272
22	30618	15217	23353	11595
23	32375	16096	26288	13053
24	34209	17010	29517	14657
25	36113	17959	33068	16421
26	39380	19782	37001	18381
27	41523	20861	41328	20539
28	43743	21978	46075	22906
29	46055	23148	51278	25500
30	48460	24359	56976	28342
31	50960	25625	63212	31454
32	53573	26944	70033	34857
33	56287	28310	77490	38578
Average	40681.2	20373.4	42470.4	21116.2

Table 8: Calculation of t-value

Group Items	Gr. A	Gr. D
Mean difference	-1789.2	-742.8
Variance	225317936	56537417
Standard Error	2836.74	1420.98
t value	-0.6307	-0.523

Note: At 5% level of significance, $t = 2.06$ for 28 degrees of freedom.

7. FINDINGS AND CONCLUSION

Table 7 shows the retirement benefits of Group A and D cadre of the government employees under the old pension scheme (defined benefit scheme) and the new pension scheme (defined contribution scheme). It is observed from the table that benefit under the old pension scheme has increased by 2.07 times on an average whereas the benefit under the new pension scheme has increased by 4.25 times for each group of employee in the range of service period of 20 to 33 years. It is also observed that average pension benefit under the new pension scheme during the study period from 2004-05 to 2008-09 (after introduction of new pension scheme for the central government employees w.e.f. 1st January, 2004) is more than the average pension benefit under the old pension scheme in each case. It is interesting to note that the pension benefits under the OPS is more than the pension benefits under NPS if the employee retired after the completion of service upto 27 years. Table 8 shows that t value between the retirement benefits of government employees and the non-government employees. Since the t values of the groups do not exceed the 2.06 at 5% level of significance, we can conclude that there is no significant difference between the retirement benefits of the government employees and the non-government employees.

NPS is more profitable than the old defined benefit pension system as the number of years of service is increasing. However, investment in NPS is not risk-free. One cannot be assured about the accumulated pension wealth at the time of exit from the scheme. Investment risk will be borne by the participant alone and the contribution might be eroded due to uncertainty of the capital market. The expected return on pension wealth depends on the performance of the fund, types of funds as well as the overall performance of the capital market. New Pension System has a great potentiality to every citizen of India. NPS will be helpful to create a good habit of savings for old age income security among all the citizens since apart from the employees who have joined the scheme compulsorily, other individuals are also eligible to join in the scheme. It provides an opportunity for old age income security, especially for unorganized, organized private employees, and self-employed personnel who are not covered by the traditional pension system. •

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External Audit Quality: A Review

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ABSTRACT: Audit Quality encompasses a good quality of factors, namely, professional ethics, code of conduct, continuing professional education, independence of auditors, peer review and quality of auditing standards. Each factor individually and collectively responds to the development of audit quality. Quality of audit may be characterized to provide reasonable assurance to the concerned regulatory authorities of better legal and regulatory compliances to improve systems and procedures for the business as a whole including the subject matter of audit, to act as a guide to successors, to a better information presentation and to offer reasonable professional satisfaction to the auditor. A sound quality control system should be maintained for conducting audit in conformity with prevailing laws, verification of the positive/negative assertions as required under relevant laws, compliance with ICAI's pronouncements and finally confirming timely completion of audit.

In typical audit assignment to conduct audit of financial statements, the auditor is required to study the concerned business process, internal checks and controls and accounting mechanism for their effectiveness. The auditor has to prepare and present report of his observations of differences and suggest for potential improvements in functioning systems, records, controls, etc. Against this backdrop, the objective of the study is to review external audit approaches for improvement of audit quality.

Key Words: *Audit Quality, Internal Control System, Auditor Qualifications.*

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1. INTRODUCTION

Audit quality is a holistic concept. A number of factors, namely, professional ethics, code of conduct, continuing professional education, independence of auditors, peer review and quality of auditing standards, determines quality of audit services. Each factor individually and collectively responds to the development of audit quality. Quality of audit may assure the extent of regulatory compliances by the companies and may suggest for improvement of internal control systems and procedures for the business as a whole including the subject matter of audit. It may guide successive audits to be effective and meaningful. It may also assure better information presentation and may offer reasonable professional satisfaction to the auditor.

Quality in audit service can be achieved through a sound quality control system which has to satisfy some fundamental requirements. The fundamental requirements are: conducting audit independently in conformity with prevailing laws, however, paying due regards to the substance over form, applying professional competence, due care and diligence, compliance with ICAI's pronouncements and finally confirming timely completion of audit.

Usually, in the conduct of audit of financial statements, the auditor is required to study the concerned business process, internal controls and internal checks and accounting system for effectiveness of audit. Against this backdrop, objective of the study is confined to review audit approaches in practice in search of improvement of audit quality.

2. QUALITY OF AUDIT APPROACH

Under Audit approach is concerned with 'means to know in detail the business processes' irrespective of legal formality, which may lead to value addition to the auditee (Narasimhan and Khicha 2005). The approach should call for more frequent audit of transactions in internal audit. A quality control system should be established where auditor's staffs are required to be more educated and trained. Innovative and creative techniques should replace mere checklist system of audit. Structured interactive process that is a 'set pattern of queries from right person at the right time' (Narasimhan and Khicha 2005) must be adopted. Internal control system should be more proactive. Attempts should be made towards detailed verification. Audit process keeping in line with audit approach is expected to be systematized and 'manual driven rather than Adhoc' (Narasimhan and Khicha 2005). There should always be an intention to make a balance between professional independence, user's interest and statutory requirement.

Audit process plays pivotal role in audit quality improvement. The process normally goes through a complete range of planning i.e. pre-audit, during audit and post-audit including audit documentation and staff training and development processes.

(i) Pre-audit planning guides the auditor to prepare an engagement letter and communicate the same to the client. The auditor must set up, for the first time, basic minimum structured procedures for each and every type of audit and it should be the basis for future evaluation and development. The auditor prepares a questionnaire suitably modified for each client which collects basic details from the auditee beforehand. The questionnaire must be compared and replaced with the earlier questionnaire to address major changes in

information. The questionnaire should be designed to incorporate all matters covered under management representation letter which is usually given to the management by the auditor with intent to improve any weakness in internal control system. The auditor is required to formulate detailed audit programme which includes Checklist for basic audit requirements, compliance of relevant laws, etc. He is to collect details about nature of business, process, activities, accounting methods / policies/ organisational structure, etc. in order to develop a permanent audit file that may be reviewed each time before audit.

(ii) During the conduct of audit, auditor conducts two tests – compliance test and substantive test. In the compliance test auditor verifies functioning of internal control system so that evidence can be obtained in proper way. But, collection of sufficient appropriate audit evidence is made complete through substantive test where auditor applies analytical procedures and conducts test of detailed transactions and balances to obtain reasonable assurance about assertions on existence, rights and obligations, valuation, measurement, presentation and disclosure, etc. of assets and liabilities. Again, results of compliance tests determine the nature, timing and extent of substantive tests. However, a good quality test facilitates evidence collection for true and fair view of financial results and position of the business. The auditor should comply with audit programme and justify deviations, if any. He should preserve sufficient working papers in support of every qualification and conclusion. Management representation letter should be part and parcel of audit evidence. There should be peer review to assure that audit working papers are in conformity with conclusion drawn. The auditor should exercise creativity in the system driven audit practice. Before finalisation of audit report, he should make discussion with management on any material issues.

(iii) Post-audit work directs the auditor to assess the limitation of audit conducted. The auditor should arrange for personal discussion with the management on the basis of the audit report. He should modify the checklist after every audit taking new compliance requirement so that it becomes basis for next audit. Again, he motivates audit staffs through rewards to improve their performance and assess their performance on the basis of quality of verification and documentation.

Audit-in-charge and Audit Team must always be separate, and periodic rotation of Audit-in-charge should be ensured.

Regarding documentation of audit procedures, the auditor should keep sufficient appropriate audit evidence in support of quality and quantity of audit work done to express his audit opinion. He should be ready to justify that he has applied his mind judiciously and objectively to the situation under audit environment and has not been influenced by either of the management and client. He is also required to keep record of discussion on crucial issues/ queries with one copy to be sent to the client. Overall audit planning, programme and checklist are the fundamental basis for documentation. The auditor should file up necessary papers in proper way for easy retrieval.

3. MEASUREMENT OF AUDIT QUALITY

Measurement of any qualitative factor is really problematic because some subjective aspects are associated with it. For this reason, audit quality is hard to measure. However, some oversight bodies, academics and audit firms have in the past focused on quantitative measures, such as, the number of audit failures, the number and identities of those who read audit

reports and/ or claim to rely on them, the number of companies who find the audit useful and survey of information on which audit firms are found better than others' (ICAEW 2006). An Audit Committee coordinates between the management and the auditor of the concerned entity, and tries to enhance audit quality. So far as qualitative issues are concerned, attention may be drawn on such qualitative factors as 'the quality of judgements, training, internal reviews, feedback from shareholders and Audit Committee and other factors affecting the quality of the auditors in terms of their experience and competence, their behaviour and external perceptions' (ICAEW 2006). Interestingly, there is no 'measurement metrics' as to measure either of qualitative or quantitative issues in audit. However, users of financial statements should keep 'an insight into auditing' (Basu 2004) so that they can examine consistency of information in financial report. Again, audit failure is practically meant for failure on the part of auditor of the company only. There may be 'fraud perpetrated by managers or employees, and particularly, dominant owner managers' (ICAEW 2006) which will not claim poor audit quality. Regulators throughout the world such as Financial Services Authority (FSA) and Financial Reporting Council (FRC) in the UK, The Securities and Exchange Commission (SEC) and Public Company Accounting Oversight Board (PCAOB), auditing standards setters for public company audit, in the USA, have been weighing quality of professional judgment. The FSA, in particular, has emphasized on the enforcement of principles as evident in recent FSA (ICAEW 2006)¹ and SEC (ICAEW 2006)² speeches.

4. CONCLUSION AND SUGGESTION

Quality of audit service is determined partially by quality of audit approach which is dependent on the quality of professional staffs in the audit team. The team needs to have sufficient exposure to the literature on the subject, 'CPE programmes, etc. would add value to their works as well'. What the audit team is essentially required for being 'kept privy of all discussions with the management encouraging their active participation' (Narasimhan and Khicha 2005). In practice, the auditor has to prepare and present a separate report to the management of his observations of differences and suggest for potential improvements in functioning systems, records, controls, etc. He should discuss with management of problems faced during attest function, provide suggestive measures and encourage management for transparency in disclosure of financial information. He should draw management's attention to the emerging areas including business/laws/regulations applicable for the business concern; furnish a report to the same of trends and ratio analysis and interpretation thereof for major financials for last few years. The auditor should also point out major drawbacks and achievements. Productivity and profitability ratios should be thoroughly analyzed and reported.

In this context, it is pertinent to note that auditors are now a days facing a lot of constraints working in audit environment and incidentally they are under tremendous time

¹ John Whittaker, 'FSA's commitment to principles-based regulation' in the FSA Fountain Court Chambers Conference on Better Regulation, 2006, as appeared in Fundamentals Principles-based Auditing Standards, Auditing and Assurance Faculty, (ICAEW), 2006. p.18.

² Christopher Cox, The AICPA National Conference on Current SEC and PCAOB Developments emphasised the importance of the professional judgement in accounting and financial reporting, as appeared in Fundamentals Principles-based Auditing Standards, Auditing and Assurance Faculty, (ICAEW), 2006. p.18.

pressure to arrive at a conclusion in support of which they, later on, seek evidence. This is, indeed, disastrous. What the auditors need 'to approach the task with an open mind' (Narasimhan and Khicha 2005), pursue evidence as preserved and apply due diligence, professional judgement to come to conclusion. 'Auditor needs to interlink between variables (e.g. stock valuation) to evaluate performance and to evaluate assets' (Narasimhan and Khicha 2005).

Further, auditor is desired to be more careful for published financial statements as these are sources of refined financial information based on which auditor forms opinion. There is another big challenge as technology is introduced in audit profession. Artificial intelligence (Neural networks) can be effectively utilised to study transaction patterns. In short, auditors should put forth the best of the time and efforts in discharging audit assignment as a true professional.

Last but not least, regulatory mechanism should be proactive and regulatory authorities should explore ways and means to improve audit quality. The regulatory system consists of self-regulatory system of the profession and the disciplinary system. The self-regulatory system guides the auditor to be self-disciplined and committed to professional code of conduct. On the other hand, disciplinary system directs the auditor to adhere to professional standards and for non-compliance of which attracts professional misconduct. Quality control system of an audit firm can act as substitute for the disciplinary system. Recently, audit firms are found to be increasingly exposed to litigation risk. A sound quality control system may be recourse for this problem. Moreover, Securities and Exchange Board of India (SEBI) is going to set up a Qualified Audit Report Review Committee (QARC) which will scrutinize audit qualifications of listed companies. Where necessary it may call management for restating numbers in case of violation of accounting rules. •

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Common Pool Water Resources and Village Development Initiatives: A Village Level Study

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ABSTRACT: Community based natural resource management has recently emerged as a pro-people paradigm for achieving conservation with development. Several authors assessed that to make co-management community institutes successful, it must be ensured that local people is benefited from conservation by way of protection and regeneration of local resources. CPR literature generally focuses on the factors that are internal to the community. Recent critics point out the lack of contextual factors operating outside the community in terms of social, cultural, economic, political, technological and institutional environment in explaining the formation and evolution of the resource regimes.

In this paper, pond creation and maintenance committee in Chamtagara village of Chhatma block in Bankura District, West Bengal, India, is analyzed to evaluate how inward and outward orientation of factors are coordinated to achieve the target by determining opportunity and transaction costs even in a homogeneous co-management institution.

Key Words : *Common Pool Resources, Sustainability, Collective Action, Tribal Communities.*

1. INTRODUCTION

Common Property Resources (CPrR) and Common Pool Resources (CPR) are often used interchangeably connote economic resources or facilities that are communally or

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collectively owned/held by an identifiable community or a group of people and either by de-facto or by de-jure accessible to and jointly used by all members of the community or group. But in true CPR situation, user's rights are shared equally and are exclusive to a well defined group of people, whereas collective ownership of a CPR implies lack of well defined individual private property rights of co-users in the CPR. Sometime private property resources¹ and state property resources are pooled and used as common resources. In such cases pooled resources were treated as Common Pool Resources (CPR). Thus CPR is a subset of CPR. (NSS-54th round 1999; Singh 1994). Now the problem of common resources is how to coordinate the action of individual user to attain optimal rate of production and consumption for the whole community (Oakerson 1986). Unregulated access to CPR creates a decision making environment in which incremental private benefits to an individual from the increased use of the resources markedly exceed the incremental costs associated with the increased use. Under this circumstance, each rational consumer or user of a CPR is maintained to consume or use more and more of the resources. This would lead to the inevitable over exploitation and degradation of the resources which is termed as the tragedy of commons by Hardin (1968). Individual rationality leads to collective irrationality. But Hardin wrongly assumes all commons are open access (Singh 1994).

2. LITERATURE REVIEW

Scholars from different disciplines examined different rules governing resource use, the features of successful resource regime and the condition conducive to the emergence of collective action. The traditional method of analyzing CPR focuses on the characteristics of resources within a community. Side by side there is another method of analysis, which includes contextual factors in the form historical, political, socio-cultural, economic and ecological process into the framework of CPR school.

Oakerson (1986, 1990) argues that researchers should focus on four set of attributes or variables that can be used to describe typical CPR. These variables are physical attributes of the resource and the appropriation technology, decision making arrangements that govern relationships among users, mutual choice of strategies and consequent patterns of interaction among decision makers, and consequences of the resource regime. Based on this framework, writers of the CPR school have tried to identify the features of successful resource regime, referred to as design principle (Ostram 1990; Wade 1987). Balland and Platteau (1996) have suggested alternative sets of design principle with many common elements. In recent years, Kloostar (2000), McCay and Jentof (1998), Singleton and Taylor (1992), Steins *et al.* (2000) have criticized that CPR school for ignoring contextual factors and argues to incorporate the contextual factors in explaining the origin and evolution of resource regime. Contextual factors are defined as dynamic forces constituted in the user groups' social, cultural, economic, political, technological and institutional environment (Edward and Steins 1999) which can

¹ a) Private property resource - Resource in which owner has right to exclude others. b) Open access - Resource owned by no one and which any one could use i.e., there is absence of well defined property rights. c) State ownership - Resource owned by government. d) Communal Property - Resource to an identifiable community which can exclude others and regulate use jointly (Beck 1994).

influence internal variables under Oakerson's framework as well as interaction process between them (Hussain and Bhattacharya 2004).

However, the role of leadership of voluntary organizations is important to motivate the communities to interact among and between the internal and external factors in such a way that a successful resource regime can be established and run in sustainable way.

Agarwal and Narain (2000) showed that this experience is prominent in Ralegan siddhi, Tarun Bharth Sangha, Alwar and Madhya Pradesh case study. In all the cases resource base was created when people relating to the resource facing severe crisis.

In Sukhamajri village, villagers built a small tank to capture rain water and agreed to protect their watershed in 1979 when they face severe drought. Subsequently the economic and ecological changes have taken place. Village level Institution evolved out to manage the resource base, which is crucial for the entire exercise.

Krishna Bhaurao Hazare, a retired driver from the Indian army, began work in the village Ralegan Siddhi in a drought prone area of Maharashtra, by constructing a storage pond, reservoirs and gully plugs in 1975. Every effort was made in the village to ensure people's participation including women and to ensure equitable access to the resources generated. Today not a single inhabitant of the village depends on drought relief.

In 1986, assisted by Tarun Bharat Sangha (a local voluntary agency) the villagers of Gopalpura (a poor and drought stricken village in Rajasthan) built three small earthen rainwater harvesting structures, locally called 'johads' using traditional knowledge on their village grazing land to store monsoon rains. The storage water then used to irrigates their fields and increase percolation in the grounds to recharge wells. Today villagers has enough to eat and do not have to migrate any more. What is absolutely stunning today is to see the rebirth of several rivers in the region. The voluntary agency follows clear guide lines - villagers contribute land and labour while Tarun Bharat Sangha supplies external resources like cement for construction or diesel for tractors.

Watershed management programme of district Jhabua in Madhyapradesh, has become outstanding example in which the government has been able to intervene in a way that promote public participation in environmental management.

These studies from India represent the transformation from a state of ecological poverty to a state of sustainable economic wealth. These micro experiences are remarkable as they are testimony to the potential of generating wealth and well-being from rain water harvesting and it takes short time to transform a poverty stricken destitute and ecologically devastated village to a rich and green village. These examples of community management of natural resources teach us that sustainable management will be succeed when people are given the right to manage their natural resources base. But today the challenge lies in empowering and mobilizing the labour of the marginalized people to develop a robust local economy based natural wealth and get out of their ecological poverty to live with dignity.

3. OBJECTIVES OF THE STUDY

3.1. Research Gap

To analyze the nature and behaviour of collective action in a sustainable common pool resource regime incorporating features within and outside a community.

3.2. Objectives

To examine how the behaviour of the community members in a co-management institution are guided in the context of historical, political, socio-cultural, economic and ecological background of a sustainable common pool water resource regime and to understand strategy of successful community management to empower and mobilize labour resource towards the sustainability of common pool resources.

3.3. Study Plan

Literature on CPR theory consisting both internal and external factors have been reviewed in section 2. Research gap and objectives of the study are specifically identified and stated in section 3. Section 4 deals with research methodology, section 5 discusses about the location of tribal area, section 6 provides a detailed background of water resources, section 7 analyzes the common pool water resources, sustainability, conflict, externalities, section 8 presents a cost-benefit analysis of the collective action, section 9 analyzes the dynamic change, section 10 deals with the context, objective and dynamic changes in resource regime and section 11 concludes the study.

4. RESEARCH METHODOLOGY

4.1. Data Collection

The primary data has been used for the purposes of the study. The primary data has been collected on the basis of sampling survey method.

4.2. Primary Sources of Data

The resources studied are a group of three water bodies (ponds) belonging to the tribal community in the village Chamtagara of Chhatna block in Bankura district, West Bengal, India. Primary data was collected from a voluntary organization of Chamtagara named Vivekananda Adibasi Kalyan Samity (VAKS). This voluntary organization was evolved out of a committee constituted to construct and maintain water resources in 1961.

4.3. Sampling Technique

Purposive sampling technique has been adopted to select the resources under the study and simple random sampling without replacement is used to select sample beneficiaries (members) of the select resources.

4.4. Sample Size

A sample size of 16 was taken out of nearly 50 members. Necessary details about the sample are as follows (Parenthesis indicate educational qualification of the respondent): 1st chosen member is Anath Saren, 70 years old and class X passed, husband of late Sundari Saren and secretary of Vivekananda Adibasi Kalyan Samity (VAKS), Chamtagara. Other chosen members consist of three women, aged 60 years (just literate), 40 years (graduate) 20 years

(class X passed), and twelve male members, (in descending ages) 1. 67years (just literate), 2. 66 years (class II passed), 3. 63 years (class I passed), 4. 59 years (class I passed), 5. 58 years (class I passed), 6. 45 years (class IV passed), 7. 40 years (MBBS), 8. 37 years (class VII passed), 9. 36 years (VIII passed), 10. 30 years (class X passed), 11. 25 years (class X passed), 12. 23 years (class XII passed).

4.5. Instrumentation Technique

A structured questionnaire with multiple-choice questions followed by personal interviews and group discussions has been used for the collection of data. The questionnaire was set in accordance with the objectives of the study. The survey was conducted in December 2004 by undertaking interviews of Anath Saren, Secretary of Vivekananda Adibasi Kalyan Samity (VAKS), Chamtagara, to know about the history of the organization and its functioning. This was followed by interviews of 15 randomly chosen members to identify their socio-economic characteristics and learn about their association with the committee to maintain the water bodies. Two group discussions were conducted taking five randomly chosen (without replacement) members in each group with one female in the first group and two females in the second. Finally I have analyzed the audited financial records (financial year 2003-2004) of the VAKS.

5. TRIBAL SETTINGS

The District of Bankura lies between 22°35 north latitude and 86°36 to 87°46 East longitudes. Administratively, it is located in the Burdwan Division in the western Part of the state of West Bengal. It is known to be a backward district in terms of socio-economic development. Chamtagara village situated in the drought prone Chhatna Block of Bankura District. More than 50 percentage of the total population in the Chamtagara village belongs to Schedule Tribe. They live in the west part of the village and higher caste 'Tamboli' society live in the east part. Majority of tribal people in the block are agricultural labourers. As agricultural activity is seasonal, they do not get regular opportunity to work as daily labourer throughout the year. As a result, to earn their livelihood they migrate three to four times in a year to the agriculturally developed Burdwan and Hoogly districts and suffer a lot. Children and old parents of such migratory labourers stay in their homes which in turn creates various problems. Economic backwardness among schedule tribe population is manifested through high illiteracy rate, poor health status, ignorance, superstition and poor consciousness about sanitation, family planning, etc.

6. BACKGROUND OF WATER RESOURCES

6.1. Genesis and Evolution of Water Resources and its Management

In 1961 when new house wife Sundari entered her husband's village, Chamtagara visualized that they (Tribal Society) are dominated by higher community 'Tambuli' as in case of other villages in Bankura district. All the ponds were owned by Tambuli society. In summer, ponds used to dried up. The remaining little water in bottom was used for domestic needs, livestock rearing etc. Due to ownership and dominant power, the members of Tambuli family, used to get priority while the tribals, on the other hand, had to wait till Tamboli's needs were met up.

Low caste, untouchable Tribal Sundari had to return home without using water from nearby ponds after a long wait under scorching heat of mid day summer like other days and other members of her society.

The fact struck her mind and she visualized the problem of her entire society in her own eyes. She realized that bathing, washing utensils and clothing and extinguishing fire is must for normal living. It can reduce the damage of crop harvesting due to uncertainty of monsoon. There is no alternative to water and for water ponds play a very important role. So to get the required water for everyday use they needed ponds from where she, her family members, members for her society could get sufficient water freely without any exclusion.

To construct ponds, land and labour are very much required. Most household in tribal society have fallow land and unemployed labour. To mobilize such valuable resources into productive purposes efficiently what are needed are initiatives and devotion. Sundari Saren filed a project in PL- 480 scheme² with the help of a person³ of Santiniketan involved in village level development projects.

The project, however, was sanctioned. They brought their sanctioned food article from Calcutta port⁴ with the financial help of a rice mill owner of Jhantipahari, Bankura.

She faced another problem, the problem of selecting land for construction of ponds. They could use ponds for domestic needs and to extinguish fire if ponds were within the hands distance; it would fill by water if it was dug in the catchment of water flows, which would also recharge ground water. It had to keep in mind how much lands were getting irrigated. Though main land area of projected pond belonged to the tribal community, the ponds could not be constructed if the owners of few 'Kathas' (1 katha = 720 sq ft) of private property land would not agree to give up.

Sundari, with her own initiatives, let them understood how a pond benefits society, solve their traditional problem of water, financial benefits of creating ponds to both those who gave land and labour. She even involved the persons, who would be landless after giving their small plot of land for ponds. She formed a committee for digging and maintenance of ponds involving her husband Anath Saren, other members of her family and her society. Three ponds were thus excavated one after another in the year of 1962-63. Now the tribal community of that village became the owner⁵ of these ponds. All the members who gave either their land or labour got user rights of the ponds. Heirs inherited the membership. It was settled that the membership can also be transferred to persons nominated by the members. Any new individuals outside the community cannot be inducted into the committee.

² PL-480 is a scheme of assistance in food article to developing countries like India under public law 480 of US Government. India government accepted this foreign aid in 1960's and 1970's to meet the food grain crisis.

³ Sundari got to know the person of Santiniketan through one of her family friends.

⁴ The food articles shipped to various Indian ports from United States of America. Government of India distributed this food articles under food for work programme and the responsible authority had to collect at their own transportation cost because sanctioned money for the project came later. The nearest port from Chamtagara village is Calcutta Port.

⁵ User rights are discussed in detail in section 6.2.

At the time of survey some of the original members have grown older even some of them, including the dreamer Sundari Saren, were died.

6.2. Functioning of the Committee for Digging and Maintenance of Ponds

Initial activity of the committee was confined to dig ponds and its maintenance. As ponds were excavated, labourers secured two full meals per day, demand for water were met up, members can purchase fresh vegetables produce in the bank of ponds and fish cultured in the ponds at a reasonable price in their ceremonies and occasions. With the money from selling fish, vegetables, etc., they had generated a monetary fund, which was used to protect the hard working poor tribal to mortgage their lands against loan in the hands of money lender belonging to the higher caste community in case of illness or any other financial needs. This was a way to reduce their dependency upon higher caste Tambuli either for water, or for money which in turn reduced the dominating power of the Tambuli society.

They dug a cube of 20 x 20 x 20 cubic feet in the middle of the pond to connect it with the source of ground water. This indigenous technology provided sufficient water for household work in summer, when pond used to dry up and even at the time of drought.

Members of the committee discussed about the excavation of ponds, earthen canal and bunds (Johard Bandh) in the catchment which prevented to flow water beyond the village premises. They thought to recharge the ground water which would increase the water level in the earthen canal. This would help the villagers to irrigate their land easily with local devise made of tin sheet, wood, pipe, etc. without using diesel pump.

After solving the water problem for domestic uses, irrigation etc., they started thinking about the problem of drinking water. The only government sponsored well dug up in the entire village was at the higher caste belt. The tribal did not get drinking water before Tamboli's demand for water were met up, even in the case when they had to keep their child or sick family person at home. They had forced to collect water from nearby small water bodies (doba). Disease like cholera and diaheora used to become part of their life. To solve this, they dug well in the tribal belt of the village in 1965. Separate committee was formed to maintain the well. They also solved the problem of pollution by closing the open mouth of the well and put a hand pump in it. They started using such a device in 1966 - one year after the construction of the well. The waste water drained out to a nearby soak pits. In this way they dug 100 ponds and wells nearby and remote villages with tribal concentration of Chhatna, Bankura-1 block of Bankura district.

The profit earned yearly from sale of fish, vegetables, utilization of the monetary fund, was equally distributed to all the members of the community including the members of the executive committee of the pond excavators and maintenance committee. Members of the executive committee got no remuneration but got bonus in terms of fish and vegetables at the time of harvesting. Members also get other benefits like educational aid for their children, medical allowance, advance for aged persons and children and discount on purchase of fish. The impact of all these direct and indirect benefits was quite important.

6.3. The Organisational Setup⁶

There are three office staff, an accountant, a typist and an administrative officer, whose duty is fixed. Accountant and typist are responsible to administrative officer who is in turn responsible to executive committee. This committee is formed for 3 years at a time from the selected members of the community and alters at periodic meeting held bi-monthly or for any special needs. Duties of all supporting staff are also allocated at that meeting. They maintain the ponds and wells in the village, repair net and act as night guards, construct ponds in other villages etc. Payment of the salary is calculated on the basis of days worked.

Executive committee is the decision making body of the VAKS. Project coordinator is responsible for the projects and implements the projects as a whole. Assistant co-coordinator helps him to guide field workers and other supporting staff. Honorary advisor, project officer and executive committee work jointly for project planning, monitoring and evaluation and also to provide other services as per the need of the project implementation. The main administrative officer works under the guidance of the executive committee. In addition to regular paid staff, VAKS also takes support from volunteer as per the need of the project implementation.

7. ANALYSIS

7.1. Common Pool Water Resources

Being a tribal lady, late Sundari Saren realized the sufferings of the tribal community and with strong desire and leadership; she attempted to solve the problem of water through construction of water harvesting tanks (ponds) and construction of dug wells. To check the soil erosion and to conserve the run off rain water, a number of 'Jorbandh' were constructed with the initiatives of Sundari Saren. All these were constructed in the land belonging to the private property⁷ of the tribals of the village Chamtagara and some vested land under the government ownership. As Sundari pooled the private ownership land, government ownership land resources and labour resources together to build ponds, wells, Jorbandh, the pooled resources were treated as common pool water resources.

7.2. Sustainability

Sustainability can be checked in the following index:

i) One index of sustainability is to getting water for domestic needs all over the year. They dug a cube of 20 x 20 x 20 cubic feet in the middle of the pond which reserves water and connects ground water basin. This traditional technology gives community sufficient water even in time of deep drought. Closing the mouth of the well and setting hand pump gives fresh water from the wells.

ii) The three ponds were dug in the village surrounding in such a way that it collects all the rain water. These methods of water harvesting recharged the ground water. Water levels

⁶ Organizational set-up of Vivekananda Adibasi Kalyan Samity (VAKS) as per its annual report of 2003-04. This is also reaffirmed by the pond digging and maintenance committee. VAKS was founded in the year 1975 as non-profit making society under the West Bengal Societies Registration Act (Act no. XXVI of 1961), the Registration no is S/15620 of 1974-75.

⁷ Data relating to the area of land used as common pool resource and its location map are not available.

in the earthen canal rose. As a result, villagers are able to irrigate their land easily with local devise made of tin sheet, wood, and pipe, etc. without using diesel pump. The process minimizes the wastage of water due to flow of water through damage of drain. As diesel pump require no labour, initiative of monitoring will be less and wastage of water will be less. This method of water harvesting resulted that no land became fallow.

7.3. Conflict

Internal conflict: Internal conflict mainly occurs when an ordinary member wants to secure a post in the organization. Because money sanctioned for the project implementation is spend through the hands of the officials. Ordinary members think that they are paid for their physical work but officials are using unlimited money sanctioned for the project implementation without any physical work. They also think that they can earn if they work outside the community, so why they take other responsibilities of the community. To avoid taking responsibilities is another type of conflict. Washing cloth of ill person in well, or putting pot in well, wastage of water during irrigation, fish poaching by the guards are the examples of internal conflicts.

External Conflict: (i) External conflict may occur between the community member and rest of the villagers of higher caste Tambuli and with the panchayat or party activists.

(ii) Poaching: Other villagers of Tambuli caste society catch fish in the night from the ponds. So they arrange night guards and day guards who are to patrol the ponds.

(iii) Use of the ponds: Higher caste Tambuli society tries to use water for domestic purposes or livestock rearing in the newly constructed ponds. These reduce the water quality for bathing, fishing, etc.

(iv) Panchyat Raj: Panchyat Raj attracts people with more and more sound promises to do the same work. This reduces the faith of the people to the community and loses bonding with the community.

7.4. Positive Externalities

Positive externalities mean positive benefits to local people outside the members of the tribal community. After construction of new ponds tribal society did not use the ponds of Tambuli society. As a result per capita availability of water resources has increased to the members of Tambuli society. When rain water harvested, ground water was recharged very well. The surroundings, as a result, always remain moist, which helps other people outside tribal community for cultivation.

8. COST-BENEFIT ANALYSIS OF COLLECTIVE ACTION

a. Traditional: Success of collective action in terms of cost benefit to free riding.

b. Contextual: Interaction between members in context of the background.

As the newly constructed water bodies were belonging to the tribal community, the water bodies were utilized only by the tribal society and other low caste people of the village for household needs, bathing, husbanding live stock, fishing, irrigation etc. Such appropriation was rival to one another in homogeneous group. Because rearing live stock reduces water quality for bathing; rearing live stock, bathing, washing cloth affect fish cultivation; irrigation

affect fish cultivation; fish cultivation prevent irrigation after a limit; cultivation increases water pollution when pesticides and insecticides inflow into the pond with water in the monsoon.

To get out from this trap it is necessary to establish an institutional arrangement, containing rules and norms, monitoring the resources according to the importance of the activity.

As the new ponds emerge mainly to address the needs of the household enterprises, using water for household activities is considered as the top most concern, though it contains no monetary benefit. The possibility of such transition depends upon feasibility of applying the exclusion principle and on the nature of the boundaries of the resources. The boundaries of the resources are both fixed and static. This means that it is possible to identify the agents, or group of agents appropriating the benefit from the resource. However it is also necessary to consider the feasibility of excluding particular member of the community who do not either conform to the rules or contribute to the conservation efforts. The small size and the homogeneity of the resource community means that transaction cost of any regime (in the form of establishing property rights, monitoring, sanctioning) would be low. This effectively rules the imposition of property rights.

Though there is absence of corresponding sense of responsibility towards maintaining the water resources for future users and there is example of disinterest in the CPR generating private benefit. Sundari Saren's movement raises the consciousness among the untouchables about the threats of other communities and dominancy and forces the tribal society to cooperate. This is the main reason for the unity in the community and the creation of the resources. It also creates a suitable collective choice arena implying that they establish a platform through which the resource user could communicate each other.

If we consider the history of the water bodies, it is clear that physical attributes of the resources and decision making arrangements emphasized by Oakerson has remained unchanged, what has changed is the mutual choice of strategies and consequent pattern of interaction among decision makers. On an obvious level, this change can be attributed to cost benefit ratio. Specifically it is the presence of a group of resource users with a common experience leading to the formation of mutually consistent expectations.

The reluctance to undertake collective action can be explained in terms of bounded rationality. The tribal were not aware of the potential benefits of collective action. They tried to choose rationally at their cost-benefit exercise was undertaken in the absence of perfect information and did not evaluate a possibilities.

It was only when Sundari Saren realised her own bitter experience in the society, she had asked questions to herself, her family members and her society; why they had no separate ponds? What was their inability? Searching answers to these common questions of every tribal mind Sundari formed a forum of collective action. Seen in this light, the evolution of the co-management can be interpreted as an instance of consciousness in the absence of perfect knowledge. However, these benefits were only possibilities, their realizations depended upon whether benefits to collective action would exceed costs. It was not actual costs or benefits but perceived values of such parameters. The actual costs and benefits here to form collective action were same for all neighbours: higher cast Tambuli, lower caste Bauri, and the perceived benefits were greater than perceived costs only to a subset that eventually form a committee.

The reason for this phenomenon depended upon the history and culture of the members and the larger backdrop in which their choice was embedded.

Tribal society had their own culture, feeling of alienation from the mainstream culture, greater community sense, and a combative spirit. These shaped the perception and attitudes of the tribal and gave them a socio-cultural identity from that of higher caste Tambuli society of the village. They were able to communicate with each other easily, were willing to suffer great hardship, plan over a longer time period, discount individual sacrifices for group welfare, to a greater extent than the other castes of the villages. Thus mutually consistent expectation what can be called a collective consciousness was created within the members, and gave them their collective identity. This created a sense of community amongst the members and served to reduce the transaction cost of collective action.

Louderdale *et al.* (1984) have shown in a game theoretic framework that the perception of a common threat may increase group solidarity. The creation of a group identity encourages co-operation because members of a social group tend to regard other members favourably and believe them trustworthy, honest and cooperative. Other members of the same group are, therefore, expected to reciprocate co-operative behaviour. In addition, inclusion with a social group reduces social distances between members so that they make less distinction between their own and other's welfare.

Now creating a water body and establishing a society is not an easy procedure. It is difficult for a not so literate class to overcome the red tape (necessary office work, creation of project etc.) involved in this process. However, the support of a man from Santiniketan involving village level development activity had reduced the vulnerability of the tribal society and his support was also important in reducing the transaction costs of this process.

In addition to this historical and socio-cultural context, the economic opportunities outside the domain of the resource were other important variable affecting perceptions about costs and benefits. The labour market was extremely tight in the sense that unemployment and income were insecure. The uncertainty and risk of loss of livelihood created a complex situation where transaction costs in the form of search cost and insecurity of job have reduced the efficacy of the labour market. Individuals can no longer be guided by market principles (in the form of seeking sectors with highest returns) in allocating labour.

Preferences of agents were molded by the economic context in such a manner that instead of choosing optimally on the basis of actual cost-benefit to maximize secured income. During the construction of ponds all adult males and females got foods and wages as remuneration, for children they got milk and for old aged persons they also got additional foods and medicines. They also used to get fish, vegetables, by selling of which they generated a fund which reduces searching for loan with high interest.

In this economic context, the water bodies became more than a common pool resource - it rather became an asset whose well-being was essential for the survival of the group. This aroused interest in management of the water bodies and in the dynamics of the ecosystem leading to an appreciation of the courses and effects in the system. Thus the economic context in which the choice of the members was embedded in (difficulties in carrying their livelihood) created the base for collective action by creating a common problem and mutually reluctant expectation. Simultaneously, the society provided the means to solve the common problem collectively.

The formation of the collective forum is thus explained if we supplement the cost benefit analysis of the feasibility of institutional change with an examination of contextual factors in the form of the historical and economic background of the resource users. Over time, there may be changes in the appropriation methods which can affect the actual costs and benefits of collective actions. However, once again it is more relevant to examine how the interplay of context and internal variables determine the perceived cost benefits. This may provide quite different results and shape to the course of collective action in unexpected directions.

9. ANALYZING DYNAMIC CHANGES

Initially the sole objective is to get sufficient water for domestic uses. The constructed pond met the demand of water for livestock rearing and small part of cultivate land. With the success, they dug three ponds in the village one after another in the year 1962-63. With previous experience they dug other ponds in proper place of the village as a manner that not a single drop of rainwater drainage out from village and most of the cultivate land can be irrigated by using only 'sini' (Water lifting instrument made of tin sheet using man power). Diesel pump was not required for lifting water. This development attracted nearby villagers. They extended their help. Within three years 100 ponds were constructed in surrounding tribal villages of Bankura-1 block and chhatna block of Bankura District.

This can be interpreted as a change in the technology to appropriate benefits from common pool resources. If we consider the effect of this change in isolation, we would expect a communal organization to be able to strengthen its economical position and realize that they can overcome the traditional problems. As a result, they shall now be benefited generation after generation and thereby strengthening the base for collective action.

The above analysis is in line with the traditional CPR school's focus on the effect of internal variables on cost benefit analysis of institutional provisioning. However, if we rework the cost-benefit analysis against the backdrop of the economic context in which the collective action has taken place, the interplay of internal variables with the contextual factors may affect the alternatives to collective action and pattern of dependencies between members of the committee.

The relevant context variable here was the labour market where members of pond maintenance committee supplied labour to supplement their wages. As discussed in the previous subsection, the condition in this market was very tight. The lack of sufficient employment opportunities - especially to relatively uneducated unskilled individuals had meant that the pond maintenance committee was forced to depend on cultivation supported by pond irrigation as a buffer for providing a steady income flow. Uncertainty in the labour market and the risk of loss of livelihood had led to retention of the economic pressure curbing potential free riding.

10. CONTEXT, OBJECTIVE AND DYNAMIC CHANGES IN THE RESOURCE REGIME

The situation had gradually changed when in 1975 the committee registered its name as a non-profit making society in the name of Vivekananda Adibasi Kalyan Samity (VAKS). Establishment of the organization required to set up office bearer and implementation

authority. So members became dependent upon authorities of the Samity and side by side organization created a distance between the ordinary members and the position holders. As a result, different conflicts have emerged in the village development initiatives. Personal initiatives or non-profit organization become less important to villagers. Workings of the pond maintenance committee become slower and the Samity becomes unable to utilize the fund for construction and maintenance of the ponds and wells. General villagers do not approach freely and voluntarily for the activity of the Samity.

During this period, On the other hand, political system of panchayati raj offers some alternative to common people. The new system which provide more and more democracy and decentralization of power hegemony attract people, and the Samity becomes the organization of position holder.

The Samity, as a result, has changed its voice and ways of activity. The organization has requested people of other villages to give priority to dig ponds in their villages for which they need not wait for government subsidy for a longtime and the Samity will bear all the financial responsibilities. Pond is the sole to livelihood, without pond you cannot live. The very slogan to dig ponds could not generate much enthusiasm at the juncture of the transition of political power in West Bengal and the slogan raised by the Samity went astray mostly. In the early stage, the Samity was searching for monetary fund needed to construct ponds, but now monetary fund is in surplus. Earlier, VAKS was searching place to dig pond for the disbursement of sanctioned money, but now money becomes more important than ponds.

Alternative system of panchayati raj promises people to construct their pond, well, road etc. and money allotted for such purposes are spending through village panchayat system, which people thought their local self government. That means if you give some time to the work of panchayat, you can use the money sanctioned for panchayat rural development projects but this is impossible in the Samity. Panchayat gives loan to people with subsidy. Most people utilize the loan not in production purpose but to get the money for subsidy against the sanctioned loan. The Samity could not find any resolution to conflict with the panchayat, party activity and farmer society. And gradually activities of the Samity become restricted, particularly after the pioneer leader Sundari Saren died in 1989.

11. CONCLUSION

The co-ordination of internal and external factors determines the success and evolution of collective action. Tribal society historically formed a homogenous group in terms of caste and culture and influenced a mutual choice of strategies. Simultaneously the economic context and the cultural characteristics of the tribal community operated to shape the pattern of dependences between members and created mutually recurrent expectation. This has reduced the transaction and opportunity costs of collective action. But all these outward and inward factors could not have played a right role and the successful resource regime could not have been established unless the motivation and consciousness were inculcated properly to determine the shape and target of the collective action. My results thus reinforce that local leadership is critical for collective institution to begin and to sustain. These conclusions are significant in today's world of globalization in which local communities integrate with regional, national and global economies and increase in the value of CPR based product and in which characteristics of CPR system become more complex. This paper will help the researcher to analyze understand the evolution of CPR. •

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