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An Analysis of Tenant Farmers Condition and Difficulties at Macro and Micro level

K. KIRAN KUMAR

Agriculture provides livelihood to more than half of the nation's population, which mainly include self-cultivating farmers who are land owners, landless labourers and tenants who do not hold ownership of land. Historically different types of tenancy existed all over the country such as fixed rent tenancy and share cropping tenancy. Agriculture is predominantly the main occupation of tenant farmers who depend on lease land to cultivate crops. To reduce the predominantly existing 'tenancy culture' and protect the tenants in the country over a period of time, central and state governments have implemented various policies such as land reforms, tenant protection policies. However, even now tenants are one of the most vulnerable sections in the agriculture sector. The present study analyzes the current conditions and difficulties of the tenant farmers in various states along with field study in the village.

1. Introduction

In India nearly 49% people still depend on agriculture and other allied activities as the means of livelihood, even though they differ culturally and geographically. More than 70% of rural household's prime occupation is agriculture. The total share of agriculture and allied sector (Including livestock, forestry and fishery logging, and mining quarrying sub-sectors) in terms of percentage of GDP is 17.4% during 2014-15 (FR) at 2011-12 prices. Agricultural exports constitute 9.6% of total exports in 2015-16. In India 253.16 million tonnes of food grain was produced during the 2015-16, which was 1.14 million tonnes higher than the previous year production of food grain that was 252.02 million tonnes.

Above all, the achievements of Indian agriculture are not only because of the land holding farmers but also because of the landless tenant farmers. Tenants are majorly landless, marginal and small holding households, they lease land for cultivation from land owners to improve their living standard rather than living as wage labourers. Tenant farming system is not new. It has been in existence in the country from ancient time to present. Tenancy is of two types: firstly fixed rent tenancy (in which rent payment is either by fixed amount of money or fixed produce) and secondly share cropping in which a share cropper cultivates the landowner's land and gets his share from the produce. In this type of tenancy, both the landowner and share cropper can bear the cost of equipments and inputs items and the latter does all manual works in the field such as ploughing, weeding, transplanting, reaping during the crop period, sprinkling urea and DAP, and spraying pesticide.

2. Review of literature:

New technology helped tighten the grip of the big farmer on rural economy. Lease market, rental market, credit

market, and input market do not function in the interest of poor sections (Parthasarathy & Prasad, 1974). After Independence, the Indian government adopted the British style of bureaucracy, which retained the basic structure of administration of colonial masters that continues till date. It is well known that major segments of bureaucracy have a class bias as they have direct connection with the rural elite. Hence it is inexplicable that such a bureaucracy would have an additional block against any radical land reform. Bureaucracy, who comes from the urban middle class with no land-relations, it acts the same way (Bandyopadhyay, D.1986). Even after the finishing of 4 five-year plans, the condition of tenants, and mainly of share croppers continues to be precarious especially in, Andhra Pradesh, Punjab, Gujarat, Bihar, Tamil Nadu and Haryana.

In accordance with the policy of the second Five Year Plan, the laws enacted by some states for return of tenanted lands by landowners for personal cultivation (Koshy,1974). In Indian villages, the land market operates largely through tenancy rather than through outright sale/purchase (Bardhan and Rudra, 1978). The presence of a strong organization of tenants in rural areas impeded the ejection of tenants and acquisition of their lands by landowners. These developments along with successive enactment of radical tenural legislations have changed the pattern of landlord-tenant relation in Malabar and other parts of Kerala and converted the erstwhile tenants into landowners (Alexander, 1980).

Contrary to the traditional faith that tenants are always small farmers or landless labourers being exploited by landlords with large holdings, the study revealed while large farmers leased in land, small farmers leased out substantial areas of land. In four of the six villages, large farmers had the largest share (34 to 69%) of total land leased in (Jodha, 1981). It showed reduction in the percentage of tenants and an equal upsurge in the percentage of owner-cultivators in all size groups of landholdings between 1961 and 1971 in Dakshina Kannada district. Then essentially during this period there was no improvement in the conferment of ownership rights on the tenants under the 1961 Act 36. Therefore, a decrease in the size of tenants in Dakshina Kannada District between 1961 and 1971 accounts for the uncontrolled eviction of tenants (Damle, 1989).

A programme of assignment of control over land from the big to the small via leasing will also increase overall consumption. Well distribution of land and control over land by sharecroppers and tenants will not only increase

employment per unit of land but it will also increase consumption standards of the rural poor, thus expanding the size of the market for consumer products. (Saxena, 2013).

3. Objectives of the study:

- To analyze the distribution of operational land holdings and tenant holdings at macro level among the size groups.
- To observe the conditions of tenant farmers at micro level in the field village.

4. Data and methodology:

The present study is mainly based on the primary and secondary data. The primary data has been collected from the Chalmeda village of Nalgonda district in Telangana to observe the condition of tenant farmers at micro-level. To analyze the data, simple arithmetic has been used. The secondary data has been taken from NSSO 70TH round to analyze the macro-level condition of land holdings and tenant holdings.

5. Tenant reforms in India

Tenancy predominantly existed in Indian agriculture during pre-independence and further prevailed at the time of Independence. Some important guidelines were given in the Five Year Plans regarding fixed rent on leased-in land and to give tenure security and protection to tenant ownership. Some of the important guidelines were: Rent should not be more than the level of 1/5 to 1/4 of the gross produce; the tenants should be accorded permanent rights in the land they cultivate subject to a limited right of resumption to be allowed to land owners; and in respect of non-resumable land, conferring ownership rights on tenants. Based on these guidelines, state governments made legislation to reform tenancy in their states. Various states made legislation regarding tenant ownership. Some states that allowed tenants to obtain land after paying money to the original landlord were: Hyderabad, Uttar Pradesh, Bombay, Gujarat, Mysore, Delhi and Madhya Pradesh. While states that agreed for tenants to attain land without paying money to original landlord were: Bengal, Bihar, Bhopal, Orissa, Assam, and Madhya Pradesh. States that decreased rent of the tenants without conferring ownership rights on them were: Andhra Pradesh, Rajasthan, Madras and Hyderabad.

5.1 Tenure security:

Insecurity of tenure is a big obstacle in the growth of agriculture. Because of insecurity, a tenant farmer does not focus much on soil augmentation. Less concentration of tenants on soil/land, reduces crop production in the long run. With regard to this issue, various state governments passed laws to provide tenure security for tenants. Various state governments (West Bengal, Assam, Tamil Nadu etc.) mentioned that a tenant should not be evicted by landowner without completing at least five years of tenure. However, there is one provision that had been given to landlords to take half of the leased land from tenants for personal cultivation. In this regard, West Bengal during the 1972-73 took a step towards protection of tenants under 'Operation Barga,' following which a fixed rent was decided for 'fixed rent farming' while for share croppers 25% of the produce was assured for them.

6. Operational Holding and Operated Area at All India Level.

From Table 1 it can be observed the percentage of operational holdings that are being operated by the various size group households at all India level. Land is an important factor for more than 70% of rural households across the country to sustain and improve the livelihood, standard of living, education and health. It was observed

in 1970-71 marginal operational holding households constituted 45.80% of total operational holdings and area under their control were 9.20% of the total operated area. Meanwhile, small operational holding households constituted 22.40% of total operational holding and area under their control was 14.80 of the total operated area. Semi-medium operational holdings constituted 17.70% and area under their control were 22.60%. Medium operational holding households accounted for 11.10% of total operational holdings and area under their control was 30.50% of the total operated area, while large operational holding households accounted for 3.10% of the total operational holdings and area under their control was 23.0% of the total operated area. Marginal and small operational holdings constituted 68.20% and area under their control was 24%, while semi medium, medium and large operational holdings constituted 31.80% of total operational holdings and area under their control was 76% of the total operated area. These statistics reveal unequal distribution of the operated area among the operational holding households.

Furthermore, by 2012-13 marginal and small operational holding households constituted 88.47% and area under their control was 51.15%, while semi-medium, medium, and large operational holdings constituted 11.53% of total operational holdings and area under their

TABLE 1: Percentage distribution of the number of household operational holdings and operated area by category of holding across the last five LHS Surveys of NSS.

Category of holdings (land size in ha)	1970-71	1981-82	1991-92	2002-03	2012-13
Landless (< 0.002)	0 (0)	0 (0)	0 (0)	0 (0)	0.03 (0)
Marginal (0.002-1.000)	45.80 (9.20)	56.0 (11.50)	62.80 (15.60)	70.0 (21.70)	73.17 (27.71)
Small (2.000 -4.000)	22.40 (14.80)	19.30 (16.60)	17.80 (18.70)	15.90 (20.30)	15.30 (23.44)
Semi – medium (2.000-4.000)	17.70 (22.60)	14.20 (23.60)	12.0 (24.10)	8.90 (22.30)	8.10 (23.50)
Medium (4.000 – 10.000)	11.10 (30.50)	8.60 (30.20)	6.10 (26.40)	4.40 (23.10)	3.04 (19.33)
Large (>10.000)	3.10 (23.0)	1.90 (18.20)	1.30 (15.20)	0.80 (12.50)	0.37 (6.02)
All sizes	100 (100)	100 (100)	100 (100)	100 (100)	100 (100)

Source: 70th NSSO household ownership and operational holding, 2013.

control was 48.85% of the total operated area. Over the period percent of marginal and small operational holdings have increased but area under their control has not increased as much even after implementation of Land Ceiling Act during 1971-73. Here it reveals that a larger percent of operated area is under the small percent of large holdings due to laxity in implementation of the Land Ceiling Act intensively by the various state government across the country.

From Table 2 it can be perceived that Gini coefficient values on size distribution of operational holdings in each state of the country. According to Gini coefficient values in the 1970-71, the highest value was in Rajasthan with 0.599, it means highest inequality existed in this state in the distribution of operated area among the operational holdings and second highest inequality in combined area was noted in Andhra Pradesh with 0.582 Gini value. The lowest inequality was observed in Assam with 0.388 Gini

value compared to other states, which was followed by Punjab with 0.398 Gini concentration. But at all India level inequality was also highest with 0.567 Gini concentration.

By 2012-13, maximum inequality existed in Punjab with 0.670 Gini concentration value and second highest in Haryana with 0.598 Gini concentration value. Incidentally both Punjab and Haryana were low inequality states in distribution of operated area among the operational holdings during the 1970-71, but they in 2012-13 they scored a dubious first and second spot amongst highest inequality states in the country due to implementation of Green Revolution techniques and HYV. In both Punjab and Haryana, the Green revolution has given more profits to big farmers while marginal, small farmers could not use the improved technology due to which either they sold their land or leased it to medium and large farmers. At all India level inequality has declined marginally in 2012-13 as compared to 1970-71.

TABLE 2: Changes in Gini's coefficient on the size distribution of operational holdings across the last five LHS of NSS

Gini's coefficient					
State	1970-71	1981-82	1991-92	2002-03	2012-13
Andhra Pradesh	0.582	0.573	0.529	0.543	0.455
Assam	0.388	0.465	0.412	0.366	0.351
Bihar	0.511	0.534	0.525	0.421	0.376
Chhattisgarh	-	-	-	-	0.361
Gujarat	0.518	0.544	0.573	0.605	0.518
Haryana	0.436	0.571	0.645	0.675	0.598
Himachal Pradesh	-	-	-	-	0.334
Jammu & Kashmir	-	-	-	-	0.237
Jharkhand	-	-	-	-	0.350
Karnataka	0.509	0.562	0.577	0.543	0.509
Kerala	0.483	0.449	0.392	0.348	0.342
Madhya Pradesh	0.508	0.520	0.533	0.527	0.508
Odisha	0.466	0.504	0.462	0.381	0.316
Punjab	0.398	0.685	0.694	0.706	0.670
Rajasthan	0.599	0.551	0.590	0.610	0.575
Tamil Nadu	0.480	0.555	0.527	0.508	0.480
Telangana	-	-	-	-	0.440
Uttar Pradesh	0.471	0.520	0.498	0.450	0.444
West Bengal	0.433	0.494	0.430	0.313	0.223
All India	0.567	0.596	0.591	0.557	0.516

Source: 70th NSSO household ownership and operational holding, 2013.

7. Tenant Operational Holdings

Table 3 outlines the percentage of tenant holdings under operational holdings from 1970-71 to 2012-13. The percentage of tenant holdings decreased from 25.7% in 1970-71 to 9.9% in 2002-03 but increased to 13.7% during 2012-13. During 1970-71, the highest percentage of tenant holdings were marginal and small holdings with 27.0%

and 27.8% respectively but the lowest tenant holdings was large holdings at 15.9%. During 2002-03 and 2012-13, the highest percentage of tenant holdings was large holdings at 13.8% and 21.8% respectively as against marginal and small tenant holdings in 1970-71. By comparing the data from 2012-13 with 2002-03, the percentage of tenant holdings has increased in all categories.

TABLE 3: Percentage of tenant holdings by category of operational holdings, across last five LHS surveys of NSS.

Category of holdings (land size in ha)	Percentage of tenant holdings*				
	1970-71	1981-82	1991-92	2002-03	2012-13
Land less (< 0.002)					2.6
Marginal (0.002-1.000)	27.0	14.4	9.3	9.8	13.2
Small (2.000 -4.000)	27.8	17.9	14.9	10.7	13.6
Semi – medium (2.000-4.000)	24.8	15.9	12.2	10.3	18.0
Medium (4.000 – 10.000)	20.0	14.5	13.1	7.8	14.8
Large (>10.000)	15.9	11.5	16.7	13.8	21.8
All India	25.7	15.2	11	9.9	13.7

Source: 70th NSSO household ownership and operational holding, 2013, *tenant holding' stands for an operational holding with wholly or partially leased-in area.

Table 4 gives details of the percentage of leased-in area under the below-mentioned category of holdings from 1970-71 to 2012-13. The prevalence of leased-in to total operated area increased over time. The total area of leased-in area in 2012-13 was very small as compared to 1970-71, although it was larger than 2002-03. During 2012-13, the leased-in area under landless farmer is 13.7%. It can

be seen that marginal and small categories show a stable decline up to 2002-03 and increase during 2012-13. Even so, for the semi-medium, medium and large holdings, the percentage of area leased-in reduced from 1970-71 to 1981-82, increased during 1991-92, decreased during 2002-03 and finally increased during 2012-13.

TABLE 4: Percentage of area leased-in by category of operational holdings across last five LHS surveys of NSS.

Category of holdings (land size in ha)	Percentage of area leased in				
	1970-71	1981-82	1991-92	2002-03	2012-13
Landless (< 0.002)					13.7
Marginal (0.002-1.000)	18.9	9.7	8.7	8.6	11.30
Small (2.000 -4.000)	14.6	8.5	8.5	6.8	11.25
Semi – medium (2.000-4.000)	11.7	7.3	7.4	6.3	13.14
Medium (4.000 – 10.000)	8.7	6.6	6.9	4.2	8.64
Large (>10.000)	5.9	5.3	11.4	6.1	12.59
All sizes	10.6	7.2	8.3	6.5	11.30

Source: 70th NSSO household ownership and operational holding, 2013.

Table 5 shows distribution of leased-in operated area across the country that was computed through various NSS surveys. Leasing of land takes place between two parties—tenant and land owner—based on one common agreement or understanding. A tenant can pay rent through any of the following agreed upon modes: i) fixed money, ii) fixed produce, iii) share produce, iv) others (it includes remaining type of contracts). During 1970-71, 47.9% of leased-in operated area was paid for through share

produce. During 2012-13, 41.1% of leased-in operated area in the form of fixed money was paid by tenants or lessee of total leased-in operated area. Over the last five decades, payments via share produce method started decreasing while fixed money mode gained importance. Payment of rent on leased-in land in the form of fixed money gives somewhat independence to the tenant as compared to share produce mode as it reduced the tenant's role in the cultivation of crops.

TABLE 5: Trends in percentage distribution of leased-in operated area in terms of lease across the last five LHS surveys of NSS.

Terms of lease	Percentage distribution of leased in operated area				
	1970-71	1981-82	1991-92	2002-03	2012-13
Fixed money	15.4	10.9	19.0	29.5	41.1
Fixed produce	11.6	6.3	14.5	20.3	17.0
Share of produce	47.9	41.9	34.4	40.3	28.7
Others	25.1	40.9	32.1	9.9	12.9
All terms	100	100	100	100	100

Source: 70th NSSO household ownership and operational holding, 2013.

8. Field Study of Chalmeda Village on Tenant Farmer Condition:

Chalmeda is a village in Munugode division of Nalgonda district in Telangana state. In this village agriculture is the prime occupation with more than 80% people being dependent on agriculture in addition to pursuing their caste-based occupation. Earlier in this village people were dependent mainly on their caste-based occupation, but globalization and liberalization of the Indian economy changed all that. Villagers turned to cultivation by leasing land to sustain themselves. Moreover, in this village cultivation is mainly dependent on rainfall due to lack of irrigation facilities. Farmers mainly depend on dry crops for cultivation. Their main crop is cotton because of abundance of black soil (alluvial soil) here. Most of the

land in the village is in the hands of few rich land owners especially belonging to the upper castes, because of that high incidence of tenancy in the village is prevalent.

It can be observed from Table 6 that in this village 100 tenant farmers are located out of which SC (Scheduled Castes) are 19%, OBC 77% and others are 4%. Out of the total leased in area, SC leased-in 80 acres (12.6%), OBCs leased-in 532 acres (83.8%), and others 23 acres (3.6%). Overall observation of the tenant farmers, highest percent of tenant farmers and the area leased is more in the OBC category followed by SCs. The high prevalence of OBCs as tenant farmers is due to decline of their caste-based occupation. In addition, then they are not trained in any other occupation and less employment opportunities are available outside their village.

TABLE 6: Social group wise percentage of tenant farmers and percentage of area leased-in by them in the study village.

Social groups	Number of tenant farmers	% to total tenant farmers	Area leased in (Acres)	% to total leased in area
SC	19	19	80	12.6
OBC	77	77	532	83.8
Others	4	4	23	3.6
Total	100	100	100	100

Source: field survey data.

Table 7 shows class-wise percentage of tenant farmers and percentage of area leased-in by them during the crop year. Out of total tenant holdings, 20% are marginal tenants holdings, 32% are small tenant holdings, 34% are medium and 14% are large tenant holdings. Marginal tenant holders are leased-in 38 acres (5.9%), small tenant holders are leased-in 132 acres (20.8%), medium tenant farmers are leased-in 245 acres (38.6%), and large tenant farmers are leased-in 220 acres (34.7%) of total leased in land.

Here it can be seen that 100 tenant farmers in the village leased-in 635 acres of land, in which medium and

large tenant farmers constitute 48% and they leased in 73.3% of the total leased-in area. Meanwhile, small and marginal tenant farmers constitute 52% of the total tenant farmers and they leased-in 26.7% of the total leased-in area. We had one notion that land leased-in was only small and marginal size but here it showed that tenants are leasing medium and large size of land as well. Cultivation of crop by leasing small and marginal area was not yielding much profit in dry land area hence tenants started leasing medium and large size of land to reap profit.

TABLE 7: Class-wise percentage of tenant farmers and percentage of area leased-in by them in the study village.

Size groups	Number of tenant farmers	% to total tenant household	Area leased in (Acres)	% to total leased in area
Marginal (0 to 2.5)	20	20	38	5.9
Small (2.6 to 5)	32	32	132	20.8
Medium (5.1 to 10)	34	34	245	38.6
Large (above 10)	14	14	220	34.7
Total	100	100	635	100

Source: field survey data.

Table 8 shows average cost of cultivation and average agriculture income of cotton from leased-in area by tenants. In this village more than 90% of operated land is under cotton cultivation. The average cost of cotton cultivation at A2 per acre of cotton cultivation among the size groups is Rs 27,912 and average agriculture income per acre cotton produced is Rs 30,376. Average cost of cultivation for marginal tenant farmers is Rs 26,500 while for small tenant farmers it is Rs 27,500 and for medium tenant farmers is Rs 28,200, and large tenant farmers is

Rs 29,450. Average agriculture income from per acre cultivation of cotton for marginal, small, medium and large farmers is Rs 28,250, Rs 29,345, Rs 29,400, and Rs 34,500 respectively. Except large tenant farmers the remaining tenant farmers are getting agriculture income per acre less than Rs 5000 after deducting cost of cultivation per acre from income per acre of cotton.

After gradual decline of their traditional occupation, most people in the village turned to agriculture to earn

TABLE 8: Average cost of cultivation per acre and average agriculture income for leased in cultivated land. (Cost A2 = cost A1 + rent paid for leased in land).

Size groups	Avg Cost of cultivation per acre (Rs.)	Avg Agriculture income per acre (Rs.)
Marginal (0 to 2.5)	26500	28250
Small (2.6 to 5)	27500	29354
Medium (5.1 to 10)	28200	29400
Large (above 10)	29450	34500
Average total	27912	30376

Source: field survey data.

their livelihood with many taking the leased-in land rather than becoming an agricultural labourer. Finally, tenant farmers in all size groups are not getting minimum wage income from the cultivation of crops by working more than six months on the cultivated field. Here cost of cultivation calculated at A2 Cost, which is not including the family labour in the cost of cultivation.

9. Source of Credit for Tenant Farmers

In this village almost 60% of tenant farmers depend on money lenders for loans while the remaining 40% depend on fertilizer-dealers-cum-traders. Tenant farmers are most vulnerable group of farmers in the farming community not only in this village but all over the country. These farmers do not own any land for cultivation and they sustain themselves by leasing-in land and paying rent. Tenant farmers approach non-institutional agencies for loans and end up paying interest at double rate than institutional interest rate. There is a facility for tenant farmers to get institutional credit by approaching banks where they can take land pattas (xerox copy) from the land owner. But in reality land owners only avail bank loan credit for other expenses without cultivating any piece of land without giving the land patta (legal documents) copy to tenants. Hence the tenants are exploited and are helpless.

10. Conditions of Tenants in the Village:

One of the more important and debatable issue is that in the village more than 70% of tenancy is a verbal agreement while only 30% is on paper. In case of verbal agreement, owners play a dual role at the time of leasing land out to the same tenant for the next crop year under a fake name of someone offering more than now what the landowner gets. If a tenant pays the agreed amount then the land remains with him or else it is given to someone else who offers more rent.

- Owners continually cheat and evict tenants from the leased-in land before the end of the tenure due to loopholes and provisions for landlords in the law.
- Tenant farmers do not get minimum support price for their produce as fertilizer-cum-traders approach them and harass them to sell the product to them immediately and if they refuse then they are forced to pay the loan taken by them. Because of these malpractices tenant farmers are losing their minimum income or profit from agriculture.
- In the village, at the time of droughts tenant farmers cannot even claim crop failure funds released by

government to reduce the crop loss due to the land owners not issuing the land pattas to them. Land owners are ready to give xerox copy of pattas to a tenant only if he agrees to 50% of the amount claimed by them.

- Tenant farmers had to depend on big land owned farmers for agriculture inputs such as tractor plough before sowing and traditional ploughs at the time of removing weeds/grass between plants.
- In essence, tenant farmers' economic condition is less than that of an agriculture wage labourer's economic condition.

11. Conclusion

Farmers, be it a tenant or agriculture labour, work continuously in the field irrespective of loss or profits and distress to feed the nation as opposed to the common notion that they leave their farming if given a viable option. In the case of tenant farmers the distress is more due to lack of credit, mechanized input and lack of awareness about laws meant for their protection. Various governments are also ignoring these farmers. Predominately existence of tenant farmers in the country (13.7%) is due to failure of other sectors (industry, manufacturing and service) in generating employment opportunities for surplus agricultural labour. Moreover, high predominance of tenancy due to the failure of land reform policies across the country and prevalence of loopholes in the policies has added to their woes. To ease the distress of tenant farmers, state governments and even Central government must take steps towards creation of employment opportunities other than agriculture and also protection of tenant from unusual eviction by imposing strict rules on landlords in addition to providing subsidized inputs and easy access of credit to tenancy farmers. Otherwise there will be increase in dependency of people on agriculture as a wage labourers or tenant farmers.

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"If connectedness is the chief difference between rural and urban areas, then broadband technology and other communication technology goals rise to the top of the list."

– Brad Lubben

Prospects of Sustainable Agriculture Practices under Groundwater Exploitation Scenario: A Case of Saurashtra, Gujarat

B. SWAMINATHAN, N. J. ARDESHNA AND R. L. SHIYANI

At least 50% of India's total irrigated area is dependent on groundwater and there are wide variations in terms of its access and usage. Of late, over-exploitation of groundwater and falling water table levels across the country has become a cause of concern. Though there are many strategies to arrest this trend, crop diversification and water use efficiency stand out as they reduce farmer's risk besides improving resource use efficiency and scaling down cultivation cost. In this context, the present study was conducted in the groundwater exploitation areas of Saurashtra region, Gujarat to understand the extent and feasibility of crop diversification and water-use efficiency. For this study, Harfindahl and Margalef indices were worked out and water use efficiency (WUE) was estimated. The findings revealed Harfindahl indices between 0.65 and 0.91 indicating lesser preference for crop diversification in the study area. Further, Margalef Index (MI) of cotton (1.10) and groundnut (0.52) indicated higher concentration of these crops. The water consumption levels (in HP hrs /ha) for cotton (291.94 to 1050.97) and groundnut (209.85 to 424.03) were found to be highly varying among the farmers. Similarly, average WUE (in HP hrs/qtt) was 35.10 (groundnut) and 56.98 (cotton). Though the WUE of Chilly crop (8.49) was found higher, its average gross returns (Rs. 19,222/ha) was observed to be lower than that of groundnut (Rs. 25,081/ha) and cotton (Rs. 54,373/ha). Accordingly, the study suggests that income, price and adaptation factors are crucial for successful adoption of crop diversification and WUE leading to scaled down risks, costs and boost farm profitability, which in turn may result in sustainable agriculture.

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1.0 Introduction

Groundwater resources vary greatly in terms of their accessibility and ease of recharge and their importance can better be realized by the fact that at least 50% of the total irrigated area in India is dependent upon groundwater alone (CWC, 2008). Such is the importance of the management of the resource in Saurashtra region that in the official meeting of Commission for Agricultural Costs and Prices (CACCP), the scientists at Junagadh Agricultural University stressed the need for incentivizing groundwater dependent farmers of Gujarat while fixing minimum support prices (JAU, 2015). On the other hand, the advances in the groundwater extraction technology, including drip irrigation, have only resulted in its excess water draft across India (Suresh Kumar and Palanisami, 2010). In this context, the erratic and uncertain rainfall coupled with the large inter-annual rainfall variability and prevailing hard rock hydrogeology of Gujarat (JAU, 2017) cause increasing vulnerability of water availability and often leading to scarcity conditions and droughts. As a result, the demand for groundwater has always been found to be ever increasing in the state over the years to such an extent that the overdraft often exceeds the replenishment capacity in most regions (Shaheen and Shiyani, 2005).

2.0 Methodology

2.1 Study Area

Though the Gujarat state is divided into eight agro-ecological zones, it can be succinctly categorized into four major regions viz. Saurashtra, Kutchh, North Gujarat and South Gujarat. Among these, only South Gujarat region has good irrigation facilities through canal network of Mahi, Narmada and Tapti, whereas the Saurashtra region is severely riddled with acute water

shortage (Rao *et al.*, 2014). In addition, rainfall is also subjected to high variations in terms of both annual and inter-annual variability in the region. As a result, the water balance fluctuates on a year-to-year basis with the degree of fluctuation so high that acute water scarcity conditions emerge almost periodically. But since agriculture still continues to be the mainstay of Saurashtra region, the need of water management strategies becomes unequivocally important.

Understandably successive governments in Gujarat have given adequate focus on water conservation. Especially between 2000 and 2016, the state has built 126,000 check dams out of which 55,000 were constructed in Saurashtra region alone (JAU, 2017). Thereby, it is no coincidence that farmers in Saurashtra with improved prospects of irrigation coupled with improved crop varieties and cultivation practices have achieved highest productivity levels in groundnut, sugarcane, banana and even wheat. But the present scenario is categorically different as farmers in Saurashtra are unable to cope with the overexploitation of groundwater leading to surge in salinity levels and lands becoming virtually useless. As groundwater alone accounts for more than 80% of irrigation requirement in the irrigation in the region, the gross mismanagement of the resource has lowered the water table (Dudhat and Shiyani, 2008). On the other hand, rapid urbanization and land use changes have drastically decreased the infiltration rate into the soil and have diminished the natural recharging of aquifers by rainfall as well. All the above factors lead to lowering of water table with the situation becoming more untenable in summer when most of the dug wells and bore wells in the region completely dry up. In this context, this study is an attempt to gauge the prospects of sustainable agriculture in the region in terms of the extent of water use efficiency and crop diversification among Saurashtra farmers to counter farm risks.

2.2 Data Collection

The present study was carried out in Rajkot and the newly formed Morbi districts of Saurashtra region, Gujarat which were purposely selected on the basis of severity of groundwater exploitation in the state (CWC, 2008). Subsequently, Jamkandorna taluka (Rajkot district) and Wankaner taluka (Morbi district) were also identified. A reconnaissance visit was carried out to select two villages from each taluka on the basis of the intensity of cropping

pattern (of both water intensive and non-intensive crops) and the propensity of open well/ bore well using farmers. Accordingly, Raydi and Taravda villages were chosen from Jamkandorna and Sindhavadar and Panchasiya villages were selected from Wankaner talukas. The primary data were randomly collected from 120 respondents consisting 30 farmers from each village during kharif 2016-17.

2.3 Tools of Analysis

The following analytical tools have been used in this study to gauge the extent and prospects of sustainable agriculture in the study area,

- (i) **Herfindahl Index (H):** It is the sum of square of the proportion of acreage under each crop to the total cropped area. It is given by the following equation (Mahendran *et al.*, 2006),

$$H = \sum_{i=1}^1 P_i^2$$

Where, 'P_i' is the share of each crop

and is given by,

$$P_i = \frac{A_i}{\sum_{i=1}^n A_i}$$

Where,

A_i = Acreage under each crop; $\sum_{i=1}^n A_i$ = Total cropped area; and n = No. of crops.

The value of H ranges from 0 to 1. Unity implies complete specialization and zero shows high diversification. Hence, as Herfindahl Index increases diversification in a particular region decreases and *vice-versa*.

- (ii) **Margalef Index:** It is a measure of crop concentration and accounts for the area cultivated with different crop species on the farm (Sibhatu *et al.*, 2015) and given by: $MI = (S-1) / \ln A_i$,
Where, A_i = Area of the ith crop to total cropped area; and S = No. of crops.

- (iii) **Water consumption (HP hours/ha):** Following Narayanamoorthy (2004) and Kaushal *et al.* (2012), water consumption per hectare was measured in terms of horse power (HP) of the motor used for irrigation. Accordingly, water supplied by a farmer using different levels of energy was estimated as the product of the energy level of the pump-set (HP) and the time of use of the pump-set. (i.e. HP x t).

Thereby, water consumption of a particular crop is used as,

Water Consumption (HP hrs/ ha) = Total no. of irrigation of crop 'i' per ha X

HP of the pump-set used X Pumping hours per ha

- (iv) **Water Use efficiency (HP hours / quintal):** It was arrived by using the following specification as given by Narayanamoorthy (2005),

WUE (HP hours / qtl) = Per ha water consumption / Per ha of yield

- (v) **Electricity consumption or power consumption (kWh/ha):** It was arrived as a product of water consumption in HP hrs with assumed power consumption of 0.75 / kWh / HP (Narayanamoorthy, 2005 and Kaushal *et al.*, 2012).

- (vi) **Power Use efficiency (HP hours / quintal):** Following Narayanamoorthy (2003), PUE was arrived by using the following specification,

PUE (HP hours / qtl) = Per ha power consumption / Per ha of yield

3.0 Result and Discussions

3.1 Demographic Profile of Sample Farmers

Demographic profile of farmers would be of help in studying their adoption of a particular cropping or water use technique. It could be seen from figure 1 that more than 38% of the sample farmers belong to the age group of 45–54 years. In fact, 76% of the sample farmers were found to be more than 45 years of age and the mean age was found to be 54.12 years. In terms of experience in crop cultivation, almost half of the farmers were found to be in the range between 16-30 years and the average experience was found to be of 28.96 years. Younger farmers could be expected to be open to adopt new cropping as well as water harvesting practices. On the contrary, older farmers will want to maintain their hold on to conventional practices.

In case of education, more than 45% were educated up to the middle school level (i.e. between 5-8 years of schooling), with average schooling years of 9.12. As education improves, farmers' awareness of emerging agrarian issues, institutional and extension efforts may reap better dividends. In addition, as with groundwater exploitation, the focus on non-monetary inputs (such as

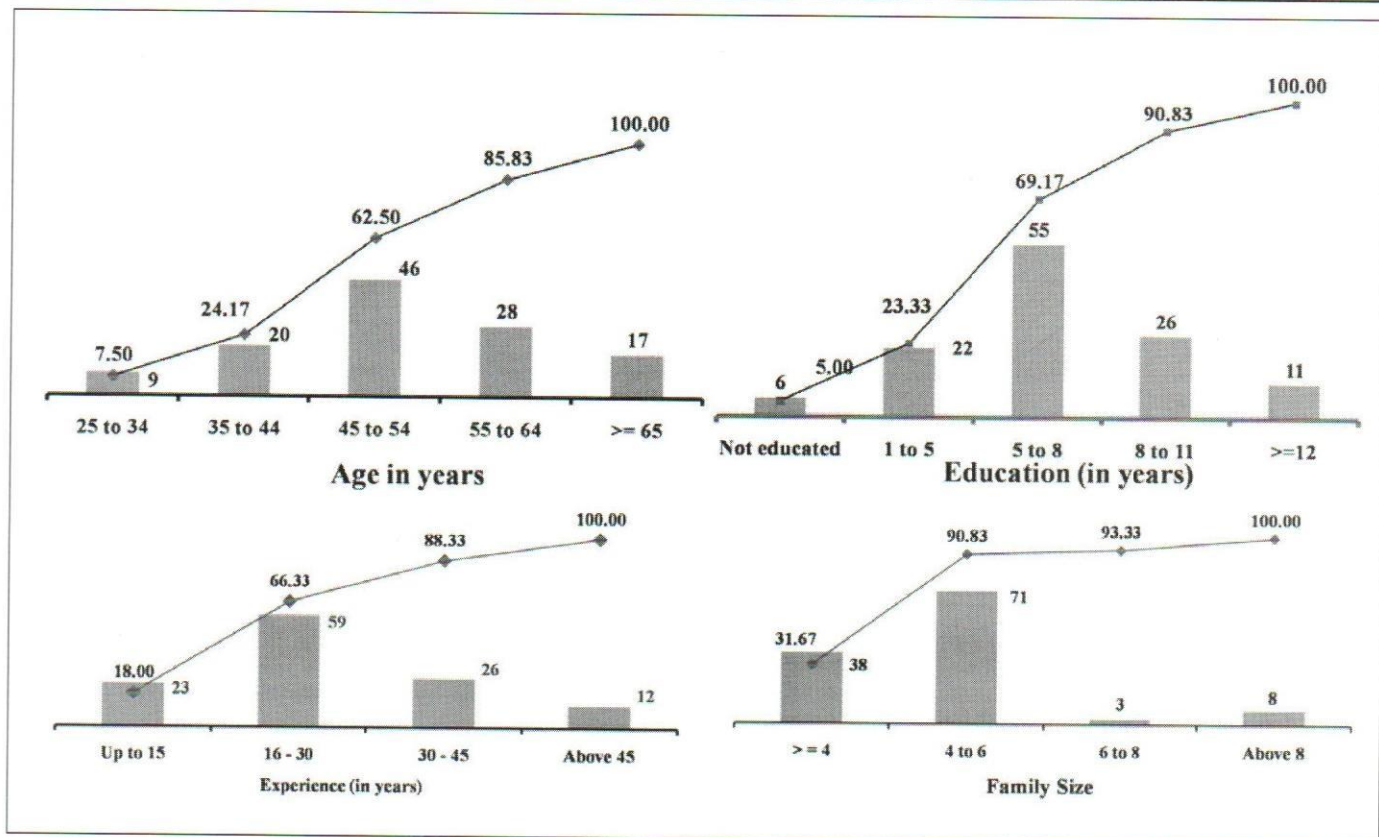
time of sowing, crop geometry, optimum plant stand, timing of cultivation practices *etc.*) has become unavoidable, improved education standards will improve the prospects of adoption of non-monetary and low-monetary inputs. The average family size among farm households was 5.61 and it could be observed that the farmers were more dependent on hired labourers and are in a situation to adjust or modify their crop cultivation priorities on the basis of labour availability and their wage requirements.

3.2 Cropping Characteristics

The cropping pattern details of sample farmers show that the entire owned area is generally put under cultivation and scope of leasing in and out or sharecropping among farmers in order to bring in more area under cultivation is generally not practiced. Cotton, groundnut, redgram, blackgram, soybean, sesame, and sorghum were found to be cultivated in Jamkondorna taluka, whereas cotton, groundnut, soybean, sorghum, and chilly were the crops cultivated in Wankaner taluka of the study area (Table 1). But the major crops cultivated were cotton (1.99 ha) and groundnut (0.53 ha), whereas all other crops occupied negligible area (8% of the study area). The acreage under cotton was higher in Wankaner taluka (2.94 ha) than Jamkondorna taluka (1.04 ha). The groundnut acreage was found to be skewed and higher only in Jamkondorna taluka (0.97 ha). At the same time, among both the talukas, cropping pattern in Jamkondorna was found to be highly diversified. In Wankaner taluka, 94% of the area was found occupied under cotton alone. On one hand, crop rationing is not widely practiced in Wankaner and, on the other hand, farmers indicated depredation and damage caused by wild boar menace as a reason for not taking up other crops.

3.3 Crop Diversification and Concentration

The Herfindahl Index (HI) in a given region would decrease and move toward zero with increase in the prospects of diversification (Mahendran *et al.*, 2006). As depicted in table 2 that though the overall mean of HI (0.78) indicated lesser scope for crop diversification among sample farmers, the HI of Jankandorna (0.65) was better when compared to Wankaner (0.91). The average number of crops per farm was found to be 1.61 but Jamkandorna was slightly better (1.93) than Wankaner (1.29) in terms of number of crops per farm. Wild boar problem and lack of interest among farmers to look beyond cotton crop were found to be the key reasons for lesser crop diversification in Wankaner taluka.



Note: Boxes are frequencies and the lines are cumulative frequencies (in %)

Figure 1. Demographic characteristics of sample farmers

TABLE 1. Cropping characteristics of sample farmers (in ha)

Sl. No. (1)	Particulars (2)	Jamkandorna Taluka		Wankaner Taluka		Overall Mean (7)
		Raydi (3)	Taravda (4)	Sindhavadar (5)	Panchasiya (6)	
1	TOA	2.37 (1.81)	2.33 (1.72)	3.13 (1.78)	3.15 (1.43)	2.75 (2.32)
2	TCA	2.38 (1.80)	2.33 (1.72)	3.13 (1.78)	3.15 (1.43)	2.76 (1.89)
Crop-wise acreage						
1	Cotton	0.92 (0.95)	1.15 (1.55)	2.99 (1.88)	2.89 (1.36)	1.99 (1.83)
2	Groundnut	1.22 (0.76)	0.71 (0.84)	0.07 (0.22)	0.13 (0.37)	0.53 (0.51)
3	Redgram	0.11 (0.55)	0.25 (0.46)	0.00 (0.00)	0.00 (0.00)	0.09 (0.17)
4	Blackgram	0.06 (0.21)	0.03 (0.14)	0.00 (0.00)	0.00 (0.00)	0.04 (0.35)
5	Soybean	0.00 (0.00)	0.09 (0.26)	0.04 (0.16)	0.08 (0.22)	0.07 (0.12)
6	Sesame	0.02 (0.14)	0.02 (0.12)	0.00 (0.00)	0.00 (0.00)	0.02 (0.14)
7	Sorghum	0.05 (0.21)	0.08 (0.28)	0.00 (0.00)	0.03 (0.15)	0.05 (0.32)
8	Chilly	0.00 (0.00)	0.00 (0.00)	0.03 (0.10)	0.02 (0.17)	0.03 (0.19)

Note: TOA – Total Owned Area; TCA – Total Cropped Area; Values inside parentheses indicate Std. dev.

TABLE 2. Crop diversification and concentration indices

Sl. No. (1)	Particulars (2)	Jamkandorna Taluka		Wankaner Taluka		Overall Mean (7)
		Raydi (3)	Taravda (4)	Sindhavadar (5)	Panchasiya (6)	
1	Avg. no. of crops / farm	1.83	2.03	1.23	1.36	1.61
2	Harfindhal index	0.68	0.62	0.93	0.89	0.78
Margalef Index						
1	Cotton	0.54	0.99	1.64	1.22	1.10
2	Groundnut	0.85	0.77	0.04	0.43	0.52
3	Redgram	0.10	0.52	0.00	0.00	0.31
4	Blackgram	0.03	0.02	0.00	0.00	0.02
5	Soybean	0.00	0.32	0.22	0.29	0.28
6	Sesame	0.17	0.18	0.00	0.00	0.18
7	Sorghum	0.02	0.29	0.00	0.17	0.16
8	Chilly	0.00	0.00	0.02	0.09	0.05

Source: Authors' calculation from survey data.

Apart from the index of crop diversification, Margalef Index (MI) was also estimated to comprehend crop concentration in the study area. On an average, MI showed crop concentration of 1.10 in case of cotton and 0.52 for groundnut indicating that the sample farmers concentrate more on these crops alone. But the MI of redgram (0.31) and soybean (0.28) augur for the possible inclusion of these crops in the prevailing cropping system. On the other hand, the MI of sesame (0.18), sorghum (0.16), chilly (0.05) and blackgram (0.02) indicated lesser interest among farmers for these crops. It seems that despite the farmers being satisfied with higher yield levels of these crops, either the absence of ready-market or the prevailing low prices discourage their wider cultivation. At the same time, the extension and institutional efforts are still not prevalent in motivating the farmers towards the prospects of crop rationing in the study area.

3.4 Irrigation Characteristics

The irrigation characteristics (Table 3) portray intense groundwater exploitation and the overall mean depth 128 feet indicate the extensive use of bore wells in the study area. Above all, the average HP of pump-set of 6.92 with 11.50 pumping hours per ha indicate large scale extraction of groundwater by sample farmers. It was interesting to note that though the average number of

irrigation was more or less the same in all the sample villages, pumping hours / ha was found to be highly varying from 8.33 (Raydi village) to 16.64 (Panchasiya village). Among the crops, cotton was given more number of irrigation (6.97) followed by groundnut (3.71). As farmers seemingly provide special attention to cotton and groundnut alone, all other crops (except chilly) were found given hardly one or two irrigation during the entire kharif season.

3.5 Water Consumption (HP hours / ha)

As it could be seen from Table 4 and Table 5, the average water consumption for cotton varied from 331 hp hrs / ha in Jamkandorna to 864 hp hrs / ha in Wankaner, nearly 160% more than the former taluka. Even water requirement of groundnut crop in Wankaner was found higher (317 hp hrs/ha) when compared Jamkandorna (254 hp hrs / ha). At the same time, higher water consumption was not found guaranteeing higher yield levels, which was especially found in the case of both the sample villages of Wankaner taluka. In fact, productivity of both the crops was falling short by 50 to 75% of the state yield levels (JAU, 2017).

Further, the farmers were found not irrigating at critical growth stages of all the crops which in turn was the single most reason for such low yield levels. Thereby, the need

TABLE 3. Irrigation characteristics of sample farmers

Sl. No. (1)	Particulars (2)	Jamkandorna Taluka		Wankaner Taluka		Overall Mean (7)
		Raydi (3)	Taravda (4)	Sindhavadar (5)	Panchasiya (6)	
1	Avg. Depth of well (ft)	116.73	102.33	117.36	174.83	127.81
2	Avg. Pumping hours / ha	8.33	10.06	11.18	16.64	11.55
3	Avg. dm of suction pipe	2.50	2.50	2.50	2.50	2.50
4	Avg. hp of the motor	5.91	6.25	7.11	8.41	6.92
5	Avg. no. of irrigation	2.72	2.62	4.09	3.11	3.14
Crop-wise irrigation details						
1	Cotton	5.93	5.90	8.52	7.51	6.97
2	Groundnut	5.04	4.12	2.64	3.03	3.71
3	Redgram	1.36	1.56	0.00	0.00	1.46
4	Blackgram	1.10	1.60	0.00	1.76	1.49
5	Soybean	0.00	1.36	1.50	1.40	1.42
6	Sesame	1.60	1.13	0.00	0.00	1.37
7	Sorghum	1.30	1.43	0.00	1.20	1.36
8	Chilly	0.00	0.00	3.70	3.76	3.73

Source: Authors calculation from survey data.

TABLE 4. Crop-wise water consumption in Jamkandona taluka

Sl. No. (1)	Crop (2)	Raydi			Taravda		
		Water usage (3)	Yield (qtl / ha) (4)	Gross Income / ha (5)	Water usage (6)	Yield (qtl / ha) (7)	Gross Income / ha (8)
1	Cotton	291.94	12.66	66,236	370.96	13.24	59,483
2	Groundnut	248.12	11.71	43,678	259.05	9.68	37,171
3	Redgram	66.95	2.45	6,925	98.09	2.78	8,979
4	Blackgram	54.15	1.96	5,850	100.60	2.06	6,524
5	Soybean	0.00	0.00	0.00	85.51	3.15	6,879
6	Sesame	78.77	1.29	3,597	71.05	1.65	4,780
7	Sorghum	64.00	2.13	2,332	89.91	1.67	1,778
8	Chilly	0.00	0.00	0.00	0.00	0.00	0.00

Note: Water usage is given in HP hrs / ha; Gross income per ha is given in INR.

to train farmers on non-monetary inputs remains as vital as ever. Gross returns were calculated on the basis of farmers' selling prices which were at least 20 to 30% lesser than the prevailing minimum support prices and were highly varying from one farmer to the other since they were realized based on the quality of the output as mandated by the local markets or village traders. In the Wankaner taluka, the farmers were found interested in cultivating chilly crop and diversify their cropping system. The number of irrigation to chilly in Wankaner was found to be more than three times and average water consumption of it was found 410 hp hrs

/ ha. Despite that the average gross returns / ha from chilly crop was Rs. 19,222 alone. At the same time, groundnut crop with lesser water consumption (317 hp hrs/ha) was found to yield better gross income for farmers (Rs. 25,081/ ha). With the cultivation cost of chilly being higher than groundnut, the prospects of farm profits are further skewed which in turn act as a deterrent for diversification.

3.6 Water Use Efficiency (HP hours / quintal)

As shown in table 6, water use efficiency, i.e. water used to produce one quintal of crop output was found highest

TABLE 5. Crop-wise water consumption in Wankaner taluka

Sl. No.	Crop	Sindhavadar			Panchasiya		
		Water usage	Yield (qtl / ha)	Gross Income / ha)	Water usage	Yield (qtl / ha)	Gross Income / ha)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Cotton	677.25	10.97	49,694	1050.97	9.13	41,093
2	Groundnut	209.85	6.38	25,839	424.03	7.12	24,323
3	Redgram	0.00	0.00	0.00	0.00	0.00	0.00
4	Blackgram	0.00	0.00	0.00	246.30	0.00	0.00
5	Soybean	119.23	3.86	6,893	195.92	2.23	4,431
6	Sesame	0.00	0.00	0.00	0.00	0.00	0.00
7	Sorghum	0.00	0.00	0.00	167.93	1.75	1,685
8	Chilly	294.11	56.75	21,605	526.18	44.56	16,840

Note: Water usage is given in HP hrs / ha; Gross income per ha is given in INR.

for cotton on an average (57 hp hrs / quintal) and it ranged from 23 hp hrs / qtl (Raydi village) to 115 hp hrs / qtl (Panchasiya village). In the same vein, WUE of other crops were also estimated (Table 6) and were found exceedingly 30 hp hrs/qtl. On a surprising note, farmers were requiring more than 36 hp hrs of water to produce one quintal of soybean which was higher than that of groundnut (35.10). Despite the fact that the number of irrigations of groundnut (3.71) was more than that of soybean (1.42), the excess water requirement of the latter only indicate that either farmers are not adapting improved varieties or failing to irrigate at critical intervals. Another surprising element is that the sorghum crop was given more water than that of pulses, as the farmers raise it for cattle feed. Similarly, though only 8.5 hp hours of water is required to produce one quintal of chilly, as the farm gate prices of the crop was found very low (Rs. 5.24 on an average), the farmers were not able to realize higher incomes with less water consumption.

3.7 Power Consumption (kWh/ha)

As the water consumption was observed to be more for cotton and groundnut crops, it is natural that the power consumption would also at the higher end (Table 7). The top three crops in terms of power consumption (kWh/ha) were cotton (448), chilly (308) and groundnut (214). The pulse crops were found to consume less power. At the same time, electricity consumption was found to be highly varying among the villages in commercial crops (cotton, groundnut and chilly) as compared to pulse crops.

3.8 Power Use Efficiency (kWh/qtl)

On the contrary, as shown in table 8, the electricity consumed to produce one quintal of output (kWh/qtl) was found to be low for chilly (6.38) followed by blackgram (19.12). The lesser the PUE the better is the farm sustainability in terms of power consumed to produce one

TABLE 6: Crop-wise water use efficiency (WUE) in the study area

Sl. No. (1)	Particulars (2)	Jamkandorna Taluka		Wankaner Taluka		Overall Mean WUE (7)
		Raydi	Taravda	Sindhavadar	Panchasiya	
		WUE (HP hrs/ctl.) (3)	WUE (HP hrs/ctl.) (4)	WUE (HP hrs/ctl.) (5)	WUE (HP hrs/ctl.) (6)	
1	Cotton	23.06	28.02	61.74	115.11	56.98
2	Groundnut	21.19	26.76	32.89	59.55	35.10
3	Redgram	27.33	35.28	0.00	0.00	31.30
4	Blackgram	27.63	48.83	0.00	0.00	38.23
5	Soybean	0.00	27.15	30.89	87.86	36.48
6	Sesame	61.06	43.06	0.00	0.00	52.06
7	Sorghum	30.05	53.84	0.00	0.00	41.95
8	Chilly	0.00	0.00	5.18	11.81	08.49

Note: HP- horse power; and ctl – quintal; only well / bore well irrigated farms were considered.

TABLE 7. Crop-wise power consumption in the study area (in kWh/ha)

Sl. No. (1)	Particulars (2)	Jamkandorna Taluka		Wankaner Taluka		Mean (kWh/ha) (7)
		Raydi (HP hrs/ctl.) (3)	Taravda (HP hrs/ctl.) (4)	Sindhavadar (HP hrs/ctl.) (5)	Panchasiya (HP hrs/ctl.) (6)	
		1	Cotton	218.95	278.22	
2	Groundnut	186.09	194.28	157.39	318.02	213.95
3	Redgram	50.21	73.56	0.00	0.00	61.89
4	Blackgram	40.61	75.45	0.00	184.72	100.26
5	Soybean	0.00	64.13	89.43	146.94	100.17
6	Sesame	59.08	53.29	0.00	0.00	56.19
7	Sorghum	48.00	67.43	0.00	125.95	80.46
8	Chilly	0.00	0.00	220.58	394.64	307.61

Note: HP- horse power; and ctl – quintal; only well / bore well irrigated farms were considered.

unit of output. Though the power consumption of redgram (62 kWh/ha) was found much lesser to groundnut (214 kWh/ha), the PUE of both the crops were found to be similar. This would only mean that farmers still use low yielding cultivars of redgram in general. Even in the case of groundnut the ruling variety being used by farmers (GG 20) is at least 20 years old and though there have been many improved cultivars since then released by the ICAR research system, the popularity of local varieties or older cultivars have not waned among farmers.

This is further refurbished by the fact that the seed replacement rate in Gujarat (i.e. share of area under improved variety to the total acreage sown of a particular crop) was only 18.1% for redgram against 32% of groundnut (JAU, 2017). Besides, the PUE of sorghum (44.96 kWh/ctl) was found higher than that of cotton (42.73 kWh/ctl). Gujarat happens to be one of the daring states in India to provide zero free power or power subsidy for the farming community. This progressive step needs to be supported by the promotion of high yielding cultivars of more yields per drop of water consumed. Otherwise,

TABLE 8. Crop-wise power use efficiency (PUE) in the study area

Sl. No.	Particulars	Jamkandorna Taluka		Wankaner Taluka		Overall Mean (kWh/qtl.)
		Raydi PUE (kWh/qtl.)	Taravda PUE (kWh/qtl.)	Sindhavadar PUE (kWh/qtl.)	Panchasiya PUE (kWh/qtl.)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	Cotton	17.29	21.01	46.30	86.33	42.73
2	Groundnut	15.89	20.07	24.67	44.67	26.33
3	Redgram	20.49	26.46	0.00	0.00	23.48
4	Blackgram	20.72	36.63	0.00	0.00	19.12
5	Soybean	0.00	20.36	23.17	65.89	36.47
6	Sesame	45.80	32.30	0.00	0.00	39.05
7	Sorghum	22.54	40.38	0.00	71.97	44.96
8	Chilly	0.00	0.00	3.89	8.86	6.38

the sorry affairs of even the sorghum crop consuming more power per unit production will continue unabated (Table 8).

4.0 Conclusion and Suggestions

Groundwater exploitation is fast becoming the most pertinent issue in times of climate variability. Farmers with perennial sources of irrigation can no longer be confident of assured irrigation, as even bore wells dry up and become unyielding upon monsoon delays and failures. The cost of water extraction is not only widening but also goes incentivized and unregulated. In this scenario, the issue of water crisis has to be addressed which alone can ensure sustainable agriculture. The strategies discussed in the present study are the prospects of crop diversification with inclusion of less water intensive crops and feasibility of crops with higher water and power use efficiency. At the same time, there are a plethora of factors which need to be addressed first so as to motivate farmers to adopt sustainable agriculture practices which are given as below,

4.1 Policy suggestions for sustainable agriculture

Income factor: To improve crop diversification and reduce crop loss and lessen farmers' dependency on high water intensive crops, suitable crops should be suggested only after duly considering its income generating capacity. Otherwise, farmers won't be motivated to adopt a new cropping system despite various intangible benefits.

Price factor: Crop diversification may not be successful considering water use efficiency alone. As shown in the study, only 8.5 hp hours of water and 3.19 kWh of power is required to produce one quintal of chilly. Despite that, the farmers were not able to realize improved income levels from chilly due to low farm gate prices coupled with high cost of cultivation.

Adaptation factor: On a surprising note, farmers were requiring more water and power to cultivate soybean, sorghum and pulses despite low number of irrigations in the season. This only indicates that either the farmers are not adapting improved varieties or failing to irrigate at critical intervals. Besides, the importance of non-monetary inputs right from time of sowing to maintaining optimum plant stand to irrigating at critical intervals need to be popularized among farmers which will shall lower farm vulnerability, cut down production costs, lead to better groundwater management practices and, overall, improve the prospects of sustainable agriculture in the region.

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Innovations that are guided by smallholder farmers, adapted to local circumstances, and sustainable for the economy and environment will be necessary to ensure food security in the future.

– Bill Gates

Rural Unorganised Manufacturing Sector in Assam in the Post-reforms Period

DILIP SAIKIA AND UDDIPANA GOGOI

The objective of the present paper is to analyse the performance of the rural unorganised manufacturing sector in Assam in the post-reforms period. Using the National Sample Survey Organisation's (NSSO, 2008 report) 'quinquennial' rounds on unorganised manufacturing sector for the years 1994-95, 2000-01, 2005-06 and 2010-11, we have analysed the growth performance and structural changes in the rural unorganised manufacturing sector in Assam in terms of number of enterprises, employment and output. The analysis showed that in the post-reforms period there has been a deceleration in the growth of output in Assam's rural unorganised manufacturing sector, while the growth of enterprises and employment has been negative. Considerable structural change has been occurring within the rural unorganised manufacturing sector over the years; the share of Own Account Manufacturing Enterprises (OAMEs)– the dominant segment of the rural sector – has been falling, while that of the establishments has been increasing. The establishments' segment has been growing at a faster rate than the OAMEs. Employment elasticity in the overall rural unorganised sector and the OAMEs is negative, whereas that in the establishments' segment has been relatively high. Labour productivity in the rural unorganised sector has been lower than the urban counterpart, however, growth in labour productivity is found to be higher in the rural unorganised sector than urban unorganised sector.

Introduction

The unorganised manufacturing sector is an important constituent of the industrial sector in India in general and in Assam in particular. The role of the unorganised sector in an industrially underdeveloped state like Assam is enormous. The strategic role of the sector is perhaps the creation of a wide variety of gainful employment opportunities, together with its contribution in terms of production, income generation, exports and capital accumulation (Subrahmanya, 2004). Since the unorganised sector is highly labour intensive and also quite diversified including a wide range of manufacturing enterprises dispersed all over the rural and urban areas, the sector can generate large employment opportunities to the surplus agricultural labourers and landless labourers in the rural areas and to the unemployed migrant workers in urban areas. The sector also plays a vital role in industrialisation in rural and backward areas through creating new small-scale enterprises, since large-scale industries can't grow in rural and backward areas where basic infrastructure facilities are not available. Since the enterprises consisting the unorganised sector are small-scale enterprises and require comparatively lower capital cost than large industries to start-up, they can grow anywhere especially in rural and backward areas with small amount of investments, and provide substantial employment opportunities, and thereby holds the promise to enhance the economic condition of the backward states like Assam (Saikia, 2014).

The size of the unorganised manufacturing sector in Assam is huge in terms of number of enterprises and employment. The unorganised sector accounted for about 99.5% of manufacturing units, over 80% of manufacturing employment and about one-fourth of value added of the manufacturing sector in the state during

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1994-95 to 2005-06 (Saikia, 2015). In absolute terms, the unorganised sector, with about 3,70,700 manufacturing units employed about 6,32,500 workers and contributed Rs 13617 million value added (at current prices) in the state during 2005-06.

One striking feature of Assam's unorganised manufacturing sector that makes it distinct from other Indian states is predominance of the rural unorganised manufacturing sector. The rural sector accounted for about 87% of enterprises, 82% of employment and 72% of value added of the unorganised manufacturing sector in Assam during 2010-11, compared to the corresponding share of 59%, 53% and 37% respectively for the country as a whole (Raj & Sen, 2016). Among the major states, only Odisha and Jharkhand's rural unorganised sector has a higher share than Assam.

Notwithstanding the crucial role played by the rural unorganised sector in the industrial economy of the state, the sector has not received due attention in the policy sphere and research community. While there have been very few studies on the unorganised manufacturing sector in Assam, and most of these studies have attempted to examine the issues such as growth, structure, employment, productivity, etc. for the overall unorganised manufacturing sector in the state (Das, Dutta & Borbora, 2010; Saikia, 2014, 2015; Dutta, 2015), these issues have not been addressed in the context of the rural unorganised manufacturing sector. For the unorganised manufacturing sector as a whole (rural plus urban) in the state, studies have shown that the sector has experienced deceleration in the number of enterprises and employment during 1994-95 to 2000-01 (-1.6% and -3.6% per annum respectively), while the period 2000-01 to 2005-06 has seen impressive growth in the number of enterprises and employment (5.9% & 4.9% per annum respectively). The average growth rate of real value added of the sector was about 3% per annum during 1994-95 to 2000-01 and about 8% per annum during 2000-01 to 2005-06 (Saikia, 2014, 2015). However, the performance of the rural unorganised manufacturing sector in the state has not been discussed yet. This paper tries to fill this visible gap in the literature by analysing the growth, structural change and factor productivity of the rural unorganised manufacturing sector in Assam.

The economic reforms started in India since 1991 has thrown up both opportunities and challenges for the small-scale enterprises. The liberalisation of industrial policies and reduction in the number of items reserved for the small-scale sector¹ coupled with opening up of the economy to the global market has drastically changed the business environment in which the unorganised enterprises operate and exposed the unorganised enterprises to intensifying competition from large-scale industries (Bhavani, 2002; Subrahmanya, 2004; Raj & Sen, 2016). Since the business environment in the rural areas is unfavourable due to institutional and infrastructural bottlenecks, the unorganised enterprises in the rural areas are supposed to be adversely affected. Further, the growing consumerism and increasing demand among the consumers for quality products in the globalised era can obviously have an adverse effect on the demand for products from the unorganised manufacturing sector, which often are of poor quality (Golder, Mitra & Kumari, 2011). In this context, it is important to examine the performance of the rural unorganised manufacturing sector in a backward state like Assam in the post-reforms period. More specifically, the present paper analyses the performance of the rural unorganised manufacturing sector in Assam in the post reforms period in terms of growth in number of enterprises, employment and output, structural changes, employment elasticity, labour productivity, among other things.

The rest of the paper is organised in the following sections. The next section briefly discusses the database used in this study. Following that we analyse the size and structure of the rural unorganised manufacturing sector. Then we analyse the growth performance of the rural unorganised manufacturing sector. The next section discusses the employment elasticity and labour productivity of the rural unorganised manufacturing sector. The final section summarises the findings with policy implications.

1. Data source

The data used in this study has been collected from the published survey reports of the National Sample Survey Organisation's (NSSO) latest four 'quinquennial' rounds of survey on unorganised manufacturing sector in India,

¹ The number of items reserved for the small-scale sector consistently increased from 47 in 1967, the year of implementation of reservation policy, to 873 in 1984 and then declined to 836 in 1989, which remained almost unchanged until 1997. Following the recommendation for total abolition of the reservation policy by the Abid Hussain Committee, constituted by the Government of India in 1997, the number of items reserved for small-scale sector witnessed significant reduction since 1997; the number of items reserved for small-scale sector declined to 799 in 2001, to 326 in 2005 and to 20 in 2010 (Raj & Sen, 2016).

i.e. the 51st (1994-95), 56th (2000-01), 62nd (2005-06) and 67th (2010-11) NSSO rounds. These surveys provide a large variety of estimates for the entire unorganised manufacturing sector separately for rural and urban areas at disaggregated industry level as per National Industrial Classification (NIC).

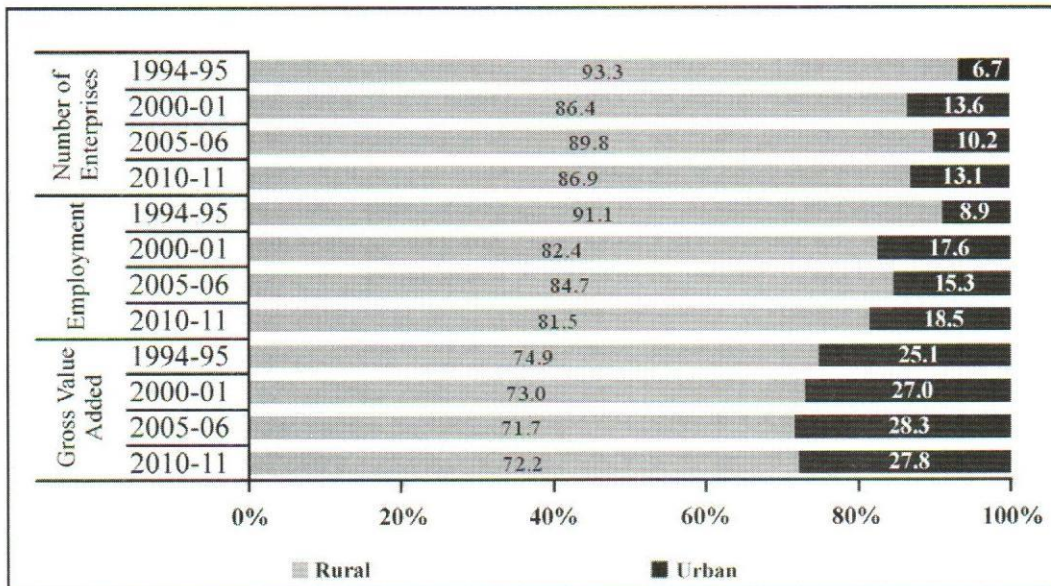
In the NSSO framework, the unorganised manufacturing sector covers all the manufacturing enterprises except (a) those registered under section 2m(i) and 2m(ii) of Factories Act, 1948 and Bidi and Cigar Workers (conditions of employment) Act, 1966 and (b) those run by government (central government, state governments, local bodies)/public sector enterprises (NSSO, 2008). The frequent changes in the industrial classification created a major problem in the consistency of the industry groups in the dataset. The NSSO survey 1994-95 provides information as per NIC 1987, while the surveys 2000-01, 2005-06 and 2010-11 provide information as per NIC 1998, 2004 and 2008 classifications respectively.

Therefore, to make the industrial classifications comparable across the four survey rounds we have made the required adjustments in the industrial classifications following the concordance tables provided by the Central Statistical Office (CSO) before aggregating the industry groups to arrive at the total unorganised manufacturing sector. We have considered the two-digit NIC 2004 codes 15-36 to arrive at the total unorganised manufacturing sector.

We have considered three variables for analysing the performance of the unorganised manufacturing sector in the present study— number of enterprises, employment and gross value added. Employment includes primary workers, working proprietors and supervisory staff engaging either full time or part time in the activity of the enterprise with or without receiving wages/salaries. Gross value added refers to the additional value created by the process of production by an enterprise, and is calculated as the difference between 'total receipts' and 'total operating expenses' during the reference period (NSSO, 2008). The nominal gross value added has been converted into real gross value added by using the wholesale price index (WPI) for manufactured products (at constant 2004-05 prices).

2. Size and structure of the rural unorganised manufacturing sector in Assam

The relative size of the rural unorganised manufacturing sector in Assam is examined in terms of the share of the sector in the total unorganised manufacturing sector in the state. Figure 1 presents the share of the rural and urban sector in number of enterprises, employment and value added of the unorganised manufacturing sector in Assam during 1994-95 to 2010-11. It is evident that a large proportion of enterprises, employment and output of the unorganised manufacturing sector in the state are concentrated in the rural areas. During 1994-95, the rural sector accounted for over 93% of enterprises, 91% of



Source: Computed from the NSSO 51st, 56th, 62nd and 67th rounds.

Figure 1. Percentage Share of Rural and Urban Sector in the Unorganised Manufacturing Sector

employment and 75% of value added of the unorganised manufacturing sector, as compared to the urban sector's share of about 7% in enterprises, 9% in employment and 25% in value added. However, the share of the rural sector has been declining over the years. By 2010-11, the share of the rural sector in the unorganised manufacturing sector has declined to 87% in number of enterprises, 81.5% in employment and 72% in value added.

In absolute terms, there were about 2,48,527 unorganised manufacturing enterprises in the rural areas in Assam, which employed around 5,03,895 workers

and contributed Rs 3622 million value added to the state economy during 1994-95 (Table 1). Between 1994-95 and 2000-01, about 8,122 units have been closed down and as many as 93,463 jobs have been lost, as a result of which the number of enterprises has reduced to 2,40,405 and number of workers has slumped to 4,10,432 in 2000-01. The period 2000-01 to 2005-06 has witnessed substantial number of new enterprises (about 92,515 enterprises) and as many as 1,24,992 new jobs, causing the number of enterprises and employment jumped to 3,32,920 and 5,35,424 respectively in 2005-

TABLE 1: Number of Enterprises, Employment and Value Added in the Rural Unorganised Manufacturing Sector

	1994-95	2000-01	2005-06	2010-11
Number of Enterprises	248527	240405	332920	189920
Employment	503895	410432	535424	344013
Gross Value Added (Rs. million)*	3622	7009	9586	12165

Note: * Values are at 2004-05 constant prices. Source: Computed from the NSSO 51st, 56th, 62nd and 67th Rounds.

06. The period 2005-06 to 2010-11 again experienced closure of large number of enterprises and huge jobs loss, as a result of which the number of enterprises and employment in the rural unorganised manufacturing sector in Assam has declined to 1,89,920 and 3,44,013 respectively in 2010-11. The real value added of the sector, on the other hand, has been steadily increased from Rs 3622 million to Rs 12165 million over the period 1994-95 to 2010-11.

Let us now look at the structure of the rural unorganised manufacturing sector in Assam. The unorganised manufacturing enterprises are subdivided into three categories, namely own account manufacturing enterprises (OAMEs), non-directory manufacturing establishments (NDMEs) and directory manufacturing establishments (DMEs). OAMEs are enterprises run without a hired worker, while NDMEs are establishments employing up to six workers, at least one of them being a hired worker employed on fairly regular basis, and DMEs are establishments employing six or more workers (but less than 10 workers with power and less than 20 workers without power), at least one of them being a hired worker on fairly regular basis (NSSO, 2008). Although the NSSO surveys 1994-95, 2000-01 and 2005-06 followed this disaggregation, the 2010-11 survey clubbed the NDMEs and DMEs together under the establishments segment.

Therefore, we restrict our analysis into two categories of enterprises, namely OAMEs and establishments (NDMEs plus DMEs).

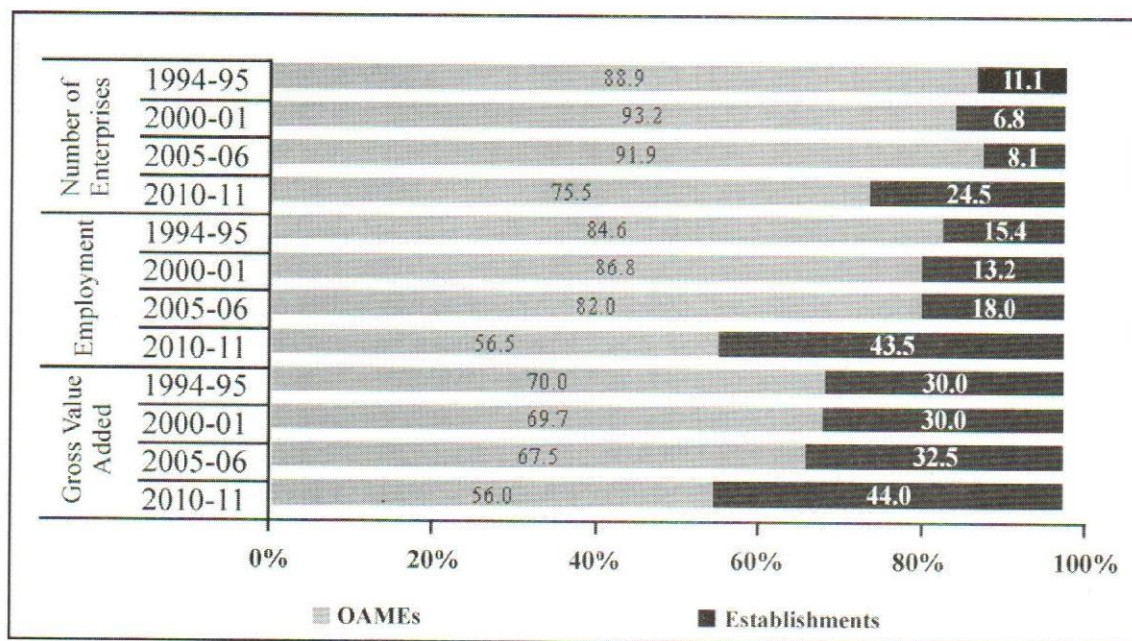
Table 2 gives the number of enterprises, employment and value added in the rural unorganised manufacturing sector by types of enterprises. Further, the share of the different categories of enterprises within the rural unorganised manufacturing sector is shown in Figure 2. A very large proportion of the rural unorganised manufacturing enterprises are OAMEs, which are the household-based tiniest enterprises. During 1994-95, the OAMEs accounted for 89% of enterprises, 85% of employment and 70% of value added of the rural unorganised manufacturing sector, as compared to the establishments segment's share of 11% in enterprises, 15% in employment and 30% in value added sector.

However, considerable structural change has been occurring within the rural unorganised manufacturing sector over the years. The share of OAMEs marginally increased in number of enterprises and employment and remained almost unchanged in value added during 1994-95 to 2000-01, whereas the share has considerably declined during 2000-01 to 2010-11. The decline was moderate during 2000-01 to 2005-06, but quite sharp between 2005-06 and 2010-11 (about 16 %age point in enterprises, 25 %age

TABLE 2: Number of Enterprises, Employment and Value Added in the Rural Unorganised Manufacturing Sector by Types of Enterprises

Year	Number of Enterprises		Employment		Gross Value Added (Rs. million)*	
	OAMEs	Establishments	OAMEs	Establishments	OAMEs	Establishments
1994-95	221047	27480	426056	77838	2534	1089
2000-01	224131	16275	356424	54006	4883	2126
2005-06	306071	26849	438942	96482	6467	3120
2010-11	143392	46526	194422	149588	6809	5356

Note: * Values are at 2004-05 constant prices. Source: Computed from the NSSO 51st, 56th, 62nd and 67th Rounds.



Source: Computed from the NSSO 51st, 56th, 62nd and 67th rounds.

Figure 2. Percentage Share of OAMEs and Establishments in the Rural Unorganised Manufacturing Sector

point in employment and 12 %age point in value added). On the contrary, the share of the establishments segment declined during 1994-95 to 2000-01, but considerably increased over 2000-01 to 2010-11. As a result, by 2010-11, the share of OAMEs fell to 75.5% in number of enterprises and 56% each in employment and value added, whereas the share of establishments segment rose to 24.5% in number of enterprises and 44% each in employment and value added.

3. Growth of the rural unorganized manufacturing sector in Assam

Table 3 shows the growth rates in number of enterprises, employment and real value added in the rural unorganised manufacturing sector by types of enterprises as well as in the urban sector and the overall unorganised manufacturing sector in Assam. During 1994-95 to 2010-11, the average growth rate in number of enterprises in the rural unorganised manufacturing sector was negative at -1.7 % per annum, compared to a positive growth rate

TABLE 3: Growth Rates (% p.a.) of Number of Enterprises, Employment and Value Added in the Rural Unorganised Manufacturing Sector

Time Period	Rural			Urban	Rural+Urban
	OAMEs	Establishments	Total	Total	Total
Number of Enterprises					
1994-95 to 2000-01	0.2	-8.4	-0.6	13.5	0.7
2000-01 to 2005-06	6.4	10.5	6.7	-0.1	5.9
2005-06 to 2010-11	-14.1	11.6	-10.6	-5.4	-10.0
1994-95 to 2010-11	-2.7	3.4	-1.7	3.0	-1.2
Employment					
1994-95 to 2000-01	-2.9	-5.9	-3.4	10.0	-1.7
2000-01 to 2005-06	4.3	12.3	5.5	2.1	4.9
2005-06 to 2010-11	-15.0	9.2	-8.5	-4.3	-7.8
1994-95 to 2010-11	-4.8	4.2	-2.4	2.9	-1.7
Gross Value Added					
1994-95 to 2000-01	11.6	11.8	11.6	13.1	12.0
2000-01 to 2005-06	5.8	8.0	6.5	8.2	6.9
2005-06 to 2010-11	1.0	11.4	4.9	4.4	4.7
1994-95 to 2010-11	6.4	10.5	7.9	8.8	8.1

Note: Growth rate is compound annual growth rate.

Source: Computed from the NSSO 51st, 56th, 62nd and 67th Rounds.

of 3% per annum in the urban sector and a negative growth rate of -1.2% per annum in the overall unorganised manufacturing sector. Looking at the intermediate periods, the number of enterprises in the rural sector registered a decline at the rate of -0.6% per annum during 1994-95 to 2000-01, followed by a high growth rate of 6.7% per annum during 2000-01 to 2005-06 and a large deceleration at the rate of -10% per annum during 2005-06 to 2010-11. The average annual growth rate of number of enterprises in the urban sector during these sub-periods was 13.5%, -0.1% and -5.4% respectively and that in the overall unorganised manufacturing sector was 0.7%, 5.9% and -10% respectively.

Within the rural unorganised manufacturing sector, the number of enterprises in the OAMEs segment registered a negative growth rate of -2.7 % per annum during 1994-95 to 2010-11 compared to a positive growth rate of 3.4 % per annum in the establishments' segment. The number of enterprises in the OAMEs segment grew at a very slow rate of 0.2 % per annum during 1994-95 to

2000-01 followed by a moderately high growth rate of 6.4 % per annum during 2000-01 to 2005-06 and a huge slump at the rate of -14 % per annum during 2005-06 to 2010-11, whereas the number of enterprises in the establishments segment registered a huge decline at the rate of -8.4 % per annum during 1994-95 to 2000-01 followed by spectacular growth rate of 10.5 % per annum during 2000-01 to 2005-06 and 11.6 % per annum during 2005-06 to 2010-11.

The employment in the rural unorganised manufacturing sector has registered a decline at the rate of -2.4 % per annum during 1994-95 to 2010-11 compared to the average growth rate of about 3 % per annum in the urban sector and a decline at the rate of -1.7 % per annum in the overall unorganised manufacturing sector. The rural unorganised manufacturing sector registered a negative growth rate of -3.4 % per annum during 1994-95 to 2000-01, followed by a moderately high growth rate of 5.5 % per annum during 2000-01 to 2005-06 and a sharp deceleration at the rate of -8.5 % per annum during 2005-06 to 2010-

11, whereas the urban sector registered an impressive growth rate of 10 % per annum during 1994-95 to 2010-11 followed by a slower growth rate of 2.1 % per annum during 2000-01 to 2005-06 and a negative growth rate of -4.3 % per annum during 2005-06 to 2010-11. Across the sub-sectors within the rural sector, the establishments segment registered a moderately high growth rate of employment at 4.2 % per annum during 1994-95 to 2010-11, compared to a deceleration of employment at the rate of -4.8 % per annum in the OAMEs segment. The average growth rate of employment in both the OAMEs and establishments segment was negative at -2.9 % and -5.9 % per annum respectively during 1994-95 to 2000-01 followed by a higher growth rate of 4.3 % and 12.3 % per annum respectively during 2000-01 to 2005-06, whereas during 2005-06 to 2010-11 the employment in the OAMEs segment slumped at the rate of -15 % per annum and that in the establishments segment grew at the rate of 9.2 % per annum.

Turning now to output, the real value added of the rural unorganised manufacturing sector grew at the rate of 7.9 % per annum during 1994-95 to 2010-11. The growth rate of real value added in the overall unorganised manufacturing sector was almost same (8.1 % per annum) and that in the urban sector was higher by a fraction (8.8 % per annum). The growth rate of real value added in the rural sector was lower than that in the urban sector and overall unorganised manufacturing sector during 1994-95 to 2000-01 and 2000-01 to 2005-06 and was higher by a fraction during 2005-06 to 2010-11. The growth rate of real value added has been decelerating in both the rural and urban sector over the years; the growth rate fell from 11.6 % per annum during 1994-95 to 2000-01 to 6.5 % per annum during 2000-01 to 2005-06 and to 4.9 % per annum

during 2005-06 to 2010-11 in the rural sector, and from 13.1 % per annum during 1994-95 to 2000-01 to 8.2 % per annum during 2000-01 to 2005-06 and to 4.4 % per annum during 2005-06 to 2010-11 in the urban sector. Within the rural sector, the establishments' segment achieved a higher growth in real value added than the OAMEs segment during the entire period as well as the intermediate periods. The growth rate of real value added in the establishments segment was 11.8 % per annum during 1994-95 to 2000-01, 8 % per annum during 2000-01 to 2005-06, 11.4 % per annum during 2005-06 to 2010-11 and 10.5 % per annum during 1994-95 to 2010-11, whereas that in the OAMEs segment was 11.6 %, 5.8 %, 1 % and 6.4 % per annum respectively.

4. Employment elasticity and growth in labour productivity

The employment elasticity, defined as the ratio of employment growth rate to the value added growth rate, in the rural unorganised manufacturing sector has been lower than the urban unorganised manufacturing sector throughout the period 1994-95 to 2010-11 (Table 4).

Employment elasticity in the rural sector has been negative throughout the period, except for the period 2000-01 to 2005-06. The same has been the trend in case of the overall unorganised manufacturing sector, whereas employment elasticity in the urban sector has been positive throughout the period, except for the period 2005-06 to 2010-11. While the period 2000-01 to 2005-06 has been remarkable for positive and comparatively high employment elasticity in both the rural and urban unorganised manufacturing sectors, the period 2005-06 to 2010-11 has been disastrous for highly negative employment elasticity in both the sectors.

TABLE 4: Employment Elasticity in the Rural Unorganised Manufacturing Sector

Time Period	Rural			Urban	Rural+Urban
	OAMEs	Establishments	Total	Total	Total
1994-95 to 2000-01	-0.25	-0.50	-0.29	0.76	-0.14
2000-01 to 2005-06	0.74	1.54	0.85	0.25	0.71
2005-06 to 2010-11	-14.50	0.80	-1.74	-0.97	-1.64
1994-95 to 2010-11	-0.75	0.40	-0.30	0.33	-0.21

Source: Computed from the NSSO 51st, 56th, 62nd and 67th Rounds.

For the entire period 1994-95 to 2010-11, employment elasticity in the rural sector was found out to be negative at -0.30%, compared to 0.33% in the urban sector and -0.21% in the overall unorganised manufacturing sector. Within the rural sector, employment elasticity in the establishments segment has been positive and higher than that in the OAMEs segment throughout the period, except during 1994-95 to 2000-01. On the other hand, employment elasticity in the OAMEs segment has been negative throughout the period, except during 2000-01 to 2005-06.

It is unanimously believed that the factor productivity in the unorganised manufacturing sector is low because of the very low level of technology used by the unorganised enterprises. This is confirmed by the existing empirical studies in the Indian context (Sahu, 2007; Kathuria, Raj & Sen, 2010; Golder et al., 2011). In the context of Assam, Saikia, (2014, 2015) observes that labour and capital productivity in the unorganised manufacturing sector in Assam has been very low during 1994-95 to 2005-06. While Kathuria et al, (2010) find that labour productivity in the unorganised manufacturing sector in Assam was 9.4 times lower than the organised sector during 1994-94 to 2005-

06, while for the country as a whole it was 4.4 times lower in the unorganised manufacturing sector as compared to the organised sector.

Table 5 presents the labour productivity, defined as the real value added per worker, in the rural unorganised manufacturing sector by types of enterprises as well as in the urban sector and the overall unorganised manufacturing sector in Assam. Labour productivity in the rural unorganised manufacturing sector in the state was less than one-third of that in the urban sector in 1994-95 and just over one-half of that in the urban sector during the period 2000-01 to 2010-11. Within the rural sector, labour productivity in the establishments segment was more than double of the OAMEs segment during the period 1994-95 to 2005-06, but the labour productivity in the OAMEs segment rose so rapidly over 2005-06 to 2010-11 to become almost equal to that of the establishment segment.

Table 6 gives the growth rates of labour productivity in the rural unorganised manufacturing sector by types of enterprises as well as in the urban sector and the overall

TABLE 5: Labour Productivity (Rs.) in the Rural Unorganised Manufacturing Sector

Time Period	Rural			Urban	Rural+Urban
	OAMEs	Establishments	Total	Total	Total
1994-95	5947	13985	7189	24545	8742
2000-01	13701	39365	17078	29083	19190
2005-06	14733	32334	17904	38940	21130
1994-95	35022	35807	35363	59932	39904

Source: Computed from the NSSO 51st, 56th, 62nd and 67th Rounds.

TABLE 6: Labour Productivity Growth (% p.a.) in the Rural Unorganised Manufacturing Sector

Time Period	Rural			Urban	Rural+Urban
	OAMEs	Establishments	Total	Total	Total
1994-95	14.9	18.8	15.5	2.9	14.0
2000-01	1.5	-3.9	0.9	6.0	1.9
2005-06	18.9	2.1	14.6	9.0	13.6
2010-11	11.7	6.1	10.5	5.7	10.0

Note: Growth rate is compound annual growth rate. Source: Computed from the NSSO 51st, 56th, 62nd and 67th Rounds.

unorganised manufacturing sector. The growth of labour productivity is found to be positive in both the rural and urban sectors and within the rural sector in both the OAMEs and establishments segments, except in the establishments segment during 2000-01 to 2005-06. The growth rate of labour productivity has been higher in the rural sector than in the urban sector and the overall unorganised manufacturing sector, except for the period 2000-01 to 2005-06. Among the two enterprises categories within the rural sector, labour productivity has been increasing faster in the OAMEs segment than in the establishments segment except for the period 1994-95 to 2000-01. This is, however, contrary to the sluggish growth of labour productivity in the OAMEs segment at the all India level (Golder et al., 2011).

5. Summary and conclusion

This paper has attempted to examine the performance of the rural unorganised manufacturing sector in Assam in the post-reforms period. The analysis showed that Assam's unorganised manufacturing sector is predominantly rural oriented. The share of the rural sector in the unorganised manufacturing sector in the state has been much bigger than that for the country as a whole and in the major states except Odisha and Jharkhand. The share of the rural sector, however, has been falling in the post-reforms period. The break-up of rural unorganised manufacturing sector by types of enterprises shows that a very large proportion of enterprises are OAMEs – the household-based tiniest enterprises, and so as the employment and output of the sector. However, considerable structural change has been occurring within the rural unorganised manufacturing sector in the state in the post-reforms period. The share of the OAMEs has been considerably declined in the post-reforms period, while that of the establishments segment has been considerably increased.

The analysis has brought out that there has been a deceleration in the rural unorganised manufacturing sector in Assam in terms of number of enterprises, employment and output in the post-reforms period, especially during 2005-06 to 2010-11. The growth rate of real value added in the rural unorganised manufacturing sector has been positive throughout the post-reforms period, but the growth rate has been decelerated over the years.

On the other hand, the growth rate of enterprises and employment in the sector has been negative during 1994-95 to 2000-01, followed by a moderately high growth rate during 2000-01 to 2005-06 and a massive slump during

2005-06 to 2010-11. Within the rural sector, the establishments segment registered a higher growth compared to the OAMEs segment throughout the period. The growth of enterprises and employment in the OAMEs has been negative in the post-reforms period, mostly due to the huge slump of the segment during 2005-06 to 2010-11, whereas that in the establishments segment has been positive.

Part of the decline in the number of enterprises and employment in the OAMEs segment in the post-reforms period, especially during 2005-06 to 2010-11, could be due to transition of the OAMEs to establishments over time, which is evident from the high growth rate of number of enterprises and employment in the establishments segment. Another explanation for the decline in the employment growth rate in the unorganised manufacturing sector, as Golder et al, (2011) point out, could possibly be the improvements in estimating the number of workers more rigorously in the NSSO surveys over time.

The employment elasticity in the rural unorganised manufacturing sector in the state has been negative in the post-reforms period. Employment elasticity in the OAMEs segment has been lower than that in the establishments segment, and has been negative in the post-reforms period compared to the positive employment elasticity in the establishments segment. The negative employment elasticity signifies a situation of job-loss growth in the rural unorganised manufacturing sector in Assam in the post-reforms period.

The labour productivity in the rural unorganised manufacturing sector in Assam has been very low; less than one-third of the urban sector in 1994-95 and just over one-half of the urban sector during 2000-01 to 2010-11. Within the rural sector, labour productivity in the OAMEs segment has been less than one-half of the establishments segment during 1994-95 to 2005-06, but by 2010-11 labour productivity in both the segments has become almost equal. The low level of productivity is a serious challenge for the rural unorganised manufacturing sector, as the sector has to meet stiff competition from large industries in the post-reforms period.

The findings of the paper have the following policy implications. Since a large proportion of the unorganised manufacturing enterprises in the rural areas are in the tiniest household-based OAMEs segment, which use traditional technologies, and hence, quite unproductive,

and that the segment has been decelerating drastically in the post-reforms period, emphasis needs to be given to formulate sector specific policies for the revival of the OAMEs. Priority should be given by the government in providing training facilities for skill development and financial literacy, easy access to credit at low rate of interest and access to electricity at subsidised rate to these enterprises.

Similarly, ensuring easy access to credit and subsidies on raw materials and machineries should be the focus of policy towards the establishments segment. In addition, concrete efforts need to be made to promote stronger linkages of the unorganised enterprises with the agriculture sector and the organised manufacturing sector.

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Smart habitation is an integrated area of villages and a city working in harmony and where the rural and urban divide has reduced to thin line.

– A. P. J. Abdul Kalam

Agriculture to Horticulture: An Innovative Method to Standardize the Socio-Economic Condition of Jammu and Kashmir

MOHD AZHAR UD DIN MALIK

The objective of the paper is to evaluate change of cropping patterns from agriculture to horticulture and its socio-economic impact on residents of Jammu and Kashmir. Horticulture, which is a significant component of agriculture, has become a profitable sector in recent years and thus has an important share in the country's economy. This study is analytical and experiential in nature and is based on both primary as well as secondary data. For analysis of data Statistical Package for the Social Science [SPSS] was used. The study concludes that the change in cropping pattern has improved the socio-economic development of Jammu and Kashmir.

Introduction

Horticulture is a mixture of two Latin words "Hortus" meaning garden and "cultura" meaning cultivation thus horticulture literally means 'culture of garden crops.' The term "agriculture" generally refers to the knowledge of growing plants and rearing animals while "horticulture" is a part of agriculture that is associated with growing 'garden crops.' Horticulture has been redefined as the 'science of growing and management of fruits, vegetables including tubers, medicinal and aromatic crops, ornamental, spices, plantation crops their processing, value addition and marketing.' The Department of Agriculture Cooperation & Farmers Welfare oversees horticulture development in India. Horticulture was separated from agriculture in 1981 and the post of horticulture commissioner was created in 1985. At the national level three boards - National Horticulture Board, National Bee Board and Coconut Development Board, besides two other executive boards were set up for the development of horticulture sector in the country (**National Horticulture Board 2006**).

The state of Jammu and Kashmir is basically a horticulture economy in nature. Mainstream population, about 75% lives in rural areas, with most of them being reliant on the horticulture sector. The state economy depends mostly on horticulture.

Jammu and Kashmir is affected by continuous violence and insurgence since the country's independence. Animal husbandry and horticulture form the backbone of the state economy. The state has insufficient industries, poor social and economic infrastructure and limited avenues in the private sector vis-à-vis jobs all of which have resulted in residents becoming dependent on the agriculture sector for livelihood safety, income generation and employment. Since the last one decade a change

from agriculture to high value commercial horticulture farming i.e, fruits, vegetables and livestock products as well as world famous spice like saffron, has accelerated. This has resulted in more share of high value commodities in the agriculture production in almost all the districts of the state. **(Lone Raof & Sen V, 2014).**

Jammu and Kashmir, is India's northern most state with diverse environmental condition and topography, which gives it an absolute advantage in the production of various horticultural products like Black Zeera, Saffron, fresh fruit like apple and dry fruit like almond etc. The environment in J&K offers a wide scope for farming of almost all types of horticulture crops grown in different tropical zones temperate fruits like apple, plum, pear, apricot, medical and aromatic plants, mushrooms and all types of vegetables, besides world famous spices like Zeera and Saffron. **(Masoodi, 2003).**

Earlier horticulture was not given prime importance, however, it is now considered a sub-sector that is showing remarkable progress in the state. It has gained prominence due to its contribution to the State Gross Domestic Product (SGDP). Sample this: Horticulture constitutes 53% of agriculture in J&K while its contribution to the SGDP is almost about 10%.

Horticulture crops offer food and security, preserve ecological balance, generate employment and also produce raw materials for agro-based industries, thereby improving the state's economy. Economic development, urbanization and liberalization have all contributed to an increase in demand/consumption of horticulture produce. This sector also has higher rate of returns and engagement of labour a compared to traditional agriculture crops. This sector in Jammu and Kashmir has a large share in employment potential and export earnings in the state. Horticulture sector related activities presents wide source of income earning and livelihood security to the huge number of population and with the help of numerous backward and forward linkages, horticulture augments the income and economic prospectus of a huge chunk of population like fertilizer dealers and sellers, small scale industrial workers (box preparation and processing) and transporters,. This sector provides self-employment opportunities and safety for labour of informal sector like women working in categorization, grouping, packing, apple carrying and streetwalkers selling apples etc. The horticulture sector covers a wide range of crops e.g., vegetables, fruits, potato and tuber crops, medicinal and

aromatic crops, ornamental crops, spices and plantation crops **(Tajamul Islam & Shrivastava, 2017).**

Review of Literature

Fida Iqbal (2004), discussed about the importance of horticulture sector and opportunities. The researcher believes that if suitable measures are taken to develop this sector then it can become a great source of income and employment.

Malik (2013), Agriculture is the pillar of the Indian economy and Horticulture its crucial section. He advocates for proper marketing of horticulture produce like apple to make it more commercially feasible. Though there have been multidimensional efforts for increasing production of apple in Jammu and Kashmir, but its marketing has not received proper attention. In addition, government laxity, lack of research and development as well as poor infrastructure has adversely impacted the supply-chain management of apples in the Kashmir Valley.

Bhat and Choure (2014) cultivation of Apple is a highly profitable economic activity in Jammu and Kashmir. It is farm-based, labour generating and commercially attractive economic activity. The income per acre gained by cultivation of apple is much higher than any other crop. Apple production plays an important role in improving the living standard, revenue and employment generation. More than half of the state's population is involved in the farming of apple directly or indirectly. Improvement in production process is pretty high, but marketing has equal chance to develop it as a more commercially viable crop. It has been found that the agrarians face numerous difficulties like storage facilities, marketing, lack of good quality pesticides etc, which adversely affects production. It has been suggested that if these facilities are improved then apple production can be improved just like it was done in China.

Bhat (2014), As a leading crop of the Kashmir valley "Apple" can be rightfully termed as fruit industry of the state with 98% of contribution to the total fruit production. Apple industry is the mainstay of the economy of Kashmir valley. It provides employment directly and indirectly to about 60% of the people and is the main source for livelihood of many households. However, there hasn't been any noteworthy increase in this industry during the last few years due to various reasons such as large chain of commission agents from the grower to consumers in the Kashmir valley as whole and lack of cold storage.

Zulfiqar Murtaza (2015), the researcher draws attention towards the fact that the horticulture sector in the Jammu and Kashmir valley has lost its pride and glory. Kashmir was once home of high quality fruits and the industry was flourishing, helping not only generate employment but also in driving the economy. The researcher used an empirical study, which is one of the first of its kind. The research uses statistical tests (chi-square test) to show the factors that are responsible for decline in the horticulture sector. The paper also uses percentage analysis and rank analysis to come to the conclusion.

Desai Rajesheri and Sheikh Ali (2016), Horticulture occupies a very significant position in the mainly agricultural economy of western Himalaya. This sector contributes largely in strengthening the economy of Jammu and Kashmir. Horticulture is the backbone of the economy with 2.3 million people associated with the sector and 2,37,000 hectares of land in Kashmir valley under fruit cultivation. This is an essential sector of Jammu and Kashmir agriculture. Around 20% of area of the state is under horticultural crops that contribute around Rs 5000 crores to the annual income of J&K. Among the horticultural yields, apple occupies the top position with around 45 per cent of the total area being used for cultivation of this fruit. Horticulture contributes meaningfully to employment generation, economic and ecological development, export and nutritional requirement of the people of the state. Apple is the most widely grown and commercially the most important fruit crop.

Research Gap

From the above studies it is clear that agriculture is the mainstay of J&K economy with 27% contribution to the state's revenue. Almost 70% of its population is dependent on agriculture sector and about 49% of the working class is involved in it. During the last several years, diversification of J&K state's agriculture towards high value commodities, i.e. fruits, vegetables and livestock products is taking place at a faster pace and is reflected in the increased share of High Value Commodities (HVCs) in agricultural production in a number of districts. Over the years, horticulture has emerged as an important and growing sub-sector of agriculture, offering a wide range of choices to farmers for crop diversification. It also provides plenty opportunities for supporting large number of agro-industries, which generate considerable employment opportunities. There is a significant increase in area and production of horticulture crops. There are almost around 7 lakh families including of about 33 lakh people, who are directly or

indirectly working in the horticulture sector. As a result, there is also a perceptible change in the concept of horticulture development in the state. Area under fruits has increased from 85,508 hectares in 1975-76 to 2,05,543 hectares in 1995-96 and the production has increased from 3,75,068 MTs in 1975-76 to 9,68,640 MTs in 1995-96, which further increased to 2,83,084 hectares (area) and 1,50,4011 (production) MTs in 2006-07.

All through in 2016-17 the area under fruit cultivation in J&K was 3,37,677 hectares and production was 24,93,999 MTs, recording an increase of 64.28% in area and 157.47% in production during the last two decades. Apple is the most significant fruit. As per the horticulture census 1999-2000, about 55% of the area is used for apple cultivation. It is also important in terms of production and also provides the maximum level of marketable surplus. J&K is the major apple producing state accounting for more than 70% of apple production in the country. Apple production per hectare is 10.25 metric tons in J&K, which is higher than the countrywide average (7.98). The area and production of apple has increased from 47,342 hectares and 34,8011 metric tons in 1975-76 to 78,007 hectares and 7,14,834 metric tons in 1995-96 correspondingly, which additional increased to 1,61,773 hectares and 19,66,417 metric tons in 2016-17, recording an increase of 107.38 % in area and 175.08 % in production during the last two decades. Apple cultivation is done in all districts of Kashmir valley. Major districts contributing to apple production are Baramulla, Shopian, Pulwama, Budgam, Anantnag, Kulgam etc. So, the researcher tries to analyze about the effect of cropping patterns (agriculture to horticulture) and its impact on socio-economic condition of Jammu and Kashmir.

Research Methodology

The study is analytical and empirical in nature, based on both primary as well as secondary data. The primary data is collected through interview on a specially structured pre-tested questionnaire through personal interview method. For the study, sample respondents were selected from the two highest apple producing districts Baramulla and Shopian. To make the study more reliable respondents having marginal and small land holding were selected. As per the 8th Agriculture census (2005-06) of the state, the total number of operational land holders is 13,77,808 and average size of operational holding was found out to be 0.67 hectare. About 94% of the operational holders fall in the category of marginal and small farmers. About 5% of the operational holders fall in semi-medium category holding

while only 1% of the operational holders fall in the medium category holding and only 0.04% of the operational holders fall in the large category holding.

The researcher has taken total random sample of 100 respondents. Fifty respondents each were selected from Baramulla and Shopian districts of which 25 respondents had agriculture land holding while 25 did horticulture farming. The regression analysis through SPSS was used to compare respondents of agriculture with

respondent of horticulture. Both socio-economic variable was selected for data collection. The secondary source of data was collected from Directorate of Horticulture Planning and marketing Jammu and Kashmir, National Horticulture Database, Directorate of Economics and Statistics J&K sources. Further various published research papers and reports of State and Central Govt. For the authenticity of data reliability test was used as shown in Table 1.I.

Social and Economic Development of (Agriculture and Horticulture) Respondents in Jammu & Kashmir

TABLE 1.I. Reliability Test

S. No.	Variables	Cronbach's Alpha	No. of Items
1	Socio-Economic Development of Agriculture Respondents in Jammu and Kashmir	.812	6
2	Socio-Economic Development of Horticulture Respondents in Jammu and Kashmir	.778	6

Source: survey data

TABLE 1. II. Comparative study of Agriculture and Horticulture Sample farmers through Regression Analysis for Socio-Economic Development in Jammu & Kashmir

Model Summary ^b					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.213 ^a	.124	.013	3.56143	2.729

Source: Survey Data.

a. Predictors: (Constant), Agriculture Farmers

b. Dependent Variable: Horticulture Farmers

ANOVA^a

Table tests whether the overall regression model is a good fit for the data.

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.281	1	.251	2.813	.061 ^b
	Residual	1518.241	59	20.616		
	Total	1518.503	60			

Source: Survey Data

a. Dependent Variable : Horticulture Farmers

b. Predictors Constant: Agriculture Farmers

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	23.041	4.289		9.072	.000
	Agriculture Farmers	-.014	.311	.208	1.755	.091

Source: Survey Dataa. Dependent Variable: Horticulture Farmers

The reliability test was taken on data among two group of variables— agriculture and horticulture respondents. The obtained values of Cronbach's Alpha are greater than to Standard Value of Cronbach's Alpha i.e. 0.7, it means that the data is reliable and provides necessary information as we want.

The model shows agriculture farmers' independent variable and horticulture farmers' dependent variable. The model summary table indicates that agriculture farmers have 12.4% effect on horticulture farmers. Since the r square value of table is .124 which means agriculture farmers have direct but very low relationship with horticulture farmers. The R Value 0.213 shows positive

correlation but very low. The Durbin Watson value is between 1 – 3 it mean that there is no auto correlation of the errors – Data is free of auto correlation. This model has average fit as indicated by F-test value which is 2.813 insignificant at .061^b level of significance.

The result of regression from the coefficient table indicates that agriculture farmers have direct but low relationship with horticulture. It shows the socio-economic condition of horticulture is different from agriculture respondents with experience of more than six months in Jammu and Kashmir. Having beta value of 0.2088 tested through t-test having t-value of 1.755 (t standard value is 1.96) which is insignificant at 0.091 level of significance.

TABLE . 1.III

Increasing production and productivity of Horticulture crops in Jammu and Kashmir

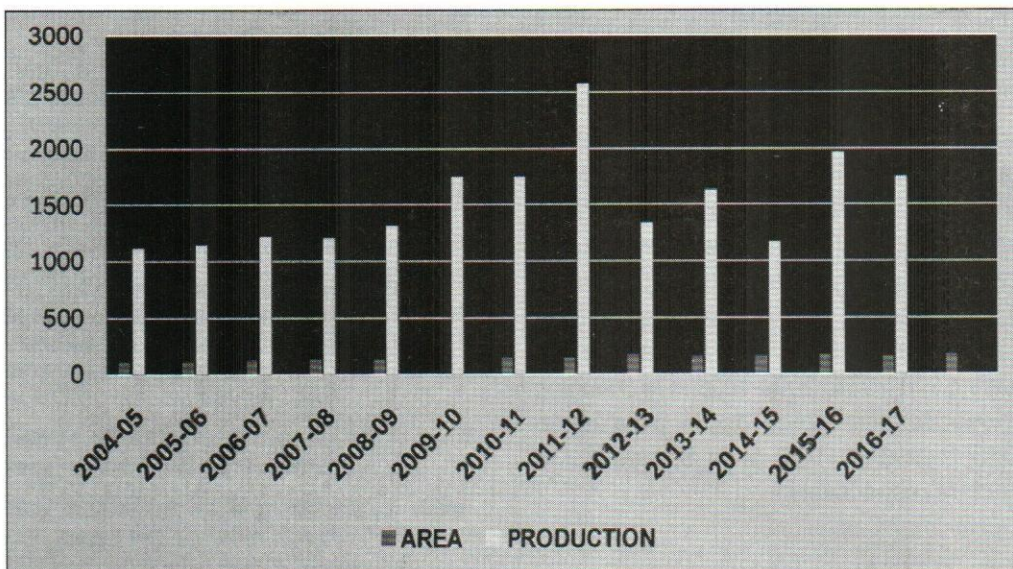
Year	Area in (000) Hactares	Production in (000) Metric Tons	Productivity MT/HCT.
2004-05	107.93	1093.33	10.12
2005-06	111.88	1151.34	10.12
2006-07	119.04	1222.18	10.26
2007-08	127.80	1211.85	10.26
2008-09	133.10	1322.81	10.01
2009-10	139.04	1367.80	9.84
2010-11	141.72	1680	11.86
2011-12	170.60	2581.18	15.13
2012-13	157.28	1348	8.58
2013-14	161.37	1633.35	10.12
2014-15	163.43	1170.30	7.16
2015- 16	161.77	1966.41	12.16
2016-17	162.97	1726.83	10.6

Source: Directorate of horticulture Jammu and Kashmir

As per the data it shows that there is lot more improvement in socio-economic status of horticulture members than the respondents working in agriculture sector. The data was collected on the variables like increase in income, employment opportunity, increase in saving and consumption, improvement in social status, improvement in personal and family health and increase in education level among child. The survey shows that socio-economic development among people working

with horticulture sector is much better compared to respondents working in agriculture sector. The area under horticulture has steadily increased from last two decades. This diversification has improved socio-economic condition of the people in J&K as mentioned in Table 1.III and chart 2.I.

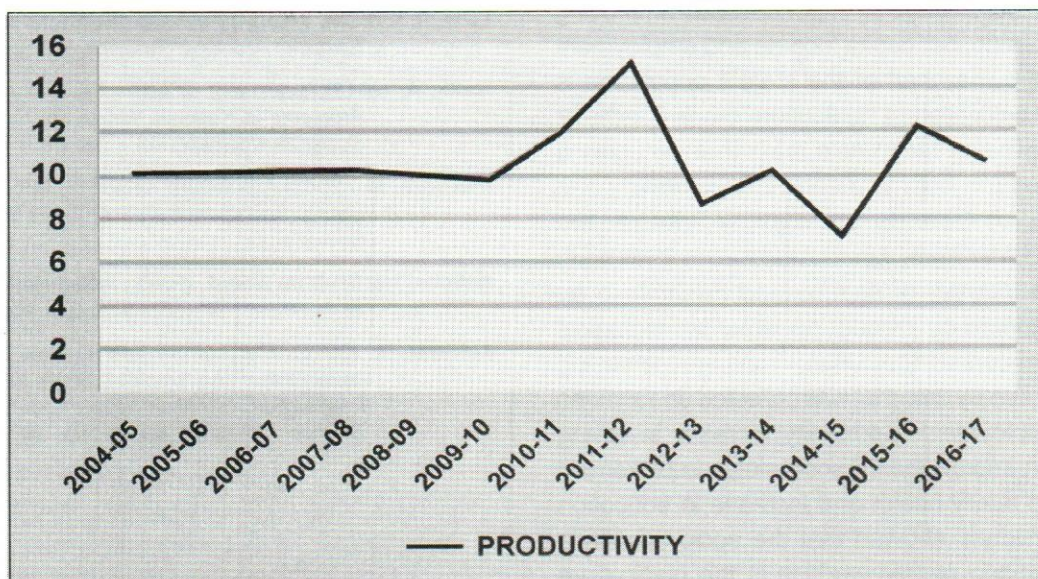
There was non-stop progress of area under apple cultivation in Jammu and Kashmir from 107.93 (000) hectares in 2004-05 to 163.43 (000) hectares in 2015-16.



Source: Directorate of horticulture Jammu and Kashmir

Chart 2.I

Representation of Area and Production of Horticulture in Jammu and Kashmir



Source: Directorate of horticulture Jammu and Kashmir

Chart 2.II

Graphical representation of Horticulture productivity in Jammu and Kashmir

The main motive for the increasing tendency was mainly relative advantage of this crop over the other commercial crops grown in high elevation region in the state. During 2004-05 the production was worth 1093.33(000) metric tons. The production marked uppermost growth during 2011-12 worth 2581.18(000) metric tons. But the production diminished during 2012-13 because due to premature rainfalls in the state. The overall production of apple for the year 2013-14 and 2014-

15 was worth 1633.35(000) MTs 1170(000) MTs , 2015-16 and 2016-17 was worth 1966.41(000) MTs, 1726.83(000) MTs respectively as there has been some damage to the Horticulture crop due to low temperature and due to unforeseen rains followed by flood in some areas of J&K. state. The overall production of apple for the year 2013-14 and 2014-15 was worth 1633.35(000) MTs 1170(000) MTs, 2015-16 and 2016-17 was worth 1966.41(000) MTs, 1726.83(000) MTs respectively as there has been some

damage to the Horticulture crop due to low temperature and due to unforeseen rains followed by flood in some areas of the J&K as mentioned in Chart 2.II.

Jammu and Kashmir has the major potential for production of superior temperate horticulture crops. It has carved a niche in production of apple, pear, cherry and dry fruits. Among temperate climate fruits, apple ranks first in terms of production. The yearly production of apple in the state is about 9.09 lakh ton at an average yield of 10.09 ton per hectare. However, the production of this crop has been changing during 2004-05 to 2009-10, due to changing climatic conditions despite which apple production increased in 2010-11 and 2011-12 at 11.86 and 15.13 metric ton per hectare respectively.

Conclusion

The study concludes that in Jammu and Kashmir importance of horticulture sector is undeniable. For overall growth of the state, horticulture sector needs to be developed more. Horticulture production plays an important role in improving the standard of living, per capita income and employment generation. More than half of the state's population is engaged in the cultivation of horticulture crops directly or indirectly. Apple being the state's main fruit occupies a predominant position both in area under plantation and production. Apart from its profitability criteria, the Department of Horticulture, Jammu and Kashmir will bring the horticulture industry of Jammu and Kashmir to an appreciable standard by introducing latest technological devices. The area under horticulture crops are increasing daily. As per the survey data that was collected on variables like income, employment opportunity, increase in saving and consumption, improvement in social status, improvement in personal and family health and increase in education level among children, showed that the socio-economic development among people working in the horticulture sector is much better compared to respondents working in the agriculture sector.

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"When women moves forward, the family moves, the village moves and the nation moves".

– Pandit Jawaharlal Nehru

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Impact of MGNREGA on Agriculture Sector in Sirmour and Solan Districts of Himachal Pradesh

BALBIR SINGH AND S.L. KAUSHAL

Agriculture is the mainstay of majority of the people in Himachal Pradesh. So in this connection Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) acts as a growth engine for agriculture as it creates assets like ponds, wells, rain water harvesting system, check dam and irrigational canals etc. in rural areas. This paper attempts to assess the impacts of MGNREGA on agriculture sector through secondary and primary data basis in Sirmour and Solan districts of Himachal Pradesh.

From the study it is concluded that after implementation of the scheme, 93% respondents stated that they have been provided irrigation facilities for farming to enhance agriculture productivity. Around 91.8% respondents admitted that due to the provision of irrigation facilities for farming, the production of commercial crops (89.5% respondents) have increased and 91.8% respondents stated that agriculture lands have been covered under cultivation.

It was also noted that after MGNREGA, 92.8% respondents admitted that women workers were working in household fields of other people. Thus, overall it is concluded that MGNREGA has become a growth engine for agriculture development and source of livelihood for the poor especially in the study area of H.P.

1. Introduction

The performance of agriculture sector is crucial because it contributes to the overall growth of the economy and provides livelihood and food security to a majority of the population. However, there are critical gaps in agriculture practices such as periods between cropping seasons during which agriculture labourers do not get any earning opportunities locally. MGNREGA has been designed to address seasonal unemployment in the agricultural economy and therefore its performance is organically linked to agriculture. This is so because MGNREGA provides livelihood security to rural households with a focus on landless/small and marginal farmers. The core focus of MGNREGA works relates to agriculture and agriculture allied activities, especially diversification into fisheries, horticulture etc.

India is a country, which is inhabited by villages and about 68% people live in rural areas (census 2011) whose mainstay of livelihood is agriculture that also depends on rain, which is uncertain. Therefore, without optimum and adequate knowledge of villages it is not only futile but ridiculous to judge and investigate the impact of various development and employment schemes of government. Many programmes have been launched from time to time in various forms since Independence but a majority of them have lost their goal for which they had been framed and implemented.

This historical background paved way for MGNREGA, which was implemented on February 2, 2006. This programme is meant to bring a change in people's lives by providing employment and thus raising their social and economic status.

There is a clear need for a detailed study on the inter-linkages between agriculture sector data on variables

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such as the gross value of agriculture and livestock per hectare of gross cropped areas with selected variables of MGNREGA's performance, before any definitive conclusion can be drawn. However, it is extremely significant to note that there are several micro-studies, which have analysed this question in detail and which report that due to the MGNREGA intervention, there are several positive impacts on agriculture such as livelihood diversification, increased cropping intensity and multi-cropping/dual cropping, which have improved the livelihood security of MGNREGA beneficiaries.

2. MGNREGA and Agriculture Sector: Review of Literature

Many studies have examined the MGNREGA's impact on agriculture and livelihoods of the small, marginal and landless households in the rural areas. Puri (2006)¹ studied MGNREGA as a revolutionary step for India's poor living in rural areas. He reported that 66% of male and 84% of female beneficiaries were engaged in the agriculture sector, which is uncertain and mostly depends on monsoon. So MGNREGA had provided irrigation facilities to farmers by creating assets like water tank and canals. Sankari and Murugan (2009)² analysed that MGNREGA contributed a lot in reducing seasonal and disguised unemployment in the agriculture sector and had empowered women in rural areas. Family income of the beneficiaries had increased, which promote the savings of a family after joining the MGNREGA.

Indian Institute of Forest Management (IIFM 2010)³ carried out a study in the four districts of Madhya Pradesh, which revealed that the increased supply of water due to multiple individual and community level activities of MGNREGA, had led to an increase in the irrigated land in all the sampled districts, which in turn had led to increased crop production, crop diversity and thereby an increase in household income. As a result of this, the cropped area under Rabi, especially wheat had increased significantly. The production of wheat per household had doubled in both districts after MGNREGA's inception. A study by Rao and Madhusudan (2013)⁴ conducted in two districts of Karnataka—Dharwad and Gulbarga—concluded that the benefits of effective utilization of labour and increased productivity were reported by the sample beneficiaries. About 55% of the sample beneficiaries reported increased labour utilization while 40% reported increased production and 32% confirmed increase in income. Improved land productivity was found in Athani and Hubli taluk areas of Karnataka State.

Agarwal, Gupta and Kumar (2012)⁵ conducted a study in Jharkhand and found that wells constructed under MGNREGA resulted in cropping intensity, crop productivity and a decrease in cultivation costs for individual beneficiaries. In a more rigorous study, Bhaskar (2015)⁶ reported that the MGNREGA assets, specifically wells, can lay the foundation stone for improvements in agricultural production, increased income and better livelihood. This is true not only for the completed wells but also the half dug, water filled wells, from which people are able to reap the benefits. MGNREGA wells are able to give about 5.3% of average rate of return on their total cost of construction. Their average rate of return on the public expenditure (government expenditure) for construction of wells is 6.34%.

3. Research Design

This research paper is an attempt to study the impact of MGNREGA on agriculture in Himachal Pradesh in general and in Sirmour and Solan districts in particular.

3.1 Methodology

The methodological aspect includes selection of study area, sample size, sources and collection of data and statistical tools for analysing the data.

In light of the above objectives, the present study has been undertaken on a sample of 400 beneficiaries taken from the different panchayats of all 11 blocks in Sirmour and Solan districts. The primary data has been carried out with the help of opinion survey conducted through a questionnaire/schedule on MGNREGA among rural people and its impact on agriculture productivity. The collected data has been analysed with the help of mean and percentage method.

4. MGNREGA in Himachal Pradesh and Selected Districts: Inception

Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), a landmark legislation was enacted in the state on February 2, 2006 in two of its most backward districts namely Sirmour and Chamba. Consecutively in its second phase of implementation (April, 2007), the scheme was introduced in Mandi and Kangra districts. By April 1, 2008 all the 12 districts of the state were covered under the Act. Himachal Pradesh is the only state in India whose 89.96% of population (Census 2011) lives in rural areas. So dependency on Agriculture and

Horticulture is eminent as it provides direct employment to about 62% of total workers of the State.⁶

Agriculture is also the premier source of State Income (GSDP). About 10.4% of the total GSDP in Himachal Pradesh comes from agriculture and allied sectors. Out of the total 55.67 lakh hectare geographical area of the state, the area of operational holdings is about 9.55 lakh hectares and is operated by 9.61 lakh farmers of the state. Distribution of land holdings according to 2010-11 Agricultural Census shows that 87.95% of the total holdings are of small and marginal. About 11.71% of holdings are owned by semi-medium and medium farmers and only 0.34% by large farmers. About 80% of the total cultivated area in the state is rain fed. Rice, wheat and

maize are important cereal crops of the state. Groundnut, soybean and sunflower in Kharif while rapeseed/mustard, toria are important oilseed crops in the Rabi season. Urad, bean, moong, rajmah in Kharif season and gram lentil in Rabi season are the important pulse crops of the state.⁷

Agriculture is primarily dependent on seasonal rains. The state is facing problem of irrigation, small size land holding and marginalised farming etc. MGNREGA acts as a growth engine for agriculture-based activities by the creation of durable assets- ponds, wells, rain water harvesting system, check dams and land development etc. in rural area. MGNREGA includes different categories of activities which have been represented by the Table 1 as follows:

TABLE 1: Analysis of Agriculture Related Works Completed Under MGNREGA in Himachal Pradesh from FY 2006-07 to 2015-16

Sr. No	Type of work	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	GR in % (2006-07 to 2015-16)
1	Water Conservation and Harvesting	475	322	3185	5426	5285	6249	7043	8998	11759	5213	997.47%
2	Renovation of traditional water bodies	239	188	1422	2906	2367	1389	984	882	609	494	106.69%
3	Micro Irrigation work	80	565	2292	3506	3240	2696	2423	3154	2427	2046	2457.5%
4	Irrigation facilities to SC/ST/IAY	17	37	374	1401	3144	3164	3675	8561	11759	13305	78164.7%
5	Land Development	77	92	1206	2880	3675	7277	6848	9612	9668	9830	12666.23%
	Total	888	1204	8479	16119	17711	20775	20973	31207	36222	30888	3378.37%

Source: http://164.100.129.6/netnrega/state_html/empstatusnewall_scst.aspx?page=S&flag=eng&state_name=HIMACHAL+PRADESH&state_code=13&fin=year=2013-2014

Large number of rural population in Himachal Pradesh is engaged in farming activities and agriculture is their main source of income. While analysing different types of works being carried out under the MGNREGA in the state, it is observed from table 1 that there was gradual increase in the number of works completed over the 10 years of implementation of the scheme.

Works related to irrigation facilities to SC/ST/IAY (78164.7%) constituted the highest growth rate since the inception of the scheme in 2006-07 to 2015-16, which was followed by other works like land development (12666.23%) and micro irrigation work (2457.5%). When MGNREGA was implemented in FY 2006-07, a total of 888 assets related to agriculture was created in the state but with the passage of time the total assets' creation rate rose to 30,888 in FY 2015-16, which resulted in 3378.37% growth rate in the state. These are the permissible works, which

were carried out in the state. It is being observed that focus of MGNREGA related works is shifting more towards agricultural sector, which is a positive sign towards the agriculture production and development in rural areas as shown in Table 2.

Success of any scheme depends upon the availability of fund. In case of MGNREGA the government of Himachal Pradesh has received a considerable amount of funds from the central government to execute the scheme successfully. This fund was invested on different activities carried out under the scheme. In case of agriculture sector as far as utilisation of the fund is concerned in FY 2008-09, a sum of Rs 5324.75 lakh was invested on different activities like water conservation and harvesting, renovation of traditional water bodies, micro irrigation works, irrigation facilities to marginalised section of the society and land development etc. This amount increased to Rs 21066.22

TABLE 2: Expenditure (in lakh) on Agriculture and Agriculture Allied Works through MGNREGA Permissible Works from FY 2008-09 to 2015-16 in Himachal Pradesh

Sr. No	Type of work	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	GR in % (2006-07 to 2015-16)
1	Water Conservation and Harvesting	2056.39	3677.05	3886.81	3756.5	8681.63	9359	5387.51	3587.15	74.43%
2	Renovation of traditional water bodies	693.23	1934.54	1412.40	1037.7	804.92	786.20	454.97	268.49	-61.26%
3	Micro Irrigation work	1718.42	2763.95	2804.52	2361.53	4198.96	5349.55	2969.95	2220.97	29.24%
4	Irrigation facilities to SC/ST/IAY	226.92	964.22	1406.07	2173.15	5161.98	8331.04	7233.15	7897.06	3380.10%
5	Land Development	629.79	1859.22	2258.90	3702.95	7207.88	9028.42	8220.76	7092.55	1026.17%%
	Total	5324.75	11198.98	11768.70	13031.83	26055.37	32854.21	24266.34	21066.22	295.62%7%

Source: http://164.100.129.6/netnrega/state_html/empstatusnewall_scst.aspx?page=S&Iflag=eng&state_name=HIMACHAL+PRADESH&state_code=13&fin=year=2013-2014

lakh in FY 2015-16 and it shows 295.62% growth rate from FY 2008-09. The highest growth rate is indicated by irrigation facilities provided to SC/ST/IAY (3380.10%) followed by land development (1026.17%), which is a remarkable performance by the H.P. government. But investment on activities like traditional water bodies seems to have decreased.

4.1 MGNREGA in Sirmour and Solan districts

The maximum rural population of Sirmour and Solan districts is dependent on agriculture, which is the main source of income. In the higher elevation of district Sirmour, maize is a predominant crop. Apart from this, ginger and turmeric are also grown in summer. Still in higher elevation, potato and wheat are also grown. Amongst vegetable cultivation peas, tomato, and potato have become very popular in the district. In the field of horticulture, apple, peach, plum, walnuts, kagzi lemon, and orange are grown on a very large scale. Livestock is a chief wealth next to agriculture to the prominent population of the district. Every house invariably keeps a few cows or buffaloes, sheep, goats, pigs and ponies.

Solan district is known as 'The Mushroom City of India' because a large quantity of mushroom is produced in the city. Solan is also known as the 'City of Red Gold' because large number of tomatoes is also produced in the district and this crop is exported across the different parts of the country through the wholesale vegetable and fruit market of the town. Agriculture is the main occupation of people and has an important place in the economy of the district.⁸

Meanwhile, the areas of Nalagarh and Kunihar in HP is suitable for the production of cercal potato, mangoes and citrus fruits. The area of Saproon is most fertile for production of vegetables like tomato, peas, hill capsicum, cauliflower, cabbage, radish, etc. Irrigation facilities like kuhals, wells, ponds, canals and tube wells provided by MGNREGA play an important role in the agriculture economy.

For the present study, Sirmour was selected as a poor district from Himachal Pradesh when MGNREGA was implemented in the country in 2006 whereas in Solan district the scheme was implemented from April 1, 2008. Implementation of MGNREGA in rural areas of both the districts proved to be an important step. Direct employment at the native place and various works like: drought proofing, land development, irrigation facilities to SC/ST/IAY beneficiaries, irrigation canals, water conservation and harvesting and renovation of traditional water bodies etc. have increased the productivity of agriculture and transformed the rural life of the district. MGNREGA has achieved many milestones since its inception in the districts some of which are represented in Table 3.

Table 3 is the summary sheet of total assets created related to agriculture development under MGNREGA in districts Sirmour and Solan. The table shows that in FY 2008-09 total 1923 agriculture related assets were created, which increased to 4649 in FY 2015-16 and shows 141.75% growth rate. In terms of total assets created, the performance of Solan is much better as it shows 218.72% growth rate as against Sirmour (79.49%). The works related to irrigation facilities provided to SC/ST/IAY beneficiaries

TABLE 3: Year Wise Analysis of Agriculture Related Works Completed Under MGNREGA in District Sirmour and Solan form FY 2008-09 to 2015-16

S. No.	Type of work	District	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	GR (2006-07 to 2015-16)
1	Water Conservation and Harvesting	Sirmour	469	881	877	852	771	1044	522	608	29.63%
		Solan	688	902	552	752	406	493	391	265	-61.48%
		Total	1157	1783	1429	1604	1177	1537	913	873	-24.54%
2	Renovation of traditional water bodies	Sirmour	168	217	110	76	54	39	19	18	-89.28%
		Solan	49	116	52	66	45	31	21	13	-73.46%
		Total	217	333	162	142	99	70	40	31	-85.71%
3	Irrigation canals	Sirmour	347	447	219	177	135	120	95	73	-78.96%
		Solan	39	179	153	137	147	148	114	92	135.89%
		Total	386	626	372	314	282	268	209	165	-57.25%
4	Irrigation facilities to SC/ST/IAY	Sirmour	14	262	34	38	110	386	262	282	1914.28%
		Solan	0	603	852	1338	2117	2989	3026	2180	---
		Total	14	865	886	1376	2227	3375	3288	2462	17485.71%
5	Land Development	Sirmour	65	330	1286	1385	701	931	656	927	1326.15%
		Solan	84	316	460	444	229	225	220	191	127.38%
		Total	149	646	1746	1829	930	1156	876	1118	650.33%
	Total	Sirmour	1063	2137	2526	2528	1771	2520	1554	1908	79.49%
		Solan	860	2116	2069	2737	2944	3886	3772	2741	218.72%
		Total	1923	4253	4595	5265	4715	6406	5326	4649	141.75%

Source: 164.100.129.6/netnrega/writereaddata/state_out/Empstatusall1310_1516_.html

and land development have shown tremendous increase in growth rate by 17485.71% and 650.33% from FY 2008-09 to FY 2015-16. The table also reveals that the overall growth rate in irrigation canals activity was negative (-57.25) whereas Solan showed positive growth rate (135.89%). So it is clear that district Solan is paying more attention in providing irrigation facilities to farmers to increase the agriculture productivity. Due to these facilities Solan is producing highest tomato crop in the state. Other works like renovation of traditional water bodies and water conservation & harvesting have decreased by -85.71% and 24.54% in proportion to the total works in FY 2015-16. After the inception of MGNREGA the people of district Sirmour are now shifting from labour works to agriculture sector. They are now indulging in production of commercial crops like tomato, garlic, onion, fransbean (French Bean) and ginger etc. The production of ginger in Shillai block of

Sirmour district is highest in Asia. So it can be concluded that assets created under MGNREGA is proving like a growth engine to agriculture sector development in both the districts.

Regarding the expenditure of MGNREGA fund towards agriculture sector and allied works, Table 4 shows that in district Sirmour and Solan Rs 682.77 lakh was invested in FY 2008-09 on different activities. This amount increased to Rs. 1968.85 lakh and shows 188.36% growth rate. Activities like irrigation facilities provided to SC/ST/IAY beneficiaries (11034.51%) and land development (1516.56%) shows highest growth rate in terms of investing maximum funds as compared to other activities where performance of district Sirmour is better than Solan. So it can be concluded that government is investing maximum amount of money on agriculture and agriculture allied works and paying more attention to develop the agriculture sector

TABLE 4: Expenditure (In Lakh) on Agriculture and Agriculture Allied Works through MGNREGA Permissible Works from FY 2008-09 to 2015-16 in District Sirmour & Solan

S. No.	Type of work	District	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	GR (2006-07 to 2015-16)
1	Water Conservation and Harvesting	Sirmour	210.99	344.87	267.55	518.88	1013.30	867.51	540.38	335.40	58.96%
		Solan	175.01	577.11	354.86	495.84	343.69	280.42	135.92	97.39	-44.35%
		Total	386.00	921.98	622.41	1014.72	1356.99	1147.93	676.30	432.79	12.10%
2	Renovation of traditional water bodies	Sirmour	33.76	65.40	26.43	30.51	52.11	25.42	11.11	6.35	-81.19%
		Solan	17.43	55.34	29.29	21.32	18.42	4.21	6.01	0.28	-98.39%
		Total	51.19	120.74	55.72	51.83	70.53	29.63	17.12	6.63	-87.04%
3	Irrigation canals	Sirmour	181.57	327.52	243.75	214.04	204.82	248.93	147.67	60.68	-66.58%
		Solan	17.28	103.00	127.20	67.21	129.47	82.48	41.96	39.86	130.67%
		Total	198.85	430.52	370.95	281.25	334.29	331.41	189.63	100.54	-49.43%
4	Irrigation facilities to SC/ST/IAY	Sirmour	7.07	116.25	509.86	196.67	225.02	264.20	217.21	202.20	2759.97%
		Solan	0	213.11	385.21	600.50	1003.60	1011.99	602.01	585.61	-----
		Total	7.07	329.36	895.07	797.17	1228.62	1276.19	819.22	787.81	11034.51%
5	Land Development	Sirmour	13.10	116.30	115.08	306.06	644.04	691.36	755.76	571.3	4261.06%
		Solan	26.56	150.20	271.86	696.82	163.96	103.82	85.77	69.82	162.87%
		Total	39.66	266.50	386.94	1002.88	808.00	795.18	841.53	641.13	1516.56%
Total	Total	Sirmour	446.49	970.34	1162.67	1266.16	2139.29	2097.42	1672.13	1175.93	163.37%
		Solan	236.28	1098.06	1168.43	1883.69	2101.71	1482.92	871.67	792.92	235.58%
		Total	682.77	2068.40	2331.10	3149.85	3798	3580.34	2543.80	1968.85	188.36%

Source: 164.100.129.6/netnrega/writereaddata/state_out/Empstatusall1310_1516_.html

and bring maximum land under cultivation. The agriculture sector is a major source of livelihood of rural people in the state and studied districts.

Table 5 exhibits the area under cultivation and production of principle crops in H.P. and selected districts. The table clearly indicates that the production of wheat, barley, pulses and rice in Sirmour have shown tremendous increase in growth rate as it has increased to 1761.73%, 1420%, 253.4% and 113.86% respectively. Similarly the production of barley, wheat and maize in Solan shows 1593.75%, 177.81% and 58.46% growth rate since the inception of MGNREGA to FY 2014-15. So it is concluded that the assets created under MGNREGA have positive

impact on agriculture productivity and it has become the growth engine for agriculture development in H.P. and selected districts.

5. MGNREGA and Agriculture Sector in Sirmour and Solan districts: An Empirical Prove

It has been argued that MGNREGA has been one of the factors that has contributed to increase in agriculture productivity and level of standards of living in the study districts. In this regard, in the present study the trend in productivity has been analyzed before and after MGNREGA implementation in Sirmour and Solan districts. An opinion survey was conducted on a sample of 400

TABLE 5: Area and Production of Principle Crops

S. No.	Crops	District	2005-06		2014-15		GR (2005-06 to 2014-15)	
			Area	Production	Area	Production	Area	Production
			('000'hect)	('000' MT)	('000'hect)	('000' MT)	('000'hect)	('000' MT)
1	Wheat	Sirmour	25.90	3.45	25.98	64.23	0.30	1761.73
		Solan	24.04	22.00	23.90	61.12	-0.58	177.81
		H.P	363.20	365.89	330.38	646.45	-9.03	76.67
2	Maize	Sirmour	23.04	56.23	17.05	53.22	-25.99	-5.35
		Solan	22.38	46.59	25.43	73.83	13.62	58.46
		H.P	297.50	543.06	292.57	677.78	-1.65	24.80
3	Rice	Sirmour	5.44	7.21	6.33	15.42	16.36	113.86
		Solan	4.94	7.86	1.86	4.87	-62.34	-38.04
		H.P	80.08	112.14	72.46	125.22	-9.51	100
4	Barley	Sirmour	2.32	0.45	2.47	6.84	6.46	1420
		Solan	1.60	0.16	1.58	2.71	-1.25	1593.75
		H.P	24.33	29.36	21.72	37.77	-10.72	28.64
5	Pulses	Sirmour	3.74	1.15	3.06	4.06	-18.18	253.04
		Solan	2.86	0.79	0.90	0.98	-68.53	24.05
		H.P	29.94	19.63	31.01	54.26	3.57	176.41
6	Total foodgrains	Sirmour	61.21	68.83	55.30	144.14	-9.65	109.41
		Solan	55.84	77.43	53.69	143.54	-3.85	85.38
		H.P	808.50	1079.15	755.21	1546.81	-6.59	43.33

Source: Statistical Abstract of Himachal Pradesh, Department of Economics and Statistical, Govt. of H.P. 2015-16.

MGNREGA beneficiaries taken from the 110 top performer Panchayats of all 11 blocks in these two districts. There are six blocks in Sirmour and five blocks in Solan District. All the blocks were selected by giving equal distribution of samples i.e. 200-200 for each district. Out of 400 beneficiaries studied, 263 were male which constitute 65.8% of the total population, whereas 137 were female workers, who constitute 34.2% of the population. It is observed from the table that majority (56.2%) of the respondents belongs to scheduled caste (SC) followed by general category 33% which depicts that MGNREGA

is performing well for the welfare of the underprivileged section of the society.

5.1 Major Livelihood of the Beneficiaries

Table 6 represents major livelihood sources of the respondents. It reveals that 72.8% beneficiaries were mostly dependent on agriculture. This occupation is followed by wage labourers. So it can be concluded that still people in rural area are dependent on agriculture. After inception of MGNREGA maximum activities related to agriculture sector is being carried out to increase the

TABLE 6: Major Livelihood Wise Distribution of Respondents (N=400)

Sr. No.	Major Livelihood	Frequencies	Percentage
1	Wage labour	24	6.0
2	Labour and agriculture	82	20.6
3	Agriculture	291	72.8
4	Others	3	0.6

TABLE 7: Land Holding Wise Distribution of Respondents (N=400)

Sr. No.	Particular	Land Holding	Frequencies	Percentage
1	Detail of Land owned	Yes	371	92.8
		No	29	7.2
		Total	400	100
2	If yes then what type	Nil	29	7.2
		Wet/ Irrigated	131	32.8
		Dry	240	60.0
		Total	400	100
3	Bigha/Area	Nil	29	7.2
		0-5	233	58.2
		6-10	95	23.8
		11-15	42	10.5
		More than 15	1	0.2
		Total	400	100

productivity. The details about livelihood source of beneficiaries are mentioned in table 6.

5.2 Land Holding Status of the beneficiaries

The study also attempted to examine the land holding status of the beneficiaries. The implication of MGNREGA is directly linked to the benefits availed by beneficiaries in terms of increase irrigated land and agriculture production. It is observed from Table 7 that 92.8% beneficiaries possess land owned but only 32.7% of the land is irrigated. So, still 60% of the beneficiaries' land is dry. MGNREGA need to be focused on providing

irrigation facilities like construction of tanks, canals and pounds so that maximum land under cultivation would be under irrigation and maximum production of crops will be possible.

5.3 MGNREGA'S Impact on Agriculture

Agriculture, horticulture and allied services constitute the mainstay of people of the state as almost 73% of population is dependent on it for their livelihood. Agriculture is primarily depended on seasonal rain, which is uncertain. So in this connection MGNREGA acts as a growth engine for agriculture by creating assets like ponds, wells, rain water

harvesting system, check dam and irrigational canals etc. in rural area. It is observed from Table 8 that before MGNREGA, only 14.2% respondents were availing irrigation facilities for agriculture.

But after implementation of the scheme, 93% respondents stated that they have been provided irrigation facilities for farming to enhance the production. About 91.8% respondents stated that due to the provision of

TABLE 8: Response Analysis on MGNREGA Impact on Agriculture and Horticulture (N=400)

S. No.	Particulars	Before (MGNREGA)				After (MGNREGA)				Percentage Change
		Yes		No		Yes		No		
		F	%	F	%	F	%	F	%	
1	Availability of irrigation facilities	57	14.2	343	85.8	372	93.0	28	7.0	554.92
2	Land development facilities	35	8.8	365	91.2	376	94.0	24	6.0	968.18
3	Increase in production of agriculture/horticulture	50	12.5	350	87.5	367	91.8	33	8.2	634.4
4	Land under cultivation increased	41	10.2	359	89.8	367	91.8	33	8.2	800
5	Are women working in your farm	23	5.8	377	94.2	371	92.8	29	7.2	1500
6	Availability of labour for farming	70	17.5	330	82.5	385	96.2	15	3.8	449.71
7	Production of commercial crops increased	27	6.8	373	93.2	358	89.5	42	10.5	1213.17
8	Irrigated Agriculture Land	4	1.0	396	99.0	87	21.8	131	78.2	2080

irrigation facilities for farming, the production of commercial crops (89.5% respondents) is increasing.

It is also observed that before MGNREGA, the gender inequalities in terms of wage rate, employment and empowerment were highly prevalent in the districts. Women were not allowed to work in other households' fields. But after MGNREGA, as there is a legal and equal right to get employment under the scheme, now 92.8% respondents stated that women workers are working in other households fields. They do not feel shy. So it can be concluded that MGNREGA has significant impact on agriculture and horticulture in the study areas.

6. Observations and Conclusion

Agriculture is found to be the mainstay of people in Himachal Pradesh with MGNREGA acting as its growth engine. Due to MGNREGA assets, the growth in production of wheat, barley, pulses and rice in Sirmour have increased tremendously to 1761.73%, 1420%, 253.4% and 113.86% respectively. Similarly the production of barley, wheat and maize in Solan shows 1593.75%, 177.81% and 58.46% growth rate since the inception of

MGNREGA to FY 2014-15. The study also found 3378% increase in overall growth rate of agriculture related assets in H.P. out of which Sirmour has 79.49% and Solan 218.72% from 2008-09 to 2015-16. After implementation of MGNREGA, 93% respondents stated that they have been provided irrigation facilities for farming to enhance the agriculture productivity. About 91.8% respondents admitted that due to the provision of irrigation facilities for farming, the production of commercial crops have increased. With the inception of MGNREGA barren land is also being cultivated said 91.8% respondents. It was also noted that after MGNREGA, as 92.8% respondents admitted that women workers are now working in other households fields.

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“Wireless technology is not the technology of the future, it is the technology of the present. If we don't bring technology to rural areas, they won't advance.”

– David Bridges

Effects of Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY) on Employment and Income in Keonjhar district of Odisha

PRAGATIKA MISHRA AND PRATAP KUMAR JENA

This paper has made an attempt to (i) analyze the performance of DDU-GKY in Keonjhar District of Odisha, and (ii) analyze the socio and economic effects of DDU-GKY programme in Keonjhar district of Odisha. It provides a better scope to understand how many rural youths are skilled and self-employed in Keonjhar district through this programme. The study finds that performance of DDU-GKY is best in Keonjhar district. Income as well as expenditure of the respondents has increased after implementation of the DDU-GKY programme. The study also finds that those who have joined in the Industrial Assistance trade, they are earning more income than those in retail and/or sales job. Though, this programme is mainly for the benefit of economically marginalized people, the government should take appropriate policy not only to stop dropout from the training but also for mobilization and publicity of this programme. Therefore, policy makers should take care of proper placement, capacity development programmes for the faculty members, salary of both trainers as well as trainees and also use of modern technology for teaching.

1. Introduction

Rural development is one of the important objectives of planning in India since Independence. Lack of adequate employment opportunities in rural areas led to migration from rural or underdeveloped areas to developed/urban areas (Kareemulla, et al., 2013). Therefore, to stop the migration from rural to urban area, the central government has implemented various rural development programmes/schemes to strengthen the rural economy through employment generation and poverty alleviation programmes. Sodhi (1987) said that during 1980-85 the Integrated Rural Development Programme (IRDP) in Sawai, Madhopur district of Rajasthan helped a large number of households to move above the poverty line. Singh (1985) said that the benefits of IRDP were going to the wrong households and not to the targeted beneficiaries. Bandyopadhyay (1986) suggested that there were certain operational deficiencies like: inadequate staff, lack of planning at the block level, improper benchmark household survey, etc. that resulted in ineffectiveness of IRDP. Ambedkar (1994) said poor people in Madhya Pradesh could not get benefit from the IRDP because the beneficiaries were selected by the gram panchayats, officials and also non-officials including MLAs and MPs. Munjal (1989) said that the process of correct identification of the beneficiaries of IRDP depends on the manner in which the survey of family incomes was conducted and how far the procedure laid down by the Ministry of Rural Development for selection was followed without interference from the vested interests. Gupta (1995) said that the IRDP is a core programme for socio-economic development of rural target groups and it would be more rewarding, if rural development programmes are carried on cooperative lines. Similarly, Sangita (1990) made a comparative

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analysis of Government and Non-Governmental Organizations (NGO) that implemented Self-Employment Programme for Rural Youth in four districts of Karnataka. She found that NGOs could act as powerful instruments for economic development and control of diverse rural groups with greater efficiency, equality and empowerment at relatively low cost.

Dutta, et al., (2012) said that poorer families tend to have more demand for work on the scheme. Till today not a single study has been carried out on the DDU-GKY programme in India. Therefore, this study is very important for evaluation of the programme as well as from the policy point of view. This study will also contribute to the literature on the programme.

Therefore, the present study makes an attempt to (i) analyze the performance of DDU-GKY in Keonjhar District of Odisha, and (ii) analyze the socio and economic effects of the DDU-GKY programme in Keonjhar district. This study provides a better scope to understand how many rural youth are skilled and self-employed especially in the district through this programme. This study will help policy makers to implement this programme in other states effectively.

The paper is organized as follows: Section 2 analyzes the performance of DDU-GKY in Odisha. Section 3 gives the data and methodology. Section 4 analyzes the performance of DDU-GKY in Odisha and in Keonjhar District of Odisha. The last section 5 gives the conclusion of the study.

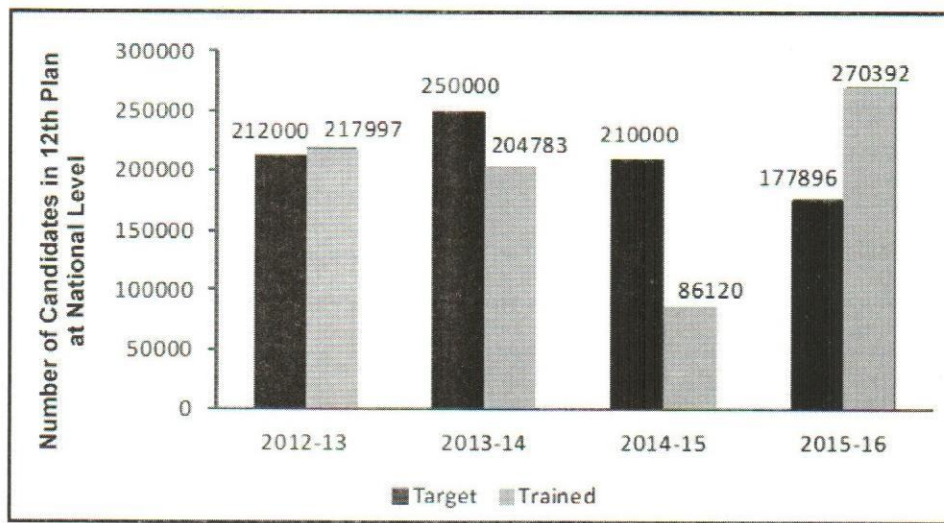
2. Performance of DDU-GKY in Odisha

In the twelfth five year plan, the government of India has launched many programmes and Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY) initiated by the Ministry of Rural Development (MoRD) is one of them.

DDU-GKY is a skill development and placement programme initiated by the Ministry of Rural Development (MoRD), Government of India in 2014. DDU-GKY has its origin in the Aajeevika Skill development programme and the special project component of the Swarnjayanti Gram Swarozgar Yojana (SGSY). The scheme focuses on catering to the occupational aspirations of rural youth and enhancing their skills for wage employment. It is a part of the mission of poverty reduction called National Rural Livelihood Mission (NRLM).

DDU-GKY follows three-tier implementation models. Tier-1, the DDU-GKY national unit at MoRD functions as the policy-making body. Tier-2, the DDU-GKY state missions provide implementing agency to implement the programme through skill and placement projects. DDU-GKY is a centrally sponsored scheme and follows the funding pattern like; (i) for all states 75% by the central government 25% of the respective state governments and (ii) Northeast states- 90% of central government and 10% of state government. DDU-GKY provides funding for education and skill training experts to start advanced, modern and well-equipped training centers. State governments have a dedicated department or State Skill Missions, who monitor and evaluate these training centers and projects. At the national level, 50% of the funds would be earmarked for SCs and STs with the proportion between SCs and STs being decided from time to time by the MoRD. A further 15% of the funds would be set apart for beneficiaries from among minority groups. States should also ensure that at least 3% of beneficiaries are from among persons with disabilities. One third of the persons covered should be women. This earmarking is only the minimum criterion. However, targets from SC and ST can be interchanged if there are no eligible beneficiaries from either of the categories and it is certified as such by the District Rural Development Agency (DRDA).

The highest number of unemployed youth are persistence in the rural India. It's a big challenge to the central and states government to provide employment to these unemployed youths. Therefore, the 'Aajeevika' a National Rural Livelihoods Mission (NRLM) was launched by the Ministry of Rural Development (MoRD), Government of India in June 2011. And later, this programme was renamed in the year 2014 as the DDU-GKY programme to give training to rural youths to get employed in different sectors. The Figure-1 shows the trends of the targets and trained candidates of the DDU-GKY programme in the twelfth plan period. It indicates that in 2012-2013 (at the time of Aajeevika), the total target of skilled youth was 2,12,000 but the achievement was 2,17,997, which was over and above the target. The government had not fulfilled its target in 2013-14 because it was so high (2,50,000 trainees) while the achievement was 2,04,783. In 2014-2015, the target was 2,10,000 youths, but the result was very disappointing as the number of trained youths decreased to 86,120. But, there was a big achievement in 2015-16, where the target was 1,77,896 youths and the achievement was 2,70,392 trained youths.



Source :DDU-GKY online data base

Figure 1. DDU-GKY 12th Plant Target and Performance at National Level

Table 1 represents the performance of DDU-GKY in all district of Odisha from 2012 (Since Aajeevika, 2011) to June 2016. It indicates that till June 2016, out of 1,79,424 total numbers of selected candidates, the reported candidates are 76,853, the training in progress candidates are 22,998, training completed candidates are 51171, drop out candidates are 854 and placed candidates are 33,284. It also shows that the number of selected candidates is highest in Mayurbhanj district where the total number of reported candidates is 5573. Here the number of candidates who already work in different fields is 2577 out of 3759 candidates who completed training. Average-wise Mayurbhanj is on the highest position in this progamme followed by Keonjhar district where the number of training completed candidates is 3388. Among them 2248 candidates are doing jobs in different fields. On the other hand the lowest performing district is Nuapada, where the training completed candidates is 503 and the number candidates who work in different fields are 338. The second lowest performing district is Boudh, where the total selected candidates is 731, among them 503 candidates completed the training and 338 candidates are doing job in their related trades.

Table 2 explains the progressive achievements of DDU-GKY in all districts of Odisha. In Keonjhar district, the percentage of selected candidates is 5.67 % and training completed is 6.62 % of the total candidates. Among them, 6.75% of candidates are placed in different field. The percentage of drop out candidates in Keonjhar district is 8.08%. This is the second highest candidates placed district followed by the Puri district (8.90%).

The performance of DDU-GKY in Mayurbhanj district is growing faster than other districts of Odisha. The percentage of selected and training completed candidates is 7.54% and 7.35% respectively. Mayurbhanj district has occupied the top position among the districts and Boudha district is at the bottom of the table due to mobilization problem and forest area, lack of communication, ignorance and apprehension among locals about the outside world. The performance of Sundargarh district is good because here the percentage of selected candidates is 6.30%, out of which the percentage of reported candidates is 6.23% and, 6.29% joined in job sector. So this data clearly shows the picture of awareness and willingness of the Sundargarh youth.

3. Data and Methodology

The study uses both primary and secondary data to analyze the study objectives. Primary data has been collected from the households survey that have already completed the DDU-GKY course and engaged in different fields from Keonjhar district. The primary data has been collected through questionnaire method with the help of personal and phone interview. The primary data has also been collected from PIAs and the selected trade (Industrial sewing machine Operator (ISMO), Retail and sales, Multi skill Technician, Industrial Assistance) from the Keonjhar district. The study has selected four study areas like; OCFIT, Gram Tarang, Centum work skill and Ikya from which data have been collected. From the OCFIT and Gram Tarang, the study has collected 30 samples, and from the Centum work skill and Ikya, the study has collected 20 samples from each area randomly and also

TABLE 1: District wise Progressive Achievement of DDU-GKY in Odisha

S. No.	District Name	Selected	Reported	Training-In Progress	Training Completed	Drop Out	Placed
1	SAMBALPUR	4801	1573	393	1153	26	603
2	SUNDARGARH	11307	4788	1378	3194	66	2092
3	KENDUJHAR	10172	5263	1742	3388	69	2248
4	MAYURBHANJ	13536	5573	1766	3759	56	2577
5	BALESHWAR	7177	2628	679	1895	9	1262
6	CUTTACK	8572	3283	915	2144	40	1042
7	DHENKANAL	5708	1906	579	1209	24	635
8	KANDHAMAL	4465	2501	366	2097	18	1681
9	BALANGIR	8314	2520	951	1523	40	935
10	KALAHANDI	7636	4133	1166	2755	28	1741
11	KORAPUT	4407	1489	193	1120	15	772
12	GANJAM	13402	5504	1464	3831	49	2731
13	PURI	7688	4051	1077	2783	76	1685
14	BARGARH	6768	2257	934	1273	24	859
15	JHARSUGUDA	1949	753	176	495	3	396
16	DEOGARH	1783	765	168	572	5	394
17	BHADRAK	5043	3023	1049	1948	26	1320
18	KENDRAPARA	5158	2124	720	1367	44	719
19	JAGATSINGHAPUR	5270	2514	742	1644	23	1055
20	JAJAPUR	7775	4196	1714	2241	41	1503
21	ANUGUL	5863	1039	445	548	35	349
22	NAYAGARH	3992	1597	686	878	30	565
23	KHORDHA	6649	3398	961	2262	50	1289
24	GAJAPATI	3962	1977	439	1487	24	846
25	BOUDH	1397	731	223	503	4	338
26	SONEPUR	3228	1458	594	843	12	446
27	NUAPADA	2846	538	110	409	3	255
28	RAYAGADA	4790	3307	783	2492	9	1820
29	NABARANGAPUR	3391	932	238	675	3	537
30	MALKANGIRI	2375	1032	347	683	2	589
	TOTAL	179424	76853	22998	51171	854	33284

Source: ORMAS online database

TABLE 2: District wise Progressive Achievement of DDU-GKY percentage in Odisha (2012-16)

S. No.	District Name	Selected	Reported	Training-In Progress	Training Completed	Drop Out	Placed
1	SAMBALPUR	2.68	2.05	1.71	2.25	3.04	1.81
2	SUNDARGARH	6.3	6.23	5.99	6.24	7.73	6.29
3	KENDUJHAR	5.67	6.85	7.57	6.62	8.08	6.75
4	MAYURBHANJ	7.54	7.25	7.68	7.35	6.56	7.74
5	BALESHWAR	4	3.42	2.95	3.7	1.05	3.79
6	CUTTACK	4.78	4.27	3.98	4.19	4.68	3.13
7	DHENKANAL	3.18	2.48	2.52	2.36	2.81	1.91
8	KANDHAMAL	2.49	3.25	1.59	4.1	2.11	5.05
9	BALANGIR	4.63	3.28	4.14	2.98	4.68	2.81
10	KALAHANDI	4.26	5.38	5.07	5.38	3.28	5.23
11	KORAPUT	2.46	1.94	0.84	2.19	1.76	2.32
12	GANJAM	7.47	7.16	6.37	7.49	5.74	8.21
13	PURI	4.28	5.27	4.68	5.44	8.9	5.06
14	BARGARH	3.77	2.94	4.06	2.49	2.81	2.58
15	JHARSUGUDA	1.09	0.98	0.77	0.97	0.35	1.19
16	DEOGARH	0.99	1	0.73	1.12	0.59	1.18
17	BHADRAK	2.81	3.93	4.56	3.81	3.04	3.97
18	KENDRAPARA	2.87	2.76	3.13	2.67	5.15	2.16
19	JAGATSINGHAPUR	2.94	3.27	3.23	3.21	2.69	3.17
20	JAJAPUR	4.33	5.46	7.45	4.38	4.8	4.52
21	ANUGUL	3.27	1.35	1.93	1.07	4.1	1.05
22	NAYAGARH	2.22	2.08	2.98	1.72	3.51	1.7
23	KHORDHA	3.71	4.42	4.18	4.42	5.85	3.87
24	GAJAPATI	2.21	2.57	1.91	2.91	2.81	2.54
25	BOUDH	0.78	0.95	0.97	0.98	0.47	1.02
26	SONEPUR	1.8	1.9	2.58	1.65	1.41	1.34
27	NUAPADA	1.59	0.7	0.48	0.8	0.35	0.77
28	RAYAGADA	2.67	4.3	3.4	4.87	1.05	5.47
29	NABARANGAPUR	1.89	1.21	1.03	1.32	0.35	1.61
30	MALKANGIRI	1.32	1.34	1.51	1.33	0.23	1.77
	TOTAL	100	100	100	100	100	100

Source: Office of ORMAS

availability of the respondent. The secondary data has been collected from the published and unpublished documents of the Ministry of Rural Development, Government of India, Orissa Rural Development and Marketing (ORMAS), Government of Odisha, District Rural Development Agency (DRDA) Office, Keonjhar, DDU-GKY, Government of India, All public implementing Agencies (OCFIT, Gramtarang, Centum work skill, Ikyu, Asmas) of Keonjhar District Under DDU-GKY programme. The study has calculated the percentage and descriptive statistics to analyze the results.

4. Analysis of the Results

Keonjhar district is located in the northern part of Odisha where majority of the people are Scheduled Castes (SCs) and Scheduled Tribes (STs). In the district, the STs constitute 44.5% of the total population whereas the Scheduled Castes constitute 11.62%. The literacy rate of the district is 69%.

The performance of DDU-GKY in different districts of Odisha from 2012 to June 2016 is reported in the appendix Table-3. It indicates that out of total 1,79,424 number of selected candidates, the reported candidates are 76,853.

The training in progress and completed candidates are 22,998 and 51,171 respectively. The total number of placed candidates is 33,284 and the number of dropout candidates is 854. The number of selected candidates is highest in Mayurbhanj district followed by Keonjhar district. On the other hand, the lowest performing district is Nuapada. The highest number of candidates (69 numbers) is dropout from Puri district followed by Keonjhar district (69 candidates).

Table 3 shows the block-wise progressive achievement of DDU-GKY in Keonjhar district. It indicates that the number of selected candidates is highest in the Keonjhar Sadar block (1072) followed by Harichandanpur (1063), Ghatgaon (949), Patana (930) respectively. The Keonjhar Sadar block has the highest number (550) of reported candidates, whereas the Joda block has the lowest number of selected candidates as this block is very nearer to Barbil, where many industries are located. The number of training completed candidates (369) is highest in the Ghatgaon block and 235 are already engaged. In Patana, around 41,972 are rural youths and mainly they spend their life farming but gradually they are motivated about this skill development programme.

TABLE 3: Block Wise Progressive Achievements of DDU-GKY in Keonjhar District(2012-2016)

S. No.	Block Name	Selected	Reported	Training-In Progress	Training Completed	Drop Out	Placed
1	Patana	930	476	155	313	7	230
2	Saharapada	702	437	146	287	1	189
3	Joda	528	241	91	145	3	86
4	Ghasipura	860	533	222	295	11	203
5	Telkoi	812	320	93	222	6	55
6	Kendujhar sadar	1072	550	203	325	11	211
7	Jhumpura	706	430	158	263	5	197
8	Ghatgaon	949	538	151	369	10	235
9	Anandapur	489	217	71	132	3	73
10	Champua	849	438	113	320	7	218
11	Harichandanpur	1063	427	130	285	1	199
12	Hatadihi	577	355	113	236	1	141
13	Bansapal	635	301	96	196	3	111
	TOTAL	10172	5263	1742	3388	69	2248

Source: Office of DRDA, Keonjhar

Champua block is on the third position for placed candidates (218). There are some blocks like Anandpur and Joda whose performance is very bad due some reasons like: ignorance, mobilization problem, etc.

Table 4 shows the total achievements of PIAs in Keonjhar district. It indicates that the total number of candidates enrolled in PIAs is 2615, out of which 2381

candidates are already completed their training and 2081 candidates are placed in all over India. Among the PIAs, the highest number of candidates are enrolled, trained and placed from the Gram Tarang followed by the OCFIT and IKYA. The lowest number of candidates are enrolled, trained and placed from the Centum Work Skills India followed by ASMACS.

TABLE 4: Achievements of PIAs in Keonjhar District

Name of PIA	No of candidates enrolled	No of trained	No of placed
OCFIT	590	586	527
Gram Tarang	795	681	604
Centum Work Skills India	205	187	131
Sum Drishti Education Society	300	277	241
IKYA	465	410	360
Asmacs	260	240	218
TOTAL	2615	2381	2081

Source: Office of all PIAs, Keonjhar

The primary data has been collected gender-wise from the major four PIAs in the study area and reported in Table 5. It indicates that total 100 trainees are interviewed from the OCFIT, Gram Tarang, Centum Work Skill India and Ikya. Out of 30 trainees from OCFIT, 13 (43%) are male and 17 (57%) are female. In Gram

Tarang, from total 30 trainees, 15 (50%) are male and 15 (50%) are female. Similarly, in Centum Work Skill India, out of 20 trainees, 12 (60%) are male and 8 (40%) are female. In Ikya, out of 20 trainees, 11 (55%) are male and 9 (45%) are female trainees, who have participated in the training programme.

TABLE 5: Gender schedule of Study Area

Area Name (PIAs)	Male	Female	Total
Area 1(OCFIT)	13	17	30
Area 2 (Gram Tarang)	15	15	30
Area 3 (Centum Work skill India)	12	8	20
Area 4 (Ikya)	11	9	20

Source: Primary data

Though, age is an important aspect of this programme and the minimum age for training is 18-35 years, but the age group between 18-32 can only do job. Table 6 indicates the age group of the selected candidates of the four PIAs in the study area. The study has categorized the age of candidates into four groups such as, 18-20, 20-25, 25-30 and 30-35 respectively. It shows that in the OCFIT,

five trainees are in the age group of 18-20, eight trainees are in the age group of 20-25, fifteen are in the age group of 25-30 and only two trainees are in the age group of 30-35. Similarly, in the Gram Tarang, the number of trainees—seven, nine, eleven and three fall in the selected age group. In the Centum Work Skill India, the number of trainees—four, seven, six and three fall in the above mentioned age

TABLE 6: Age Group of the Study Area

Name of PIAs	18-20	20-25	25-30	30-35	Total
OCFIT	5	8	15	2	30
Gram Tarang	7	9	11	3	30
Centum Work Skill India	4	7	6	3	20
Ikya	4	9	5	2	20

Source: Primary Survey

group. Whereas in the Ikya, the number of trainees—four, nine, five and two fall in the selected age group. It is observed that among the selected four PIAs, in the Gram Tarang, the highest number of trainees (7, 9 and 11 and 3 numbers)

fall in the four selected age group. The highest number of trainees fall in the age group of 20-25 and 25-30 years as these age groups are the right time for employment.

TABLE 7: Marital Status of Study Area

Area Name (PIAs)	Married	Unmarried	Widow	Divorce	Total
Area 1 (OCFIT)	12	13	3	2	30
Area 2 (Gram Tarang)	15	8	4	3	30
Area 3 (Centum Works skill India)	8	9	3	0	20
Area 4 (Ikya)	10	8	0	2	20

Source: Primary Survey

Table 7 indicates the marital status of the trainees in the selected four PIAs in the study area. It shows that out of total 100 trainees—45 are married, 38 unmarried, 10 widows and 7 divorced. The highest numbers of trainees are married in respect to PIAs. Among the PIAs, more numbers of trainees are married (15 numbers) in Gram Tarang, then followed by OCFIT, whereas, the least number

of trainees are married in the Centum Work Skill India. Similarly, more people are unmarried (13 numbers) in the OCFIT PIAs, then followed by the Ikya (9 numbers). It is observed that the highest number of widows (four) trainees fall in Gram Tarang followed by OCFIT and CWSI. Similarly, the highest number of divorcees is from Gram Tarang followed by the OCFIT and Ikya.

TABLE 8: Educational Status of Study Area

Area Name (PIAs)	primary	primary upper	higher	Above	Total
Area 1 (OCFIT)	11	6	9	4	30
Area 2 (Gram Tarang)	10	10	6	4	30
Area 3 (Centum Works skill India)	0	5	12	3	20
Area 4 (Ikya)	0	15	5	0	20

Source: Primary Survey

Education is the most important factor for DDU-GKY programme but the minimum qualification is primary education and the highest qualification is under graduate

because a large number of rural youths are under graduates and could not excel in the service sector. Due to various reasons rural youths largely drop out from their study

(reference). The study finds that poverty is the main reason for drop outs. The educational status of the selected trainees in the study area is shown in the Table 8. It indicates that out of 100 trainees, maximum have an upper primary education qualification followed by high school education (32). Twenty one trainees have primary

education whereas only 11 trainees are above high school education level. Among the PIAs, in the Ikya PIA more trainees are upper primary education qualified (15 trainees), whereas, more trainees are high school qualified (12 trainees) in the CWSI. Very less numbers of candidates have above high school qualification.

TABLE 9: Health status of Study Area

Area Name (PIAs)	Disease	Disease free	Total
Area 1 (OCFIT)	5	25	30
Area 2 (Gram Tarang)	6	24	30
Area 3 (Centum Works skill India)	2	18	20
Area 4 (Ikya)	5	15	20

Source: Primary Survey

Table 9 shows the health status of the trainees in the study area. It indicates that the majorities of trainees (82) health condition is good. This is because these trainees are very young and active. Very less number of trainees (only 18) suffer from minor disease, which can be cured with short-term medication. The trainees from CWSI PIA are more healthier and disease free than other PIAs, where, out of 20 trainees, 18 trainees are disease free. Comparatively the trainees from Gram Tarang PIA suffer more disease than other PIAs.

Table 10 shows the average income growth in the pre and post-DDU-GKY programme. It indicates that the trainees are mainly engaged in ISMO, retail and sales, multi skill technician and industrial assistance. Though,

the trainees were unskilled before the programme, therefore, they were getting less salary. It is seen that the average income generated by the trainees was less than Rs 5,500 per month. Those who were engaged as industrial assistant were getting Rs 5,655 per month and the lowest salary was received by the multi-skilled technician (i.e. Rs. 5005 per month).

It is evident that the DDU-GKY has had a favourable impact on generation of income in the study area. The average income of all respondents has increased to around Rs. 15,000 per month. Those trainees are engaged as industrial assistance and now they are receiving Rs. 17,575 per month. Similarly, the average monthly income of Rs. 14,193, 13,983 and 14,080 are received by the trainees

TABLE 10: Growth of Average Income during Pre and Post DDU-GKY Period

Economic Activity	Number of Beneficiaries engaged in Programme	Average Income Generated in Rs. During Pre DDU-GKY Programme	Average Income Generated in Rs. During Post DDU-GKY Programme	Increase in Income	Percentage Increase in Income
ISMO	30	5083	14193.33	9110.3	179.23
Retail and Sales	30	5180	13983	8803	169.94
Multi skill Technician	20	5005	14080	9075	181.32
Industrial Assistance	20	5655	17575	11920	210.79
TOTAL	100	20923	59831.33	38908	185.96

Source: Primary Survey

TABLE 11: Growth of Expenditure during Pre and Post DDU-GKY periods

Name of the PIAS	OCFIT		Gram Tarang		Centum Work skill		Lkya	
	Before Implementation	After Implementation	Before Implementation	After Implementation	Before Implementation	After Implementation	Before Implementation	After Implementation
Expenditure on education	324	937	336.3	936.7	269	1115	283	1290
Expenditure on health	811	1987	818.3	2100	779.5	1880	809.5	2260
Expenditure on housing	1627	3064	1616	2514	1615.45	2615.9	1660.45	3115.9
Expenditure on Consumption	1437	2612.7	1426	2511	1469	2931	1519	3031

Source: Primary Survey

who are engaged in ISMO, retail and sales, and multi-skilled technician respectively. It is found that the overall growth of income is 185.96% and it is different from activity to activity. In retail and sales, the generation of income is found to be lowest. An activity like Industrial Assistance is found to have generated higher income than the overall increase in income.

Table 11 shows the growth of expenditure during pre and post-DDU-GKY programme in the study area. It indicates that, before the implementation of this programme, the expenditure on education by the trainees of OCFIT was Rs. 324 per month but it increased to Rs. 937 in after implementation of DDU-GKY programme. Similarly, other expenditures also increased post DDU-GKY programme. For example; expenditure on health and housing and consumption pattern have increased to Rs. 1987, Rs. 3064 and Rs. 2612.7 per month respectively. Similarly, there is also a change in the expenditure pattern in other PIAs. In the Gram Tarang, the average health expenditure has gone up to Rs. 2,100 per month. In centum work skill and Lkya, the average expenditure on housing has increased to Rs. 1,660.45 and Rs. 3,115.9 per month respectively. This indirectly shows that the expenditure pattern has changed in the post DDU-GKY period and the rural youths have benefitted from it.

5. Conclusion

The study finds that the performance of DDU-GKY is best in the Keonjhar district and it is in the second position after Mayurbhanj district. The study finds that out of 1,79,424 total numbers of selected candidates, the reported candidates are 76,853. The training in progress candidates is 22,998, training completed candidates are 51,171, drop out candidates 854 and

placed candidates is 33,284 at the end of June 2016. The Mayurbhanj district has the highest number of trainees (7.57 %) as well as the highest number of job holders. Training completed candidates are highest in Ghatgaon block (10.89%) and lowest in Saharapada block (6.9%). On placement basis, the highest achievement block is Patana (10.23%) and the lowest is Anandapur (3.25%). The study finds that the total average income as well as expenditure of the respondents have been increased in the post DDU-GKY programme. The study also finds that those who joined in the Industrial Assistance trade, they are earning more income than retail and sales. Though, this programme is mainly for the benefit of economically marginalized people, the government should take appropriate policy not only to stop dropout from training but also for the mobilization and publicity of this programme. Therefore, the policy makers should take care of proper placement, capacity development programmes for the faculty members, salary of both trainers as well as the trainees and also for use of modern technology for teaching.

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Agriculture not only gives riches to a nation, but the only riches she can call her own.

– Samuel Johnson

MGNREGS and Rural Employment: A Study of the Changes in the lives of the Beneficiaries in North 24 Parganas

ARUNDHATI BHATTACHARYYA

Rural unemployment and poverty are causing distress to many rural people. Mahatma Gandhi National Rural Employment Guarantee Act, 2005 (MGNREGA) has been an avenue to alleviate poverty and mitigate the unemployment problem. It is the largest employment programme in the world. The Government of India through the scheme is trying to improve the social safety net. The paper tries to understand the features, issues that have been attempted to be sorted out and the challenges that are still there in the execution of Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS). It has also tried to gauge responses about the economic advancement due to MGNREGS work and the responses about engagement of rural people in any other form of work other than MGNREGS work. The paper has been part of the experience, which was obtained while conducting a project funded by the Indian Council of Social Science Research by the contributor in the district of 24 Parganas (North).

Introduction

The United Nations aims at ending poverty, which is also addressed in its report, Road to Dignity by 2030. Poverty is a curse for many and eradication of this curse can create better lives for many around the world. Poverty is multidimensional. Sustainable Development Goals 1 and 2 aim at no poverty and zero hunger. Sustainable Development Goals targets towards a fairer inclusive world by 2030. Sustainable Development Goal 8 aims to “promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all”. In that world no one should be left behind. Goal 8 aims at economic growth at the rate of at least 7% by 2030 in the least developed nations. It also aims at full and productive employment for all. Poverty eradication is possible through stable and well-paid jobs. Rio+20 were concerned with eradication of poverty and its linkage with availability decent work.

India is a country of diversity. India is home to around one-third of the rural poor. So, since independence, India had several Five Year Plans in order to go ahead of a vision of an inclusive growth. Unemployment and underemployment are major problems, which are creating several socio-economic complexities in the lives of the people. Underemployment pushes more people towards agriculture who become a burden on it. Subsistence agriculture has been the source of remaining alive in many poor rural households. Agriculture is under-performing. In many areas, there are agrarian crisis. Farmers are committing suicides in order to free themselves and their families from the clutches of moneylenders. Women are crucial resource in agriculture and in the rural economy. But, they are underperforming due to several challenges. Representation of women varies. But, most of them are engaged in seasonal and part-time work. (Doss, 2011).

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This paper tries to understand the features, issues that have been attempted to be sorted out and the challenges that are still there in the execution of Mahatma Gandhi National Rural Employment Guarantee Scheme. It has also tried to enquire regarding the responses about the economic advancement due to MGNREGS work and the responses about the engagement of the rural people in any other form of work other than MGNREGS work.

Need for Mahatma Gandhi National Rural Employment Guarantee Act

India's population is 1,324,171,354. It is predicted that India will be the most populous country by 2024. According to the UN report, India has the world's largest youth population. It is 28% of the Indian population. (India has world's largest youth population: UN Report, 2014) Unemployment is to increase marginally in 2017-18, according to another UN report. It has increased from 17.7 million to 18 million in 2018. (Unemployment in India to increase marginally in 2017-18: UN report, 2017) In this scenario, the deprivations which the youth face in the day-to-day lives may push them towards marginalization. The condition in rural areas is worse where opportunities are lacking. Accessibility to facilities is far difficult in rural areas. People are also less aware of the prevailing conditions and facilities that the system is providing. Inclusive growth should take into concern the needs of the vulnerable in the society. Without that, an unfair society will be created. Lack of decent work conditions may lead to the erosion of the democratic dynamics in the society. Due to poverty and unemployment, as the people are living in stressful conditions, they may opt for joining extremist or terrorist groups. So, a welfare state like India is trying its best to support the marginalised through programmes funded by the Centre and the states, in order to have a balanced development and provide platform to Indians so that they remain in the mainstream. The Government of India has been trying to bring an environment of decent work conditions through several schemes. Some of them are National Skill Development Mission, Deendayal Upadhyay Antodaya Yojana, Mahatma Gandhi National Rural Employment Guarantee Scheme etc.

Mahatma Gandhi National Rural Employment Guarantee Act, 2005

The largest social safety net programmes are in China, India, South Africa and Ethiopia. Employment programmes are also found in other countries, like, Argentina,

Bangladesh, China, South Africa etc. (Prasad, 2017) The World Bank Group and the International Labour Organization have a vision of social protection of all. The basic idea provided by a joint statement by these two organizations, is that anyone who needs social protection, will be able access it at his/her will. There will not be any hurdles for accessing. India had income generation schemes, like, Jawahar Rozgar Yojana (JRY), Swarnajayanti Gram Swarozgar Yojana (SGSY), Swarnajayanti Gram Rozgar Yojana (SGRY), which tried to boost the well-being of the rural people. But, they failed to satisfy the needs of the unemployed in the rural areas. (Lijeesh, P. & Ann Maria John, 2018) The Employment Guarantee Scheme (EGS) of Maharashtra has helped to provide a path for building up the MGNREGS. EGS was successful in Maharashtra. But, to make it successful for the whole country was a difficult task. The MGNREGS work had been undertaken in a massive scale. It has been a success with some loopholes, here and there.

National Rural Employment Guarantee Act, 2005 (NREGS) has brought in great changes in rural development and rural employment. It came into force in February 2006. It was renamed as Mahatma Gandhi National Rural Employment Guarantee Act on 2 October, 2009. (Prasad, 2017) It has been a symbol of execution of the welfare State which is furthering social justice. It is the largest employment programme in the world. (MGNREGA world's largest public work programme: World Bank, 2015) has been referred as the largest social security scheme. It is demand-driven and right-based employment programme. There is legal guarantee for wage employment. In order to apply for the work, registration with the Gram Panchayat is necessary. Gram Panchayat will issue a Job Card after verification. Job cards with photos are issued totally without any cost. Job Cards should be in the custody of the family. If work is not given within 15 days, lack of employment allowance is provided. Households can sue the authority if they do not get work or unemployment allowance. (Muthukumar, 2017) Unemployment allowance will be provided by Section 7(2) of the Act. Wages has to be given according to Minimum Wages Act, 1948. Disbursement of income needs to be done on a weekly basis. It is disbursed through bank or post offices. The states have to bear the cost of the unemployment programme. There are legal provisions for allowances and compensations. Through MGNREGS, there is devolution of financial resources to Gram Panchayats. It is a bottom-up approach as the Gram

Sabha has the right to accept, amend or reject the works that may have inserted by the Intermediate Panchayats and the District Panchayat before the administrative approval has been given. Social audit is an instrument which has increased the level of accountability that has been introduced in the scheme. An amalgamation of natural resource management and livelihood generation has been initiated into the scheme.

The goals of MGNREGS include-

- i) Social protection for the most vulnerable people living in rural India by providing employment opportunities
- ii) Livelihood security for the poor through creation of durable assets, improved water security, soil conservation and higher land productivity
- iii) Drought-proofing and flood management in rural India
- iv) Empowerment of the socially disadvantaged, especially women, Scheduled Castes (SCs) and Schedules Tribes (STs), through the processes of a rights-based legislation
- v) Strengthening decentralised, participatory planning through convergence of various anti-poverty and livelihoods initiatives
- vi) Deepening democracy at the grass-roots by strengthening Panchayati Raj Institutions
- vii) Effecting greater transparency and accountability in governance¹.

MGNREGS is for supplementary wage employment for the rural poor. It aims at tiding over rural unemployment, poverty and migration from the rural to the urban areas. The Act of 2005 provided a legal guarantee of at least 100 days of rural employment. It is in the form of unskilled manual labour which will be voluntarily contributed by at least one in each household in every rural poor household. It will lead to productive asset creation through public works programme. The right to work has been given through this Act. It is a form of livelihood security. A Central Employment Guarantee Council and State Employment Guarantee Councils in the state will work for the review and monitoring the execution of the revolutionary law, which was enacted in 2005. Payment of the unemployment allowance is another feature that has made the scheme unique. It is the responsibility of the state government to

pay the unemployment allowance within 15 days. The norms of transparency and accountability have been in-built into the scheme. National and State Employment Guarantee Funds have been set up. The aims include social inclusion, where women have been brought in the public employment programme en masse, strengthening of the local self government, in the form of Panchayati Raj Institutions and also strengthening the livelihood resource base of the poor.

The aim of MGNREGS of the Ministry of Rural Development has always been to strengthen the livelihood base of the poor. This will be possible through creation of productive assets. Water conservation, water management, afforestation, irrigation works, land development works, community assets an individual assets for the vulnerable sections, self help groups inclusion, etc are some of the positive aspects of the scheme. Social audit has been prescribed at least once in every six months. This would enable accountability. For this purpose, local youth have to be trained to form social auditor teams. Twenty five per cent of the youth have to be recruited from the vulnerable sections, like the Schedule Caste and Schedule Tribe. A proper grievance redressal mechanism needs to be effective. Once a week needs to be fixed when officials will be present for receiving/hearing grievances. For every district, the Act mentions that Ombudsperson will conduct an enquiry. MGNREGA has been using ICT tools, space technology, improving of livelihood resource base and convergent programme implementation. Electronic fund management system, Aadhar seeding, geo tagging of assets, strengthening of social audit system, etc are all been brought in the scheme. (Note on MGNREGA, 2017)

MGNREGA Operational Guidelines, 2013 (4th edition) provided the eligibility criteria for selecting the households on whose lands or homesteads the activities enhancing livelihoods security can be undertaken. In order to identify most vulnerable households in a habitation, Habitation Level MGNREGA Management Committees (HLMMC) will identify the households based on the criteria given below:

- Where main breadwinner is chronically ill,
- Main source of livelihood is wage labour (local or outmigration),

¹ Mahatma Gandhi National Rural Employment Guarantee Act, 2005, MGNREGA Operational Guidelines 2013, 4th edition, Ministry of Rural Development, Government of India, New Delhi pp3-4.

- Households that have a person with disability,
- Households where there is no food security,
- Houses that don't have shelter or only have a Kaccha ghar, and
- Households headed by a woman or a senior citizen or one that only has minor(s).

MGNREGA, 2005 has been amended in 2017. Districts have been notified in three phases. In the year 2018-19, there are around 9.5 crore active workers engaged with MGNREGS thus benefitting 1.06 crore households. The top five states are Chattisgarh, Uttar Pradesh, Rajasthan, Madhya Pradesh and West Bengal. In the individual category works, the top 5 states are West Bengal, Madhya Pradesh, Odisha, Uttar Pradesh and Bihar. (The Mahatma Gandhi National Rural Employment Guarantee Act 2005-Individual Category Works, 2018) Now, in MGNREGS, there are 109188000 active workers throughout the country. The demand for work may be influenced by factors like rainfall pattern, availability of alternative employment opportunities other than MGNREGA and the existing market rate of unskilled labour. (Top 10 States/UTs in terms of Percentage of Persons provided employment towards Active workers under MGNREGA during 2016-17, 2017) Initiatives have been undertaken by the Government of India in order to increase the positive impact of the scheme. MGNREGS has received the highest ever allocation, since its inception. Initiatives have also been taken to geo-tag all the MGNREGA assets, which can increase transparency. The aim is to prevent leakages. (Rural Employment Scheme gets highest-ever Funding, 2017)

The Study

The study was undertaken in North 24 Parganas district of the state of West Bengal. North 24 Parganas as an administrative unit had its origin in 1986 after 24 Parganas district was bifurcated in two separate units. The district was physically formed on March 1, 1986. It is one of the highly populated districts where population density is also high. North 24 Parganas district is located very close to Kolkata, the capital of the state of West Bengal. It shares international boundary with Bangladesh.

North 24 Parganas district had been notified in Phase II of implementation of MGNREGA by the Government of India. MGNREGS has been introduced on May 2, 2007 in the district. The district has received National Award of

Excellence in MGNREGA in the financial year 2008-09. It has also received State Award of Excellence in 2009-10. It is the first district in the state of West Bengal to have achieved close to 100% MIS in the financial year 2009-10. It has implemented e-muster roll system in 100% Gram Panchayats during financial year 2012-13. As on 30 November, 2015, the district has provided employment to 1.05 lakhs people. Out of the total of 31.15 lakhs person days, there are 16.08 lakhs women.

The district of North 24 Parganas has 5 sub-divisions and 27 municipalities. The five subdivisions are Barasat, Barrackpur, Basirhat, Bongaon and Bidhannagar. There are 22 blocks in the district of North 24 Parganas. They are Amdanga, Baduria, Bagdah, Bongaon, Barasat I & II, Barrackpore I & II, Basirhat I & II, Deganga, Gaighata, Habra I & II, Haroa, Hasnabad, Hingalganj, Minakha, Rajarhat, Sandeshkhali I & II and Swarupnagar. Primary data in the survey was conducted in the selected villages of the 10 blocks in the district. The universe of the study consists respondents from Kashimpur, Paschim Khilkapur Gram Panchayats of Barasat I block, Rajarhat Bishnupur I, Mahisbatan II Gram Panchayats of Rajarhat block, Jadurhati Dakshin, Jadurhati Uttar in Baduria Block, Kumarjhol, Dhaturdaha Gram Panchayats of Minakha block, Gobindakati, Kalitala Gram Panchayats of Hingalganj block, Nazhat I, Nazhat II Gram Panchayats of Sandeshkhali I block, Koniara I and Koniara II Gram Panchayats of Bagdah block, Chandpara and Dharampur I Gram Panchayats of Gaighata block, Machhlandapur I and II Gram panchayats of Habra I block and Dharampukuria and Tangra Gram Panchayats of Bongaon block. The sample size of the study was 1000, out of which 50% are women. A two-stage stratified random sampling method has been followed. Questionnaire method was followed, which was supplemented by the interview method. Data analysis was later done, in order to reach at conclusions regarding the impact and the changes that this rural employment scheme has brought in the lives of the villagers.

In the present study, the respondents from different blocks of 24 Parganas (North) have provided their views about the level of advancement due to MGNREGS work. Out of the 1000 respondents, 22.6% and 41% of male and female beneficiaries stated that their economic position has improved due to the initiation of MGNREGS work. (Table and Figure 1.1) MGNREGS is an opportunity, which has brought in economic benefit to them that has helped them in their family budget. The MGNREGS



Source: <http://www.mapsofindia.com/maps/westbengal/districts/north24-parganas.htm>

Figure 1. Map of North 24 Parganas

TABLE 1.1 : Composition Regarding Responses About Economic Advancement Due To MGNREGS Work

GENDER	YES	%	NO	%	TOTAL
MALE	113	22.6	387	77.4	500
FEMALE	205	41	295	59	500
TOTAL	318		682		1000

Source: Field Survey

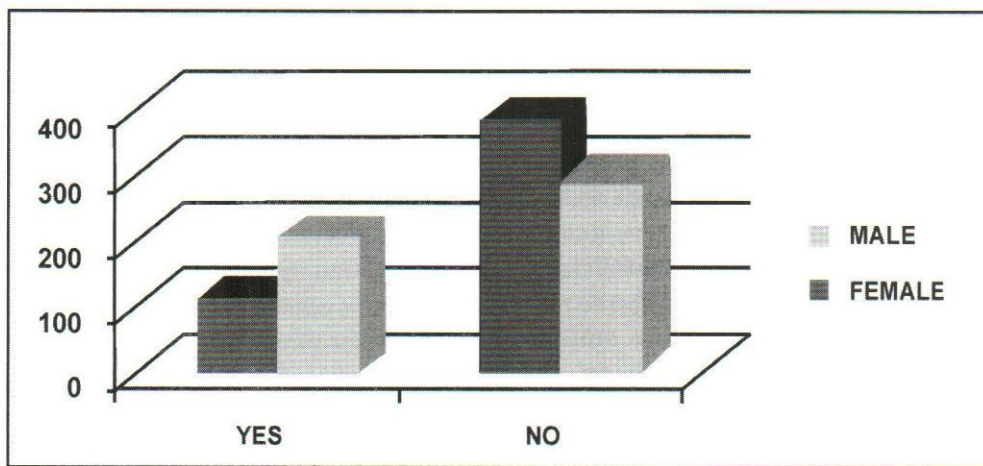


Figure 1.1: Composition Regarding Responses about Economic Advancement Due To MGNREGS Work

beneficiaries have been able to address some of the daily needs and necessities, which they failed to, satisfy before. The money that is available in their hands has empowered them, not only economically, but also socially. Female beneficiaries have started to address the demands of their lives in a different manner. Financial empowerment has created new visions for them, as many have started to engage in other avenues of employment, like tailoring, pickle-making etc.

But, grievances are also there among many beneficiaries. The expectation from the MGNREGS as a public employment scheme is very high. They expect much more than the opportunities that are currently available through MGNREGS. If the daily wage rate is increased, it will really help them. There has been a demand for increase in the daily wage rate. The beneficiaries are not happy when the NREGA wage rate is less than the minimum wage rates that is available. This issue has been a challenge elsewhere, also. For instance, around 2013, the Bihar state government had written to the Centre that the NREGA wage rate notified by the Centre is 138 per day while the minimum wage for agricultural labour notified by the Bihar government under the Minimum Wages Act by the Bihar is 162 per day. Bihar is one of the eight states, where the NREGA wage rate was lower than the minimum wage for agricultural labour. The other states were Andhra Pradesh, Jharkhand, Kerala, Mizoram and Arunachal Pradesh, Madhya Pradesh and West Bengal. Bringing NREGA wage rates at par with minimum wage rates in these states will cost the Centre an additional 2,000 crore a year.² But, the demands of the beneficiaries need to be also looked into by the authorities. In the present year,

also MGNREGS workers will not receive hike in their wages for the financial year 2018-19. (Nair, 2018) Just as the state has to curtail its expenditure in order to remain strong, similarly, the price rise in the market makes the lives of the beneficiaries difficult. So, they have the demands of increase in NREGA wage rates.

According to Jean Drèze, the pre-MGNREGA (2000–1 to 2005-6) growth rate of real agricultural wages was around 0.1% per year for men and negative for women. After the implementation of MGNREGA (2005-6 to 2010-11), the growth rate for agricultural wages for men increased to 2.7% per year and for women to 3.7% per year. Similarly, according to an analysis by the Paris School of Economics in 2011, MGNREGA also leads to an increase in private sector wages and has welfare benefits for non-participating households. The gains from the rise in wages are more for the poor and marginalized, including women. The National Sample Survey Office confirms that MGNREGA has reduced the traditional gender wage discrimination which was apparent in several States across the country. A study undertaken by the Ministry of Agriculture in 2010-11 also supported the fact that actual average wages under MGNREGA are higher than average wages in other types of public work and agricultural casual work. MGNREGS also has enormous potential to boost agricultural growth. It has allowed people in rural areas to undertake activities like de-silting, pond excavation, etc in their own villages and on their own land, to increase water availability, soil fertility and develop land. Indian Institute of Science conducted a study of four states and found that MGNREGS works have increased the area irrigated, soil

fertility and contributed to an increase in crop yields in the range of 46 per cent to 100 per cent across districts. Moreover, due to land development under MGNREGA, previously uncultivable land has now been brought under cultivation. In Andhra Pradesh, the increase has been estimated to be by as much as 10-15%. MGNREGS has shown positive impact in creating sustainable livelihoods for individual beneficiary households. A study conducted by a research organization, Sambodhi stated that in six states, almost 85% of the farmers have reported an improvement in land quality after the creation of MGNREGA assets. In the same sample, 11% and 12% of beneficiaries have also started horticulture and sowing of additional crops on their land. Both MGNREGA and agricultural growth have a significant role to play in increasing agricultural wages and in rural development.³

The Ministry of Rural Government, Government of India observes that the rural employment programme has added to employment opportunities and not substituted them. Studies have cited circumstantial evidence to prove its significant impact on the gradual withdrawal of unskilled farm labour from agricultural activities in peak season. National Sample Survey Organization data indicates that there has been a negative trend in labour force participation in agriculture since 2004-05. Studies conducted by National Sample Survey Organization also reveal that the rural employment scheme has contributed to reduction in out migration and enhancing bargaining capacity of workers. Additionally increased economic activity in states like Bihar has contributed to drying up of a perennial flow of seasonal migrant farm hands. Increase in non-farm wages, to the tune of 200 percent of NREGA wages in states like Karnataka. This has resulted in a substantial working population particularly the youth moving away from agricultural work. With work options increasing, the cost of agriculture labour has gone up. The Ministry of Rural Development stated that the majority of the work, nearly 60 to 70% person days in 2010-11 and 2011-12, under the rural employment scheme is generated during the lean agriculture season. Since MGNREGA's inception the annual average number of person days per household has never exceeded 54 days. MGNREGA boosts the real daily agriculture rate by around 5%. The increase is well targeted in favour of unskilled wages as against skilled wages. He has also referred to reduction in traditional gender wage discrimination.⁴

The other question in the survey that was enquired was whether the beneficiaries are engaged in any other form of work other than MGNREGS. Table and Figure 1.2 provide a picture of the responses about engagement in any other form of work other than MGNREGS work. Data shows 638 of 1000 respondents are engaged in other work. Most of the male beneficiaries are small and marginal farmers. Among the male beneficiaries 91.4% of them are engaged in other forms of work, like agricultural workers, construction workers, labourers in brick-kiln etc. Among the female beneficiaries, 36.2% are engaged in other work, like, agriculture labourer, casual labourer, domestic servants etc. Most of the female beneficiaries are otherwise engaged in household chores. As MGNREGS is a public employment scheme, some of the female beneficiaries got permission from the family elders to work and come out of the *purdah* system. Earlier, the family elders disallowed them to work in the public sphere.

MGNREGS has tried to cater to women as beneficiaries. In many rural traditional homes, women after taking care of the household chores, elderly and children; are running complex household and catering to the needs of multiple generations. In order to survive, a rural woman has to pursue multiple livelihood strategies. She is working from dawn to dusk, without any respite. (Doss, 2011) They have to spare with the minimum spare time and energy in the subsistence farming. This is taken as part of her job, so whatever she does it is part of unpaid labour. So, her contribution is never considered significant by others in the family. It is considered as part of her duty to engage in the small family land to provide for family members. Moreover, it is very difficult to empirically verify the share that is produced by women. MGNREGA has tried to bring in shift in the lives of rural women as beneficiaries. Civic participation has increased among women. Women are more conversant. They are participating in meetings in villages. The doors of empowerment are slowly opening for them. In a way, targeting of women has been successful as in many places; participation of women is quite high. MGNREGS has allowed women to earn more as usually women earn less than men in the market. (Sudarshan R.; R. Bhattacharya & G. Fernandez, 2010) The basket of consumption has improved after the women have started working in MGNREGS. It is a safety net for many women. (Carswell G.& G. De Neve, 2014) They have obtained financial freedom and they have started utilizing their money for satisfying the basic needs of the family

members. The crèche facilities provided is really revolutionary, however, in the study it was hardly found to be working.

Reservation for women has allowed them to participate in greater numbers. Instances of empowerment of women have come up from field studies, undertaken in different states. (Pankaj A.& R. Tankha, 2010) Moreover, it has to be taken into notice that even today it is a great step taken by the rural homemaker to come out of the barriers that the society and the family creates for her. Taking a step into the public domain is far bigger, may be, compared to man's first step on the moon. The dynamics of the socio-politico-economic environment that takes place in rural India and rural homes may be difficult to

understand for an outsider. The chains that bind rural women are to be broken by their sheer determination. Many of them have their own struggles to go ahead in the path of empowerment of women through accessing schemes, like, MGNREGS which has supported women and men in the distress situation, when they do not get adequate work to satisfy their daily needs. This form of supplementary wage employment in rural areas has brought in smiles on the face of many rural citizens. Documentation, though tedious have increased the level of transparency and accountability of the scheme.

The study in North 24 Parganas district has brought in certain positive aspects, which have been highlighted here. Indebtedness is an issue that forces migrants

TABLE 1.2 : Composition Regarding Responses About Engagement In Any Other Form Of Work Other Than MGNREGS Work

GENDER	YES	%	NO	%	TOTAL
MALE	457	91.4	43	8.6	500
FEMALE	181	36.2	319	63.8	500
TOTAL	638		362		1000

Source: Field Survey

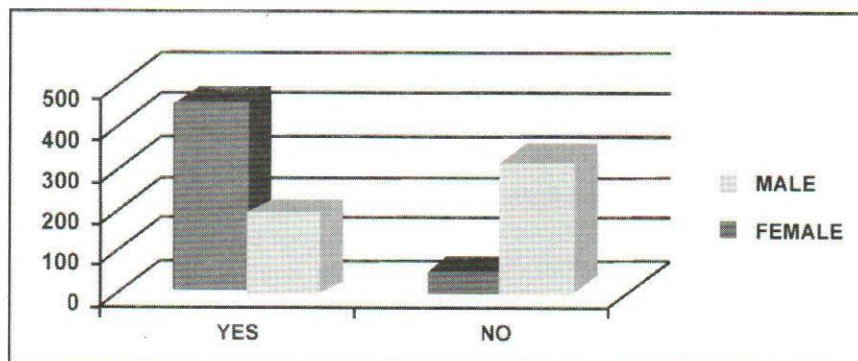


Figure 1.2: Composition Regarding Responses about Engagement in any other form of work other than MGNREGS Work

towards moving out of their villages of the district to urban areas close by or to work in Kolkata where they get better opportunities. MGNREGA has prevented many such labourers from leaving their place of origin. It has prevented some migration from the village. Migration should be an act of hope and not despair, as stated by the United Nations chief. But, due to poverty and lack of employment

facilities rural youth are pushed to the urban areas in search of work. They are forced even to live in deplorable conditions, but cannot return home as rural areas are steeped in poverty. MGNREGS has been successful to a certain extent in preventing migration from the rural areas. Migration can have an adverse impact on the social dynamics of an area.

Wages have increased for agricultural labourers, to a certain extent. This has improved the condition of living of the agricultural labourers. The supplementary work through MGNREGS has increased the wages related to occupations in rural areas. The employment insecurity in the rural areas has decreased, to a certain extent.

Awareness regarding other rural schemes has also increased among the beneficiaries in the district of North 24 Parganas as the beneficiaries socialize and share information among themselves when they are resting. Bonding has also improved among the beneficiaries. There are instances where the beneficiaries kept distance among themselves based on their religion. But, new friendship has grown and they have started confiding in people from another community. Motivation of fellow workers has pushed many others to join the programme and contribute to the success of the programme.

Challenges

There are some matters of concern that need to be addressed in order to make this scheme more fruitful. Complaints have come up from the beneficiaries, like, not getting enough work, irregularities taking place in execution, irregularities in wage payment, irregularities in the tender process, supervisor withdrawing money on the sly, malpractices and corruption, money being misused without implementing the schemes, refusal of Job Card even after applying for it, one job card holder working in two schemes, misbehaviour by the Pradhan, absence of display board, passbook kept in the post office, job card kept by the supervisor, etc.

There has been some shortage of funds at different times. (Mathur Shobhit, AMP, Nomesh Bolia, 2016) As in other studies, it was found that in this study that the beneficiaries have also complained that some of them had difficulties in receiving the payment. They had to wait for weeks, initially, to receive the payment.

There has been a raise in the budget for this scheme. Aruna Roy of Mazdoor Kisan Sangathan stated that the raise in the budget is just an eye-wash. The reason is that huge arrears are taking place. Wage payments are being delayed. Moreover, compensation to the workers also is delayed. (Rural Employment Scheme gets highest-ever Funding, 2017)

Corruption has been a problem. Initially, there were complaints of underpayment. But with cash transfer, such

grievances have decreased. E-transfer has eased the process of transfer of fund. Cases of false reporting of workers muster rolls have been found out in other studies. (P. Niehaus, S. Sukhtankar, 2013) There is need for plugging leakages in the system. Another issue that needs to be amended is that all the facilities that the beneficiaries are supposed to be provided with are lacking, according to the present study. Most of the beneficiaries, themselves are not aware of the facilities, which they are supposed to enjoy. Rural beneficiaries hardly have the courage to question the government functionaries. A kind of distance usually lies between the beneficiaries and the government servants. Though availability of work has increased, but, even now there is lack of work reaching 100 days in many blocks. There have been complaints regarding misuse of job cards.

Administrative problems are also there. Panchayat Samitis may not be meeting for months. The data shows that in 2015-16, only 10% of the rural households have participated in full 100 days of work. Beneficiaries have complained that their grievances are not always given proper attention by the administration.

The productivity of the MGNREGS workers is matter of concern in many places. The pace of work is also slow which has its repercussions on the expenditure incurred. There is lack of initiative to finish the work on time. (Muthukumar, 2017) MGNREGS work is considered as sop for many, as found in the survey. When the administrative supervisors want to measure the outcome, many of the beneficiaries are unhappy. They comment that there is no need of such strict measurement as it is being provided by the government for the poor and they should work in such a manner that the poor people are benefitted by higher pay. This mentality is also not considered good for the scheme in the long run.

The success of MGNREGS depended on the market wages and implementation of the scheme. Studies undertaken in Kerala, Tamil Nadu and Odisha revealed that the most vulnerable in the society did not receive much help. (Carley Rhonda Breitkreuz – Jane Stanton Nurmaiya Brady John Pattison Williams E.D. King Chudhury Mishra Brent Swallow, 2017) Proper targeting of the beneficiaries is necessary. The scheme also failed to provide adequate support to elderly women as their physical capabilities were not taken into concern.

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When you concentrate on agriculture and industry and are frugal in expenditures, Heaven cannot impoverish your state.

– Xun Zi

“Bankruptcy Code for Corporate Failure in SAARC Countries” (A Comparative Study)

KRISHN A. GOYAL AND RAVINDER KUMAR

Corporate failure is one of the hurdles in economic development of the SAARC countries comprising India, Pakistan, Nepal, Bhutan, Afghanistan, Bangladesh, Sri Lanka and Maldives. The main objectives of this study is to explore the existing bankruptcy code, laws, current trends of bankruptcy code and legal framework in contemporary business environment of SAARC countries for dealing with corporate failure. The study has made a comparative study of bankruptcy code for corporate failure in SAARC countries.

1. Introduction

The South Asian Association for Regional Cooperation (SAARC) was formed in 1985 to reduce regional imbalances, economical barriers and enhance co-operation among the member countries. SAARC countries are multi-cultural, geographical diversified and have a different kind of traditional legal system for dealing with corporate failure. India is the centre point for SAARC countries in terms of transmission of information, trade and other co-operation among the member countries. SAARC countries are facing problems in economic development due to lack of competitive cost effective technology, financial scarcity and lack of country's skill based resources besides quality concern at all levels. Corporate failure is a long standing problem for the economic development of SAARC countries.

Failure of industrial units depends on a number of causes such as micro and macro level of a business unit. Corporate failure is a common phenomenon that can be detected through applying simple tool or by financial analysis at business unit level or micro level. Corporate failure is becoming a serious problem as several industrial units are on the verge of failure in SAARC countries. Corporate failure has a negative impact on society, country's image in international business, financial institution for granting loans, employment and national economical development. Therefore, a systematic treatment of corporate failure in a country has become a necessity. Developing countries in South Asian Region are framing policies, infrastructure and legal framework to combat the situation of corporate failure.

Developed countries have their own sound legal system or bankruptcy code for treatment of corporate

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failure through a systematic process. Meanwhile, most of SAARC nations' treatment of corporate failure process has been laid down in their Companies Act, Courts or are informal in nature. India is the most developed country among SAARC nations. The Indian government has recently implemented "Insolvency and Bankruptcy Code 2016" for dealing with the problem of corporate failure or bankruptcy. According to the code, it will bring uniformity and expedite dealing with the corporate failure in the country. In 2017, the country's ranking has improved from 100 to 47 points in 'Ease of Doing Business' report published by the World Bank. But many companies have closed in previous years without providing any genuine information about reasons for their failure to the government. Thus bankruptcy code will be a sound tracker and effective law in the country for dealing with corporate failure.

Appropriate diagnosis of corporate failure will help check similar instances in future. Financial transactions should be verified through financial institutions for transparency and uniformity at national level. Financial expert/s should be very diligent in making timely visit to the company premises to verify corporate healthiness. In modern era, various studies have been conducted on causes of corporate failure in western countries but few studies were conducted for its treatment. Corporate failure is the biggest reason for resulting in unemployment, decreasing exports, investment and foreign exchange reserve of the country besides creating social unrest.

Tracking of sick industrial units must be done at state level or national level for monitoring and analysis. Corporate failure can be effectively dealt with through the efforts of corporate social responsibility (**Catherine Janssen, Sankar Sen & CB Bhattacharya (2015)**). A company brings innovative product and services that creates a crisis for other companies to survive in the market. The government of India is working for digitization in the nation for flow of information, goods and services in a transparent manner. A report of MSME 2015 has stated a framework for revival and rehabilitation of sick industrial units through corrective action plan and providing more credit facility to sick industrial units in India. The report has emphasized on relaxation in the payment of statutory obligation of sick industrial units in the country.

Treatment of corporate failure is a continual process for making a business unit more profitable. A new industrial

unit needs heavy resources at the time of establishment. It would be better to repair an old home rather than making new one. Hence, from the point of view of social cost benefit analysis, it will be a better move to treat a sick but economically viable industrial unit instead of establishing a new one.

Awareness of current procedures of bankruptcy code is a necessity among business managers and investors. A general awareness program on bankruptcy code is valuable for creating awareness among all business stakeholders for timely treatment of corporate failure. Many companies have closed in SAARC countries as they did not take revival grants from the governments due to lack of knowledge.

Failure of industries is a major cost concern in the state and society always pays for it. Production is the mother of necessity. Necessity comes from social needs, taste and preference. If an organization is not able to fulfill the demands according to the society or environment then it fails in the market. In the event of a corporate failure, who is liable to pay all the cost that is directly or indirectly linked to the project or business unit? Commonly, investors lose their hard earned money, financial institutions lose money, employees lose jobs etc. The government has to bear the repercussions of this failure on macro level. Most studies were conducted for prediction of corporate failure in SAARC countries but none were done on forming a bankruptcy code.

The question is: Who is liable for corporate failure in a country? The whole system of governance is responsible for not coping with the situation. If pollution is increasing then we cannot blame it on an individual. It is better to nurture existing companies rather than creating new ones. Demand will increase, fashion will change, taste will change and environment will change. There are greater challenges for the society for the development of policies and uniform code for the country. Unequal groups of society will resist for the change at national and regional level. But development is always based on the change (World Development Report 2017). The main principle of SAARC is based on respect for sovereign equality, territorial integrity, political independence, non-interference in the internal affairs of the member countries and mutual benefits. But it also has an objective to promote welfare, accelerate economic growth, understanding problem of member countries and co-operate in problem solving matters.

2. Objective of the Study:

The study is based on an analysis of the existing system of treating corporate failure in SAARC countries. The main objectives of this paper are as follows:

1. Understand the system of treating corporate failures in SAARC countries.
2. Explore the existing bankruptcy code, laws and legal framework in contemporary business environment of SAARC countries.
3. Analyze the prevailing laws related to corporate failure.
4. Do a comparative analysis of prevailing laws in SAARC countries.
5. Comparison of SAARC countries for solvency over the years.

3. Review of Literature:

Branch & Khizer (2016) "Bankruptcy Practices in India" argued for prevailing practices of bankruptcy in India. The authors have argued for landmark amendments in the Companies Act according to contemporary business environment. The researchers have recommended a list of the improvement in the existing bankruptcy legal framework of India.

Asian Development Bank (2013) "Bhutan Critical Development Constraints" in its country diagnostic study focused on the key constraints of economical development in the country. Bhutan's economic development policy is based on peace, prosperity and happiness. Bhutan is maintaining its distinct identity in respect of accepting modernization without negativity from the rest of the world. Hydropower is one of the energy sources of the country. Bhutan is exporting 80% of its power to India. Despite development of power sector, Bhutan's economy is more based on tourism industry. About 70% of land of Bhutan is covered by forest and 11% by shrubs. **There is only 3% land cultivated and out of the cultivated land only 1% is irrigated.** The critical constraints to inclusive growth are (1) Narrow fiscal space (2) Inadequate and poor quality of infrastructure (3) Limited access to quality of education (4) lack of financial resources for MSMEs (5) Presence of market failure.

Shaheen Irum (2013) "South Asian Association for Regional Cooperation (SAARC): Its Role, Hurdles and Prospects", argued for role of SAARC for giving platform

to the associated countries for sharing information, ideas and development of institution for interaction. The author has said that SAARC countries fear threat to their political, economic, and territorial stability (terrorism) from their neighboring countries. She emphasized on peace initiative that can build confidence among the member countries for increased cooperation.

Rashid & Abbas (2011) "Predicting Bankruptcy in Pakistan", authors have taken a sample of financial ratios of non-financial companies from 1996 to 2006. The researchers have selected 24 key financial ratios for the study. The financial ratios were grouped under the leverage, liquidity, profitability and turnover ratios to examine separately for bankrupt and non-bankrupt companies by calculating their means and standard deviations for five years prior to bankruptcy. In addition, T-tests and F tests were employed to get about the similarity and difference of financial variables each year prior to bankruptcy. They selected 52 companies for the research study. The authors have argued in this study for identifying the financial variables that distinguish "healthy" from "financially troubled" companies. To develop a model that could have the predictive ability of financial health and discriminate between bankrupt and non-bankrupt units. The researchers have identified the financial ratios that are most significant in bankruptcy prediction for the non-financial sector of Pakistan using a sample of companies, which became bankrupt during the period between 1996 and 2006. In doing so, 24 financial ratios that measures important financial attributes of a company (i.e., profitability, liquidity, leverage, and turnover ratios) were examined for a five-year period prior to bankruptcy. The discriminate analysis produced a model of three variables: sales to total assets, EBIT to current liabilities, and cash flow ratio. Our estimates provide evidence that the firms having 'Z value' below zero fall into the "bankrupt" whereas the firms with 'Z value' above zero fall into the "non-bankrupt" category. The model achieved 76.9% prediction accuracy when it is applied to forecast bankruptcies on the underlying sample.

Batra Sumant (2006) "Insolvency Laws in South Asia: Recent Trends and Developments" has studied insolvency law and recent development. Breakdown in cease fire between government and LTTE at Sri Lanka has boosted its GDP growth rate. A number of recent positive political developments have determinant factors for the development in the legal framework in south Asia.

Narayanan (1994) “The Law Relating to Industrial Sickness in India: The Role of BIFR” said a number of textile companies became sick in the private sector that were taken over by the National Textile Corporation, however, most of them remained sick. The Reserve Bank of India also issued periodic instructions to banks to monitor weak or sick units more closely. In 1985, the finance minister had said, “We will constitute a board, which will provide a speedy mechanism for amalgamation, mergers and devise such other solutions as may be necessary to deal with problems of sick industrial units in large and medium sectors of India.”

4. Research Methodology:

The present study is based on secondary data. All information collected from the published reports, newspapers and various surveys. The authors have analyzed and interpreted the published reports. Past studies on the topic is well reviewed and acknowledged.

This study is based on SAARC countries so the data has been compiled from various sources.

5. Bankruptcy Code for Corporate Failure in SAARC Countries

South Asia is an emerging region in the world map in terms of development related to bankruptcy code and legal framework to tackling the situation of corporate frauds, corporate governance and revival of failed business units. SAARC countries are in the process to develop Insolvency and Bankruptcy Code for better governance. These countries have higher economical growth rate and greater market for products compared to developed countries. Development can be brought through changes in the existing bankruptcy law, which is outdated at present. (Table 1). Now, business is becoming more challenging and complex and there is a need to bring a uniform bankruptcy law for contemporary business environment.

TABLE 1: Bankruptcy Code for Corporate Failure in SAARC Countries

SAARC Countries	Year	Bankruptcy Law / Code	Influenced By
1. India	2016	Insolvency & Bankruptcy Code	British, USA, Australia
2. Pakistan	---	N/A	British & Common Law
3. Nepal	2005	Insolvency Ordinance	Common, Continental
4. Bhutan	---	N/A	—
5. Afghanistan	---	N/A	—
6. Bangladesh	1997	Bankruptcy Act	British Common
7. Sri Lanka	---	N/A	Roman Dutch
8. Maldives	---	N/A	—

Sources: www.worldbank.org www.oecd.org, Authors own manually compiled Information,

*N/A- Not Available

Entrepreneurs are much more focusing on transparency in the transaction and minimal risk for doing business in a particular country.

Sri Lanka – Sri Lanka is focusing to develop a strong bankruptcy code to meet the issues related to business organizations. The cabinet of Sri Lanka has been given green signal by Prime Minister Ranil Wickremesinghe for introducing the Insolvency Ordinance No.24 of 1884. The

Institute of Chartered Accountant of Sri Lanka and Security Exchange Commission of Sri Lanka have jointly developed certain codes based on Cadbury Committee report for corporate governance.

India - The Indian government has developed its Insolvency and Bankruptcy Code 2016. Formerly it was governed through Sick Industrial Companies (Special Provisions) Act of 1985 by the recommendation of Tiwari Committee.

Provisions of the act were applied on companies that were registered under Companies Act 1956. According to the provision of **Sick Industrial Companies Act (SICA)**, **Board for Industrial and Financial Reconstruction (BIFR)** was setup for detecting industrial sickness and recommendation for revival or liquidation. **Insolvency and Bankruptcy Code 2016:-** Provisions of the code shall apply on companies incorporated under the Companies Act 2013, any company governed under Special Act, incorporated under Limited Liability Partnership Act 2008, body corporate, partnership firms and individuals. According to the code, there will be minimum threshold limit of Rs 35000 of debt waiver. This code has brought individual, firms, LLPs, & partnership firms in mainstream. Bankruptcy code is more important in dealing with the number of applications received at national level. A uniform code of bankruptcy can reduce all kind of hurdles for timely solving the problem of sick industrial units in India. Corporate insolvency resolution process has time limit of 180 days after receipt of the application, which can be extended to another 90 days. Insolvency resolution process is managed by professional agency after receipt of the application. The adjudicating authority has the right to reject resolution plan under the code. The main aim of Insolvency and Bankruptcy Code 2016 is to bring transparency, expedite decision for bankruptcy and matching bankruptcy code of developed countries.

Afghanistan: - Afghanistan is under a transition phase. Political stability was badly affected due to Taliban and its terrorist activities. Hence, corporate culture did not develop in the country. Afghanistan has not adopted any bankruptcy law. The existing Partnership Law, Corporations, and Limited Liability Companies Law have some liquidation provisions that provide some procedural framework for winding up of a business unit. That's why, the country has poor ranking in ease of doing business as per the study report of World Bank.

Bhutan: - Bhutan has a corporate sector and legal framework more influenced by Buddhism. Bhutan is the only country in the world that measures Gross National Happiness (GNH). Bhutan is also ranked high for political stability and ease of doing business by the World Bank. It is also the least corrupt and least developed country in south Asia. The World Bank report has also ranked the country lowest in terms of resolving insolvency due to lack of required legal, bankruptcy code, governance code and regulatory framework. The government of Bhutan is much more focused on balanced

and sustainable development in the country. Bhutan's economy is more dependent on tourism, handicraft and agriculture based industries. There is only some evidence and procedure for corporate governance stated in the Registration of Companies Act 2000.

Nepal: - Corporate sector plays very little role in the economy of Nepal. Private sector has not gained much significance in the Himalayan nation. Insolvency Ordinance was enacted in 2005 with inclusion of corporate insolvency and rehabilitations framework for industries in Nepal. Nepal is the only country in South Asia to give place for rehabilitation of sick industrial unit in its Insolvency Ordinance 2005. Incidentally, it is the only country in South Asia where court has no role in the process of liquidation or winding up of a company.

Pakistan: - Pakistan's economy is based on Islamic religion model. Pakistan has weak political and institutional environment for corporate sector. Security Exchange Commission of Pakistan has recommended for amendment in the bankruptcy stated in company's ordinance and making it corporate rehabilitation act. A number of companies have failed in Pakistan during 2008-09 due to its legal business framework. Contemporary business scenario is changing globally. Several countries have adopted bankruptcy code in its countries for better governance. It has direct influence on FDI and investment in the country. At present bankruptcy cases are governed through civil courts and provincial procedures only. Mr. Iftikhar Ali Malik in his keynote address at a seminar on Bankruptcy Law by Federation of Pakistan Chamber of Commerce and Industry at Karachi on 28 January, 2002 emphasized on the need for improvement in auditing standards and dispute resolution mechanism for governance. Pakistan has no mandatory requirement to keep independent directors in the board of a company. Such loopholes in legal framework are creating business risk in the country and decreasing overall country ranking in ease of doing business as per the World Bank report. Many companies in Pakistan are being run by family business groups. There is strong need for a bankruptcy code in the country to bring uniformity to deal with corporate failure in the country.

Bangladesh: - Bangladesh has an Islamic economic model for corporate governance in the country. Bangladesh has enacted Bankruptcy Act in 1997 for loan defaulters. The Bankruptcy Act 1997 came into existence due to lacunae in the country's Insolvency Act, 1909. The Insolvency Act 1909 was applicable only on natural persons

and not artificial person like companies and corporations. Meanwhile, there is no inclusion of revival and rehabilitation framework for sick industrial unit/s in the Bankruptcy Act 1997. But Companies' Act of the country has given place for revival in the Act. Bangladesh has 64 districts in the country. Each district court judge has been made Ex-officio bankruptcy court for solving bankruptcy cases in the country. Influence of international donor agencies are remarkable in terms of formulating and reformulating of its reforms agenda (Sarker, 2004).

Maldives: Maldives is made of tiny islands and is a great attraction for tourists. The economy is primarily based on tourism and fisheries. The country is one of the least developed in South Asia. Maldives's economy is at present in development stage. Majority of the companies come under small scale industry. Resources are underdeveloped. Treatment of corporate failure is only discussed in the Companies Act. There is need for strong governance code to attract investment in the country. According to the World Bank's Ease of Doing Business report 2017, **ranking of Maldives on the ease of resolving insolvency has been determined through benchmark method of distance to frontier scores for resolving insolvency. The scores were the simple average of the distance to frontier scores for the recovery rate and the strength of insolvency framework index. Maldives has been placed 2.0 on the Index of 16 points for the strength of insolvency framework.** Maldives ranks 135 among 190 countries on the ease of resolving insolvency as per the report. At

present insolvency and corporate failure in Maldives is dealt by civil court and registrar of companies. Maldives has been placed 2.0 on the Index of 16 points for the strength of insolvency framework. Maldives has a need to develop its law, procedure and governance code to enhance investment in the country.

A matter of effectively monitoring and implementation of bankruptcy code in the country is more desired to bring transparency in the transactions. Political, economical and social stability is prime root for the good governance in the country. Regional level co-operation is more desired for development of business activities in SAARC countries.

6. Comparison of SAARC Countries for Solvency over the Years

Resolving insolvency is an urgent matter for development and maintaining business stability for a country. According to the World Bank for Ease of Doing Business -2018, a list of 190 countries was ranked wherein Nepal at 76th position is one of the most efficient SAARC country for resolving insolvency. Bhutan placed at 168th position is one of the least developed SAARC country for resolving insolvency issue. According to the published report, Maldives is considered very low time consuming country for resolving insolvency among SAARC countries, Whereas, India is considered very high time consuming country for resolving insolvency in the SAARC countries. (Table 2).

TABLE 2: Resolving Insolvency for Corporate Failure in SAARC Countries

S. No.	SAARC Country	Global Ranking in Ease of Doing Business (2018)	Ranking of Resolving Insolvency (2018)	Time for Resolving Insolvency (Years)
1	Nepal	105	76	2
2	Pakistan	147	82	2.8
3	Sri Lanka	111	88	1.7
4	India	100	103	4.3
5	Maldives	136	139	1.5
6	Bangladesh	177	152	4
7	Afghanistan	183	161	2
8	Bhutan	75	168	Not Available

Sources: World Bank, Ease of Doing Business Report, Authors own manually compiled Information

According to the data released by World Bank for Ease of Doing Business (2018), Bhutan, India and Nepal have been considered as most preferred country for attracting the business or ease of doing business. India is among top ten most improving countries in the areas measured by doing business report of 2016/17.

7. Conclusion and Recommendation

Bankruptcy coding is a systematic process of bringing uniform legal framework to tackle corporate failure in a country. The situation of bankruptcy or corporate failure can be dealt with through implementing a strong bankruptcy code or bankruptcy law in a country according to its business environment. SAARC countries are considered in the categories of developing and least developing countries. India, Nepal and Bangladesh have strong bankruptcy code or insolvency law to protect all stakeholders of business. It denotes risk minimization in the respective countries. Some SAARC countries like Bhutan, Pakistan, Afghanistan, Sri Lanka and Maldives have no proper bankruptcy code for corporate failure in the countries. Few countries are at the stage of developing their legal framework such as Sri Lanka and Afghanistan. But effective legal system is also important for resolving the insolvency in the country. If bankruptcy code is not properly monitored or effectively implemented then it may affect the corporate sector as well country's ranking in the ease of doing business.

For improving country ranking at global level, there is a need to develop strong bankruptcy code or Insolvency law in SAARC countries to attract foreign investment and improve national productivity. India has strong a presence among SAARC countries due to strong legal framework for dealing with the situation of corporate failure. That's why India has improved its ranking in the Ease of Doing Business report 2017 published by the World Bank. SAARC member countries can co-operate with each other for development of legal advisory services. SAARC member countries may go for mutual transfer of ideas, technology

and financial assistance to treat corporate failure in their respective country.

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"The ultimate goal of farming is not the growing of crops, but the cultivation and perfection of human beings."

— Masanobu Fukuoka

Legal Citation Network Analysis: An Overview

R. JEYSHANKAR AND E. NISHAVATHI

This paper theoretically analyzes the role of citations in judicial opinions and their significance in stare decisis. It provides an outline for network theories and technologies its applicability to legal citations and their benefits. It also discusses about the properties, algorithms and tools used in legal citation networks.

1. Introduction

Information and technological revolution has tremendously changed the landscape of legal information sources. Exponential growth of judicial decisions published on the internet is a welcome development for lawyers, legal practitioners, scholars and citizens. At the same time finding the relevant decision has become increasingly difficult. At present efforts are taken to borrow and take advantage of modern network theory and technologies largely from the leitmotif of sociology and physics to identify the most relevant decision.

The term relevant in legal literature means: “legal importance”, “legal relevance” or “legal authority”.

Shepard’s Citations, started in 1873, is the first citation index in the field of law, and is based on a very simple idea: if a certain decision is mentioned in a later one, it is recorded and shown after the decision, together with the context. The context of the citation is measured basically by two parameters: the first is indicating the agreement, (from totally negative to totally positive mentioning: the dimension of accord), while the second is showing the impact of the citation to the decision, (the dimension of weight).

Garfield greatly inspired by Shepard’s concept of citation indexing and invented the most popular Science Citation Index, which enables to measure the impact, the importance of a scientific work, importance of an article, a publication forum (journal), frequency, and the context of citations, as well as the importance of the citing authorities. Google and other search engines are based on free text and metadata search but due to information explosion on the Internet, the methods of search has changed to relevance ranking based on *measurable traces of cognitive authority*, generated by human knowledge – hyperlinks, citations.

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Thus the concept of citation analysis precursor from the leitmotif of law, but the subject science takes advantage of the concept and evolved many metrics like Bibliometrics, Informetrics, Scientometrics, Webometrics, Altmetrics. On the other hand lawyers, judges and scholars started utilizing the modern network technologies derived from science and sociology to find out the most relevant corpus which relates to their cases.

2. Role of Citations in Judicial Opinions and their Significance

The concept of citation has emerged from the discipline law where the citation of precedent cases is important. English common law operates on the principle of **stare decisiset non quietamovere** (to stand by decisions and not to disturb settled matters). Judicial law owes its importance to the doctrine of precedent. Precedent giving rise to case – law, are concerned as sources of law. This is the policy of following rules and principles laid down in previous judicial decisions. Since later decisions may reverse or modify earlier decisions, it is legally important to find all later decisions along with earlier ones. These decisions take a form of network.

Judicial decisions become binding precedents for the determination of like cases in the future and so contribute to the material content of the legal system. In the words of Blackstone: “for it is an established rule to abide by former precedents, where the same points come again in litigation: as well as to keep the scale of justice even and steady and not liable to waver with every new judge’s opinion, as also because the law in that case being solemnly declared and determined, what before was uncertain, and perhaps indifferent, is now become a permanent rule, which it is not in the breast of any subsequent judge to alter or vary from, according to his private sentiment...”

Citations as determinant of decisions: Staredecisis are only one of multiple factors directing the courts outcome but still an importance one (Keeton, 1990). Justice Powell declared that respect for constitutional stare decisis was essential to “the rule of law”. An opinion’s citations are the operationalization of the practice of stare decisis. Justices place their holding in the existing body of the law by demonstrating that prior decisions directed their opinion. The precedents serving as citations “may be viewed as the principal asset of a judicial system,” and the higher their quality, “the better the judicial system may be said to be” (Macey, 1989).

Citations as influence: The citation as influence suggests that citations are one relevant factor for explaining decisions of the court. So that the most cited cases would be the most legally significant and the most citing cases better grounded in the law. All decisions are to some degree indeterminate in their implications, and the well-established ability of judges to “distinguish” a precedent, and the limited authority of horizontal precedent, obviously allows an opportunity to evade the principles of stare decisis (Baum, 1995).

Precedents as sources of law: Judicial decisions are one kind of sources of law. If a judicial precedent speaks with authority, the principle, which it embodies would be binding in future cases, it thus becomes a source of law but not all, and many are declaratory.

3. Related Studies

Many studies have been carried out in legal citation studies, some of the noteworthy studies which looked at judicial influences, citation based measures of judicial behaviour are: Johnson (1985), (1986), conducted test of explanations for use of Supreme Court precedents by the Court and criticisms of citation based measures of judicial behavior; Klein and Roe (1999) used citation counts and other measures to measure the prestige of U.S. appellate court judges; Kosma (1998) analyzed the 1.2 million citations of over 24,000 supreme court opinions to measure influence of individual justices; Lessig, *et al.* (1998) studied citation analysis of total and average influence of individual judges; Shapiro, (1991) utilized the measure citation count to identify most cited articles; Cross *et al.* (2010) undertook an empirical analysis of the citation practices of the US Supreme Court justices, seeking to assess why the justices cite cases in their opinions, how they differ in doing so, and how those decisions impact the development of the law. Zōdi, Zsolt (2014) explored an important aspect of the precedential character and citation pattern of decisions of the Hungarian Law.

A number of studies have also done on legal citation network analysis. Some of the significant pioneering studies are, McIntosh and Cousins, *et al.*, (2005) applied sophisticated network analysis to study diffusion of regulatory takings doctrine across jurisdictions; Post and Eisen, (2000) discovered power law distributions in Second and Seventh Circuit case citation patterns and discussed as evidence for fractal pattern in law; Fowler *et al.* (2007) has developed and tested measures of case centrality to

identify the most legally central decisions of the US Supreme Court at a given point in time. In the same year they constructed a complete network for majority opinions written by the United States Supreme Court and the cases cited in the United States reports. They describe a method for creating authority scores using the network data to identify the most important court precedents. Beommarito, Katz and Zelner (2005) compared various network representations of the United States Supreme Court corpus and evaluate the theoretical rationale and utility of each application.

From the above literatures one can understand that the concept of citation networks is the foundation to network research that has contributed to the development of network theory. Much interesting and enormous research has been carried out in this vein, especially corpus of United Nations Supreme Court, precedents of European countries Supreme Court *stare decisis*.

A gap in the literature has been felt in the vein of cross national legal citation analysis of citation pattern, judicial influence and citation behavior, and few literatures found in the area of analyzing the citation behavior of lower courts, multiplicity of citation (i.e.) how many times case A cites case B, analysis of citations other than court corpus in legal literatures.

In India, Saravanan et al (2009) has approach the legal document with ontological perspective for effective retrieval of relevant judgment. Kumar et al (2011) utilized artificial intelligence in law to predict the similarity of Indian judgments. Kumar et al (2011) analyzed all term legal term, co-citation and bibliographic coupling based similarity methods to find similar judgments. Minocha et al (2015) has studied Indian judgment with respect to Indian Constitution Article 264 to 300 using dispersion of citation network to find out the relevant judgment.

There was no major studies carried out in legal citation network analysis for Indian corpus, citation based analysis of judicial behaviors and judicial influential studies in India.

4. Scope and Purpose of the Study

The main purposes of the study are,

- To raise awareness about the network analysis in the area of Indian law;
- To familiarize about the modern network technologies and algorithms;

- To induce utilization of network algorithms in legal citation networks;
- To help the legal practitioners and professionals in finding the most important relevant or most authoritative precedents in any particular cases.

This study provides an overview of network analysis and its applicability to legal citation network analysis. This study concentrates on centrality and HITS algorithms for retrieving most important cases. The legal citation network presented in this paper are based on the assumption that,

- A.B.C.D.E.F.G,H is the set of eight landmark decisions of the Supreme Court of India given in a particular period of time.
- The precedent C is an overruled decision
- The Precedent G is the very recently declared decision in the legal citation network
- The citing and cited precedent mentioned in the legal citation network is limited to eight nodes for illustration purpose.

5. Methodology

A literature survey has been carried out in the broad area of network analysis and its conceptual influence on legal citation.

The sample data set was originally generated in Microsoft excel work sheet, and it was converted into Pajek network file format .net with the help of excel to Pajek converter programme. The legal citation network presented in the figure 4 has been generated by the open source software Pajek. Pajek is a programme for windows for analysis and visualization of large network having more than millions of vertices. Besides, ordinary (directed, undirected, mixed networks) Pajek supports also multi relational networks, 2 mode networks, and temporal networks. The figure 4 depicts the legal citation network of eight landmark decision by the Supreme Court of India in given point of time.

6. Network Analysis

A network is a set of items called vertices or nodes, with connections between them, called edges. System taking forms of networks abound in the world. Examples include internet, World Wide Web, social network of acquaintance or other connection between individuals, neural networks, metabolic networks, food webs, and distribution networks such as blood vessels or postal delivery routes, networks of citations between articles.

Network analysis is an application of graph theory. It provides a set of techniques for analyzing structure in a system of interacting agents, represented as a network. The basic components and concepts involved in the network analysis are explained evince with the network figure. Fig.1.

Vertex (pl. vertices): The fundamental unit of a network also called node. Example Nodes / Vertex (V) : = { 1, 2, 3, 4, 5, 6 }

Edge: The line connecting two vertices. It has directions. Edges (E) = { {1,2}, {1,5}, {2,3}, {2,5}, {3,4}, {4,5}, {4,6} }

Directed/undirected: An edge is directed if it runs in only one direction (such as a one-way road between two points, (E = {4,5})), and undirected if it runs in both directions (E = {4, 6}). Directed edges, which are sometimes called arcs, can be thought of as sporting arrows indicating their orientation. A graph is directed if all of its edges are directed. An undirected graph can be represented by a directed one having two edges between each pair of connected vertices, one in each direction.

Degree: The number of edges connected to a vertex. Note that the degree is not necessarily equal to the number of vertices adjacent to a vertex, since there may be more than one edge between any two vertices. In a few recent

articles, the degree is referred to as the “connectivity” of a vertex, but avoid this usage because the word connectivity already has another meaning in graph theory. A directed graph has both an in-degree and an out-degree for each vertex, which are the numbers of in-coming and out-going edges respectively. (Out degree for vertex 2 = 2; in degree = 1 (degree of vertex 2 = 3), out degree of vertex 5 = 1; in degree = 2 (degree of vertex 5 = 3)

Component: The component to which a vertex belongs is that set of vertices that can be reached from it by paths running along edges of the graph. In a directed graph a vertex has both an in-component and an out-component, which are the sets of vertices from which the vertex can be reached and which can be reached from it. (Component A = 2, 5, and component B = 1, 2, 5)

Geodesic path: A geodesic path is the shortest path through the network from one vertex to another. Note that there may be and often is more than one geodesic path between two vertices.

Diameter: The diameter of a network is the length (in number of edges) of the longest geodesic path between any two vertices. A few authors have also used this term to mean the average geodesic distance in a graph, although strictly the two quantities are quite distinct.

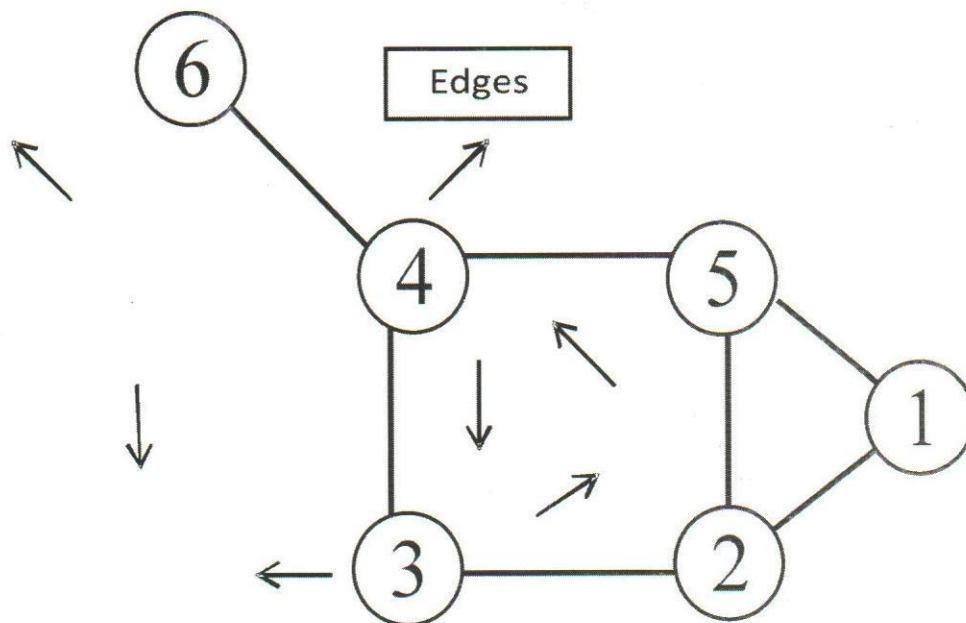


Figure 1. A small example network with 6 vertices and 7 edges

7. Properties of Legal Citation Network Analysis

Thomas A. Smith, in his paper “the web of law” used the term legal citation networks to refer “web of law”, consists of cases, statutes and other legal authorities, and the citations that link them together. The basic properties of legal citation networks are:

- Legal citation networks are directed. The links go from one judicial decision to the other precedent (i.e. a legal case may cite a statute, but a statute never cites a legal case).
- Legal citation networks are acyclic because a judicial decision cite only existing precedent. Thus all edges in the network point backwards in time, making closed loops impossible or at least extremely rare (see Fig. 4).
- Legal citation network follow a temporal flow (i.e. a newer document can cite an older document, but not the other way round).
- Vertices and edges added to the legal citation networks are permanent and cannot be removed at a later time.
- The already formed part of the network is mostly static; only the leading edge of the network changes.
- Legal citation networks exhibit scale free network and governed by power law distribution.
- Legal citation networks are highly skewed distribution of frequency.

These properties present a potentially rich source for discovering general features of common law systems.

8. Application of Network Analysis to Legal Citations

In recent years, the science of studying networks has developed and while there have been some primitive attempts to apply those methods in legal citation corpus to study about its shape and overall structure enables to know about how new laws are evolved, organized, and developed. This section describes some of the most common properties that are observed in many of the networks and its applicability to legal citation networks is discussed.

In legal citation network analysis, Supreme Court decisions, statutes, legal treatises, law review articles, and so on are considered as nodes and these nodes are linked to others through citations to existing precedents are known as edges or arcs. This link may take in two forms: outward and inward link. Example if all precedents case A cites is outward and precedents which all are citing A is inward link. (Fig. 4)

Scale - free network: Scale – free network is a network whose degree distribution follows a power law. (Fig. 3) That is a small number of nodes have a large number of connections and most nodes have few or no connections, the network is a scale-free network.

The research studies “network of cases by the US Supreme Court, (Geist, 2009) networks of cases by the European Court of Human Rights. (Malmgren, 2011)” and other works revealed the characteristic of scale – free network followed by the power law. These studies exhibits that a very small number of cases receive the most citations and most other cases are cited infrequently or not at all. Thus legal citation networks are scale-free. This

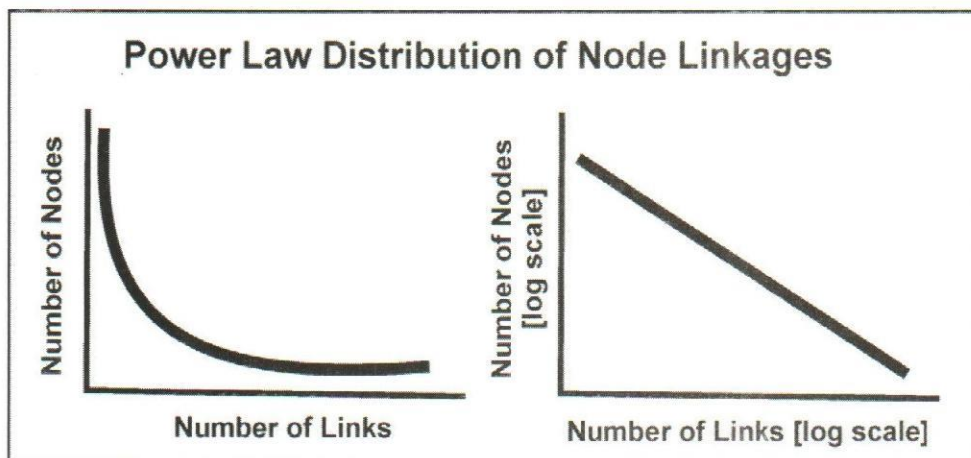


Figure 2. Power Law Distribution of Node Linkages

feature of legal citation networks is important because it shows that legal citations are structured similarly to another notorious scale-free network: the Internet.

Figure 2: Albert and Barabasi (1999) Typical shape of a power-law distribution. Scale-free networks have power-law distributions of nodes [Scientific American].

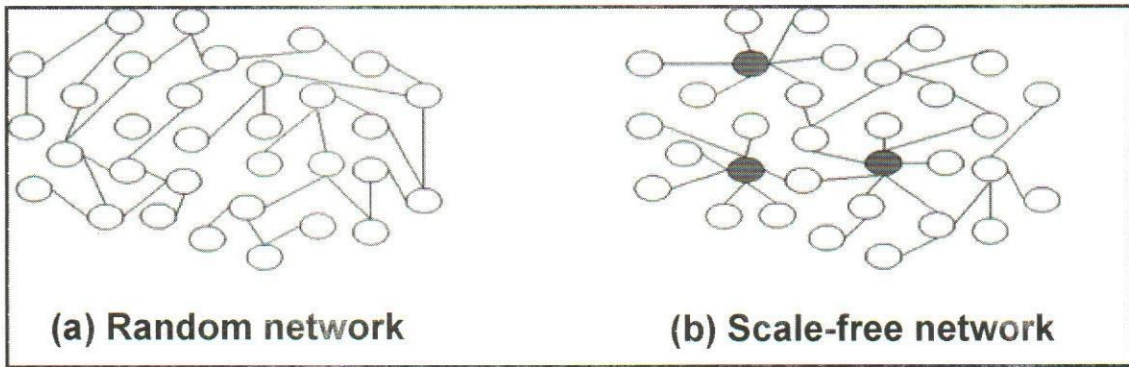


Figure 3. A sample network of random and scale - free

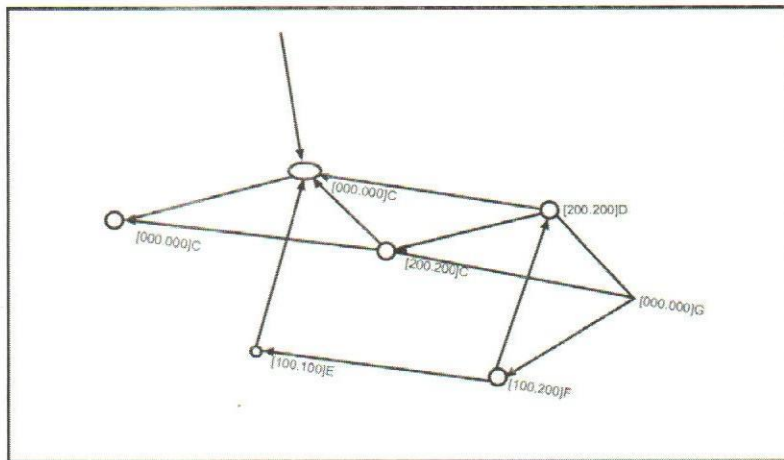


Figure 4. Legal citation network: In & Out degree centrality

Clustering analysis: In terms of network topology, transitivity or clustering means the presence of a heightened number of triangles in the network – sets of three vertices each of which is connected to each of the others. This measures the density of triangles in a network.

In legal citation networks, cases in the same legal cluster are likely to be related to each other in terms of meaning and subject matter. Example judicial decision A vertex is connected to vertex B and B connected to vertex C then there may be a close semantic relationship prevails between in the judicial decision A vertex and C vertex. It shows that cases in the same clusters are probably correlate to each other in same context. These clusters form not just structures in link topology, but structures in “semantic topology” as well.

Small World Effect: One of the most popular concepts in network theory is that of the ‘small world effect’. Practically in every language and culture we have a phrase saying that the world is small enough so that a randomly chosen person has a connection with some of our friends. Small world effect implies the fact that most pairs of vertices in most networks seem to be connected by a short path through the network. It shows the integrity of networks and measured by its diameter.

A basic measure of the diameter of a network is the average number of links one has to cross in order to get from one randomly chosen node in the network to another. Measuring the diameter of the Web of Law, or parts of it, would give us a measure of how well integrated the web of law is, and what parts of it are more or less well integrated with the rest (Smith, 2005).

9. Benefits of Legal Citation Network Analysis

The legal citation network analysis helps to:

- Determine the most important or relevant decision of precedents,
- Determine which were most carefully grounded in prior precedent at any given point in time,
- Test several hypotheses about the rise and fall of precedents
- Classify the importance of every case in the network with a fraction of second without any ideological bias
- Find out the landmark judgments
- Study about the precedent and its influence in judicial decision-making
- Illuminate the concept of judicial activism

TABLE 1: Illustrating All Degree Centrality

Decision Vertex	In degree centrality	Out degree centrality	All degree centrality
A	2.00	0.00	2.00
B	4.00	1.00	5.00
C	2.00	2.00	4.00
D	2.00	2.00	4.00
E	1.00	1.00	2.00
F	1.00	2.00	3.00
G	0.00	3.00	3.00
H	0.00	1.00	1.00

- Analysis the evolution of norms of stare decisis by focusing on changes in the average number of citations per opinion

10. Legal citation network analysis algorithms

Centrality Measures: It is the most basic level of measures in network analysis. The most frequently used centrality measures are degree, closeness, betweenness, and eigenvector. The first three were proposed by Freeman (1979) and eigenvector was proposed by Bonacich (1972). Measures of centrality based on citation pattern helps to identify the most legally central cases at any given court at a given point in time in an empirically rigorous, reliable, and valid manner. This measure is also known as degree centrality.

Degree centrality: are of two kinds, in-degree and out-degree centrality which are the two variants of directed networks.(Table 1) and (Figure 4).

In-degree centrality: is the total number of inward citations received by a node/case. In the figure 4, the in-degree centrality for case B is 4, cited by case C, D, E, H.

Out-degree centrality: is the total number of outward citations of a node. Out-degree centrality for Case A is nil. It shows the property of temporal flow. But for case B the out-degree centrality is 1 as it cites case A only.

Thus the most important or relevant or legal authority in the given legal citation network is Case B.

Degree centrality alone is insufficient in deriving the most relevant precedent as it reflects only a local view of relationships between nodes and does not provide information about overall network structures. Hence the context in which it prevailed, their relationship and the distance between citing and cited precedents, must also be taken into account. Thus the closeness and between's are the two other centrality measures which measures the closeness between the citing and cited precedents and the number of shortest paths passing through a precedents.

Closeness Centrality:A more sophisticated centrality measure is closeness, which is defined as the centrality of a given node is the sum of geodesics distance from all other nodes, which is defined as the length of the shortest path from

one node to another.(Freeman, 1979) Closeness centrality describes the extent of influence of a node on the network. Closeness centrality for direct network is computable by

$$C_c^1(i) = \left[\sum_{j=1}^N d(i-j) \right]^{-1}$$

Normalized closeness centrality:

$$C_c^1(i) = (C_c(i) | (N - 1))$$

Centralized network have the closeness centrality value of one and the decentralized network have the closeness centrality value of zero.(Fig. 5).

The figure 5 generated by Pajek exhibits the overall closeness of the given legal citation network. It shows that the network has closeness centralization.

Betweenness centrality: is based on the number of shortest paths passing through a node. Being between's means that a node has the ability to control the flow of

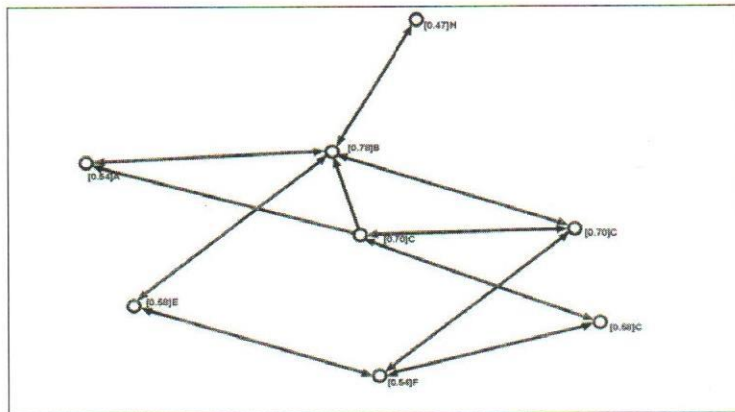


Figure 5. Centrality of Overall Betweenness

knowledge between most others. Thus the highly influential decisions can be derived by the between's centrality. The precedents with high between's are the pivots in the legal citation networks.

Betweenness centrality measures for node i:

$$C_B(i) = \sum_{j,k} g_{jk}(i) / g_{jk}$$

$g_{jk}(i)$ stands for path between node j and k that pass through node i

g_{jk} stands for all paths between node j and k.

Normalized betweenness centrality for direct network:

$$C_B^1(i) = C_B(i) / [(N - 1)(N - 2)]$$

The figure 6 depicts the centrality of overall betweenness of the given legal citation network. The precedents B (0.08), C (0.06) and D (0.06) having high betweenness value among the precedents.

Eigen Vector Analysis: Another but complicated measure of centrality is Eigen Vector. It estimates simultaneously the importance of all cases in the network. The Eigen Vector centrality of a given node reflects the number of

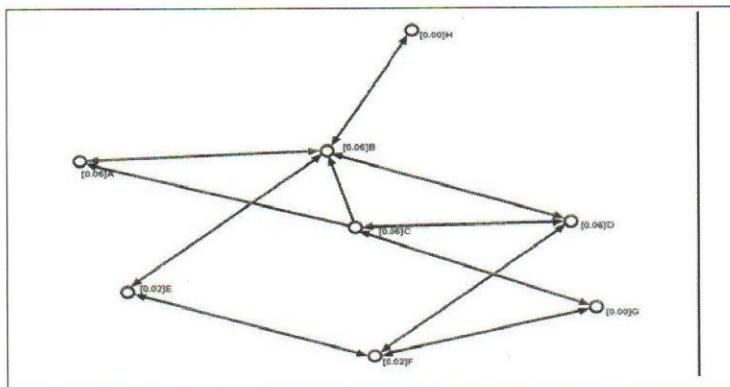


Figure 6. Centrality of Overall Betweenness

direct connections it has with other nodes that have high connectivity. Thus the eigen vector of the given node depends not only on its own centrality but the centrality of the nodes it connects to. A node with high Eigen Vector has connections to many other nodes that are themselves highly connected and central within the networks. To identify the relevant cases, Eigen Vector centrality assumes that inward citations contain more important information as well as the outward citations may provide a

clue to importance. Google's Page rank is one form of Eigen Vector analysis.

HITS Algorithms (Hyperlink Induced Topic): was developed by Jon Kleinberg in 1999, which is originated to Google's well known Page Rank algorithm. HIT algorithm aggregates the latent decisions in the citation network into authority scores and hub scores. These scores used to assess case centrality and rely on outwardly relevant cases and inwardly relevant cases.

TABLE 2: HITS Algorithms: Authority and Hub Scores generated by Pajek

Decisions	Authority Scores	Hub Scores	Inward citations	Outward citations
A	0.28	0	2	0
B	0.81	0.13	4	1
C	0.42	0.50	2	2
D	0.22	0.56	2	2
E	0.06	0.37	1	1
F	0.17	0.12	1	2
G	0	0.37	0	3
H	0	0.37	0	1

The table 2 exhibits HITS algorithms for given legal citation network. It reveals that the decisions B, C, D with high betweenness serve as a communication hub that facilitates transmission of ideas. Even though the precedent C is an overruled decision, it occupies the central core of the network. It depicts that the overruled precedents are also important.

Authority scores: The authority scores of a case depend on the number of times it is cited by the other relevant cases and the quantity of the cases that cite it. The

authority score implies the inwardly relevant cases, widely cited by other prestigious decisions. The high authority score of a case helps political scientists, legal experts, judges, law professionals to identify the most important case of "landmark cases". It also predicts the most important or landmark case in the future also. The authority scores will also use to rank the importance of every case in the network with a fraction of the time and effort and without the any ideological bias.

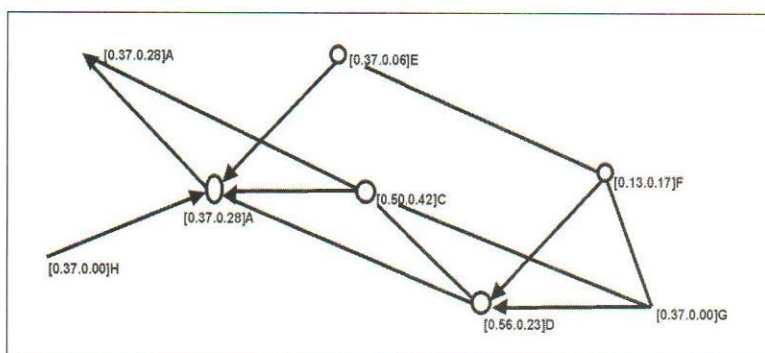


Figure 7. HITS Algorithms: Authority & Hub Scores

Hub scores: Hub scores of a case imply on outwardly relevant cases, which indicates that number of cases it cites and the quality of the cases it cites, thereby helping to define which decisions are pertinent to a given legal

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TABLE 3: Network Analyzing and Visualizing Tools:

S. No	Name of the Tools	Platform	Software Nature
1	PAJEK	WINDOWS	Freeware
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3	NETDRAW	WINDOWS	Freeware
4	MAGE	WINDOWS	Freeware
5	GUESS	All Platform	Freeware
6	R	All Platform	Freeware
7	GEPHI	All Platform	Freeware
8	NODEXL	All Platform	Freeware

11. Network Analyzing and Visualizing Tools

There are many number of network visualizing tools are available to analysis the citation legal networks. Table 3 lists some of the open source, shareware programmes. These tools are predominantly identified, experimented and utilized by the legal research scholars. These tools may also require expertise knowledge in programming.

12. Conclusion

The article has just scratched the surface of a broad subject. It confirms that analysis of the decisions of court represents web of law to which the law is often analogized. This study also elucidates that the tools and techniques borrowed from the social network theories are utilized in legal networks helps to study about the overall structures of legal citation networks and evince the most relevant decisions which assist the legal professionals, jurists in stare decisis.

This study explores that network algorithms such as degree centrality helps to identify the most legally central cases. The relationship between the citing and cited precedents and the context which it prevailed are studied through the algorithms of closeness and betweenness centrality. Eigen Vector Analysis and HITS algorithms are also employed in identifying the highly relevant or authoritative decisions. This article may motivate

additional theoretical and empirical analysis of legal citation network and its role in structuring the bounds of collective conception.

The algorithms that have been developed for bibliographic citation analysis may also be tested with legal citation network as it resembles acyclic network features. The legal citation network is intricate creatures as new decision or over ruled opinions changes the overall structure of the legal citation network. Hence findings of any study in this field will lead to scope for new research areas.

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It's clear that agriculture, done right, is the best means the world has today to simultaneously tackle food security, poverty and environmental degradation.

– Irene Rosenfeld

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Decomposition of Malmquist Productivity Index (MPI) Using Technical and Financial Parameters: A Case of Indian Electricity Distribution Utilities- A state-wise analysis

N. K. BISHNOI AND POOJA GAUR

In this paper, Malmquist Productivity Index (MPI) has been used to measure productivity change of electricity distribution companies (Discoms) of 30 states in India (state-wise clubbing of individual Discoms in each state) by decomposing productivity change into two parts namely technical efficiency change and technological change/frontier shift. The panel data for the period 2006 to 2015 has been taken for analysis. Result indicates that electricity distribution utilities are experiencing negative change in TFP (Total Factor Productivity) by an average of 1.1% from 2006-2015 while average technical efficiency progress is 1% and technological progress is (-)2.1% for the same time period. Therefore, productivity can be improved by decreasing technological inefficiency. Malmquist Productivity Index is further interpreted to find out the source of productivity change and managerial implications by further analyzing the components of technical change by following Yao Chen and Ali (2004) approach.

1. Introduction

In recent years, Data Envelopment Analysis (DEA) has been used for measuring the performance of different utilities engaged in various types of activities. The DEA uses mathematical programming tools to measure the productivity and efficiency of DMUs (Decision making units) by handling multiple input and output. DEA is used to establish a set of best practice DMUs among a set of observed DMUs and to identify the DMUs that are inefficient when compared with best practice set of DMUs. Assessing productivity of utilities is one of the central issues among researchers and regulators. DEA has been very useful in measurement of productivity of government, non government and other settings by estimating "Production Frontier". It also helps regulators and decision makers in their policies.

In this paper, Malmquist Productivity Index has been used to measure productivity change of electricity distribution companies (Discoms) of 30 states in India (state-wise clubbing individual Discoms) by decomposing productivity change into two parts namely technical efficiency change and technological change/ frontier shift.

Electricity is very important for a developing country like India where demand for power is continuously increasing. The history of Indian power sector can be studied under various legislatives regimes: Electricity Act (1948), Electricity Act (1991), Electricity Act (1998) and Electricity Act (2003).

Indian electricity distribution utilities are loss making utilities (Tripta *et al.* 2005). Major reasons for the loss is inability to recover its cost of power (the cost of power includes operation and maintenance cost, establishment & administrative cost, interest payment, depreciation and power purchase cost etc) (Planning commission 2013-

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14). Indian electricity distribution sector has long been riddled with poor financial health despite frequent aids and bailout given by the central government. So, performance evaluation studies relating to electricity distribution sector is an important part to understand the impact of these mechanisms.

We know for meaningful analysis of profitability in highly regulated monopoly market like power, we must benchmark cost and revenue. Despite the critical importance of Discoms there is no academically rigorous study available pertaining to the source of productivity change of electricity distribution utilities in India implications by further analyzing the components of productivity change. So, our study endeavored to study the performance of electricity distribution utilities in India by measuring productivity change and further decomposing productivity change into two parts namely technical efficiency change and technological change/ Frontier shift. MPI is interpreted to find out the source of productivity change and managerial implications by further analyzing the components of technical change following Yao Chen and Ali (2004) approach. This study will help authorities in taking effective steps to overcome shortcomings of electricity distribution sector by finding out the source and pattern of productivity change. It will also be helpful in finding out about change in strategy and managerial implications and whether such shifts were favorable or not.

The present paper is divided as follows. Section 2 provides review of literature while section 3 provides various definitions of productivity, DEA based MPI and its further decomposition following Yao et al (2004). Section 4 provides data and methodology while section 5 gives result and analysis and finally section 6 describes conclusion.

3. Methodology

In 1953, Malmquist associated distance function with efficiency measurement. Two indexes for measurement of productivity change were developed and named after Malmquist (he proposed neither one). One Index is developed by Caves *et al.* (1982) and other by Bjurek in (1996). One index is defined as ratio of physical output index to physical input index and can be extended to multiple input and output indexes given by Caves *et al.* that defines only input and output distance function separately. Malmquist Index given by Caves *et al.* is more popular than index given by Bjurek (Fried *et al.*). Fare *et*

al. (1992) construct the DEA based Malmquist total factor productivity index based upon the work of Farrel (DEA) and Caves *et al.* (productivity index). To avoid any arbitrary choice of referred technology, Fare *et al.* give MPI as a geometric mean of two Malmquist index given by Caves *et al.* (1982).

The formula given below is based on MPI given by Fare *et al.* (1992), which is a distance function that uses panel data to measure productivity change over time. These distance function can be input oriented or output oriented. In input oriented MPI, emphasis is given on minimize input vector for given output vector and in output oriented MPI, emphasis is on to maximize output vector for given input vector. MPI decomposes itself in two ratios. Ratio outside bracket is called technical efficiency change ratio and inside the bracket is technological change ratio. Ratio inside the bracket is geometric mean of two Malmquist index given by Caves *et al.* (1982). It uses both ratios because if we only use technical efficiency change scores, results can be misinterpreted because of environmental change like; technological change therefore, in MPI both ratios showing technical efficiency and technological change are used. If we calculate Malmquist total factor productivity change assuming constant return to scale, total factor productivity change is equal to product of technical efficiency change and technological change. But if we take VRS (variable return to scale) instead of CRS (constant return to scale) then TFP further decomposes technical efficiency change components into pure technical efficiency change and scale efficiency change. Fare *et al.* describe Malmquist total factor productivity index as follows:

$$m(x^{t+1}, y^{t+1}, x^t, y^t) = \left[\frac{D^t(x^{t+1}, y^{t+1})}{D^t(x^t, y^t)} \times \frac{D^{t+1}(x^{t+1}, y^{t+1})}{D^{t+1}(x^t, y^t)} \right]^{\frac{1}{2}}$$

Here x is input, y is output and time period has been taken as t and t+1.

Or it can be re written as follows:

$$m(x^{t+1}, y^{t+1}, x^t, y^t) = \underbrace{\frac{D^{t+1}(x^{t+1}, y^{t+1})}{D^t(x^t, y^t)}}_{\text{Technical Efficiency Change}} \left[\underbrace{\frac{D^t(x^{t+1}, y^{t+1})}{D^{t+1}(x^{t+1}, y^{t+1})}}_{\text{Technological Change}} \times \frac{D^t(x^t, y^t)}{D^{t+1}(x^t, y^t)} \right]^{\frac{1}{2}}$$

We must calculate four distance functions by solving four linear programming equations including two single period measure and two mixed period measures under CRS assumption.

Decomposition of Malmquist Productivity Index (MPI) Using Technical and Financial Parameters: A Case of Indian Electricity Distribution Utilities- A state-wise analysis

N. K. BISHNOI AND POOJA GAUR

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2. Review of Literature

Paper name	Author name	Year	Objective	Tool	Findings
DEA Malmquist Productivity Measure: New insights with an application to computer industry	Yao Chen and Agha Iqbal Ali	2004	To provide an extension to DEA- Based Malmquist approach by further analyzing two Malmquist components by illustrating it with an example of Fortune Global 500 computer and office equipment companies for period 1991-1997	MPI	Provide an extension to DEA- Based Malmquist approach by further analyzing two Malmquist components
Revenue Malmquist Productivity Index and Application in bank branch	Navanbakhsh, Jahanshahloo, Hossinzadeh and Taeb Z.	2006	To provide an extension to DEA- Based Malmquist approach by calculating cost and revenue MPI by further analyzing two Malmquist components and illustrating it with an example of 36 Iranian commercial bank branches.	Cost and Revenue MPI	Provide an extension to DEA- Based Malmquist approach by further analyzing two Malmquist components
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The economic theory of index numbers and the measurement of input, output and productivity	Caves, Christensen and Diewert	1982	To develop index number procedures for making comparison under various circumstances	New application of index number in terms of input, output and productivity	Tornquist Malmquist index can be used in translog functions which are not necessary to be homogeneous and is a geometric mean of two MPI.

Here we use input oriented CRS measure, therefore the LP equations will be:

Two single period measures: -

$$D^t(X^t, Y^t) = \min \theta$$

$$\text{s.t } \sum_{j=1}^n \lambda_j x_{ij}^t \leq \theta x_i^t \quad i = 1, 2, 3 \dots m.$$

$$\sum_{j=1}^n \lambda_j x_{rj}^t \geq y_r^t \quad r = 1, 2, 3 \dots p.$$

$$\lambda_j \geq 0; \quad j = 1, 2, 3 \dots n.$$

Here x is the input and y is the output. x_i^t is the i^{th} input and y_r^t is the r^{th} output in the t time period. The number of DMU is up to n^{th} . It is input oriented model therefore, it describes the amount of input should minimize to produce similar amount of output. By utilizing the above equation

we can get technical efficiency score in period t .

Second single period measure is as follows;

$$D^{t+1}(X^{t+1}, Y^{t+1}) = \min \theta$$

$$\text{s.t } \sum_{j=1}^n \lambda_j x_{ij}^{t+1} \leq \theta x_i^{t+1} \quad i = 1, 2, 3 \dots m.$$

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Here x_i^{t+1} is the i^{th} input and y_r^{t+1} is the r^{th} output in the $t+1$ time period. Number of DMU is up to n^{th} . It is input oriented model therefore it describes the amount of input should minimize to produce similar amount of output. By utilizing the above equation we can get technical efficiency score in period $t+1$.

Now we describe two mixed period measures. The first mixed period linear programming equation will be as follows;

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$$\lambda_j \geq 0; \quad j = 1, 2, 3 \dots n.$$

The single period LP equation exhibit technology of similar time period while mixed period LP equations show technology in different time period.

$$\text{Technical Efficiency Change} = \frac{D^{t+1}(X^{t+1}, Y^{t+1})}{D^t(X^t, Y^t)}$$

The first component of MPI shows technical efficiency change from period t to t+1 and second component shows technological change or frontier shift. Technical efficiency change shows how well a firm used its inputs to produce output. Technical efficiency change can further be analyzed by dividing into two components namely; pure efficiency change and scale efficiency change. If technical efficiency change score is greater than 1 (TEC>1) then it indicated improvement in technical efficiency (catching up); if technical efficiency change score is less than 1 (TEC<1) then it indicated decline in technical efficiency; if technical efficiency change score is equal to 1 (TEC=1) then it indicated no change in technical efficiency.

$$\text{Technological Change} = \left[\frac{D^t(X^{t+1}, Y^{t+1})}{D^{t+1}(X^{t+1}, Y^{t+1})} \times \frac{D^t(X^t, Y^t)}{D^{t+1}(X^t, Y^t)} \right]^{\frac{1}{2}}$$

The second component of MPI shows technological change or frontier shift. It is also called frontier shift because technical change leads to change in frontier, which is not possible in technical efficiency change. Technical efficiency scores show that whether a DMU is moving towards frontier

or not while technological change scores show shift in efficiency frontier. If technical change score is greater than 1 (FS>1) then it indicates technology progress; if technical change score is less than 1 (FS<1) then it indicated technology deterioration; if technical change score is equal to 1 (FS=1) then it indicated no change in technology.

If MPI (Malmquist Total Factor Productivity Index) is greater than one (m>1) it shows productivity improvement, if m<1 then it shows productivity decline but if m=1 then it shows no change in productivity of DMU from period t to t+1. Technological change can be viewed as aggregate and it reveals whether there is technical innovation, deterioration or no change in technology. But, further analysis can be done by decomposing its two ratios, which will reveal whether there is shift in strategy or not. So, decomposition of technological ratios can help us in further interpretation of results.

The above table explained that if both ratios of frontier shift are greater than one then it shows pure positive shift in frontier with no shift in strategy of input trade off. If both ratios are negative, then it shows pure negative shift in frontier with no shift in strategy of input trade off. But both conditions 3 and 4 given in the table shows that there is shift in strategy and input trade off.

Condition 3 shows that if first ratio of technological change is greater than one and another ratio is less than one, then frontier shift move from negative to positive. There can be two impact of this condition, if positive movement in frontier is greater than negative movement of frontier then frontier shift value will be greater than one FS > 1, if negative movement in frontier is greater than positive movement of frontier then frontier shift value will be less than one FS < 1.

Condition 4 shows that if first ratio of technological change is less than one and another ratio is greater than one, then frontier shift move from positive to negative. There can be two impacts of this condition; first, if positive movement in frontier is greater than negative movement of frontier then frontier shift value will be greater than one (FS > 1); second, if negative movement in frontier is greater than positive movement of frontier then frontier shift value will be less than one (FS < 1). From the above discussion, it is clear that condition one is best and second is worst situation for a firm. Among 3rd and 4th condition, condition 3rd is more favorable than 4th.

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Here x_i^{t+1} is the i^{th} input and y_r^{t+1} is the r^{th} output in the $t+1$ time period. Number of DMU is up to n^{th} . It is input oriented model therefore it describes the amount of input should minimize to produce similar amount of output. By utilizing the above equation we can get technical efficiency score in period $t+1$.

RATIO	I st ratio	II nd Ratio	frontier shift	Favorable/ unfavorable	Strategy Shift
	$\frac{D^t(x^{t+1}, y^{t+1})}{D^{t+1}(x^{t+1}, y^{t+1})}$	$\frac{D^t(x^t, y^t)}{D^{t+1}(x^t, y^t)}$			
Conditions					
1	> 1	> 1	pure positive (FS > 1)	Most favorable	
2	< 1	< 1	Pure negative (FS < 1)	Most unfavorable	
3	> 1	< 1	From negative to positive shift 1) If FS > 1, then positive shift greater than negative, or 2) If FS < 1, then negative shift greater than positive shift	Favorable than 4 th condition	Input trade off
4	< 1	> 1	From positive to negative shift 3) If FS > 1, then positive shift greater than negative or, 4) If FS < 1, then negative shift greater than positive shift	Less favorable than 3 rd condition	

4. Data and methodology

The data for the study of Indian electricity distribution utilities- state wise has been taken for period 2006 to 2015. The period selected to see the impact of Electricity Act, 2003 on Indian electricity distribution sector. The data for the selected period has been taken from document named "GENERAL REVIEW" All India Statistics issued by CEA (Central Electricity Authority), government of India and the annual reports published by power finance corporation Ltd. on performance of State Power Utilities. In this study, analysis of Indian electricity distribution utilities has been done on the basis of technical and financial parameters. The following inputs and outputs were used in this study. Inputs were transformer capacity (MVA) and distribution line length in (Ckt. Kms.) and Total Expenditures (Rs.) while the outputs were Sale (in MKwh), Total Income (Rs.) and Number of Consumers. The panel data has been used to calculate MPI of electricity distribution utilities of 30 states. Each state has been considered as a single decision making unit.

5. Result and discussion

First we look at table 1 and table 2 showing efficiency and efficiency change of DMUs from year 2006 to 2015 respectively. Table 1 shows that average efficiency score of DMUs is 81.35% in year 2014-15. West Bengal, NCT of Delhi, Puducherry and Jharkhand states show

efficiency scores 1 in all years and form efficient frontier. Apart from that Andhra Pradesh, Gujarat, Himachal Pradesh, Karnataka, Kerala, Odisha, Goa and Sikkim also get average efficiency score more than .90 (90%) and are quite efficient but doesn't form efficient frontier. Manipur, Jammu & Kashmir and Nagaland are worst performer utilities required additional measures to improve their efficiency.

From the table 2 it is clear that all DMUs other than Puducherry, NCT of Delhi, West Bengal and Jharkhand show efficiency improvement and decline. Many DMUs like Andhra Pradesh, Assam, Bihar, Haryana, Karnataka and Kerala etc. show average technical efficiency change scores greater than 1 thus implying that these DMUs are improving their technical efficiency compared to previous years but it does not mean that these DMUs are better in improving technical efficiency than a DMU scoring TEC = 1 because if a firm scores TEC = 1 means the respective DMU shows no improvement in technological efficiency scores because DMU is already a best practice firm. On the other hand, if a DMU getting score TEC > 1 shows improvement in technical efficiency over period while scores TEC < 1 shows decline in technological efficiency. Both improvement and decline exist for DMUs other than Puducherry, NCT of Delhi, West Bengal and Jharkhand. As far as MEAN is concerned, there is overall improvement of 1% in technical efficiency from year 2006 to 2015 which

TABLE 1: Technical Efficiency

DMU	MEAN
Andhra Pradesh	0.9543
Assam	0.7653
Bihar	0.679
Chhattisgarh	0.8622
Gujarat	0.9191
Haryana	0.7365
Himachal Pradesh	0.9643
Jammu & Kashmir	0.5534
Jharkhand	1
Karnataka	0.9396
Kerala	0.997
Madhya Pradesh	0.7604
Maharashtra	0.8435
Odisha	0.9629
Punjab	0.8014
Rajasthan	0.6093
Tamil Nadu	0.7314
Uttar Pradesh	0.7263
Uttarakhand	0.8047
West Bengal	1
Arunachal Pradesh	0.7261
NCT of Delhi	1
Goa	0.9685
Manipur	0.4993
Meghalaya	0.6933
Mizoram	0.6328
Nagaland	0.5349
Puducherry	1
Sikkim	0.9228
Tripura	0.8179
MEAN	0.8135

(Mean is equal to average mean of sample)

is a positive sign. But, there is inconsistency in technical efficiency. So, TEC scores shows inconsistency but overall improvement in technical efficiency of DMUs in period 2006 to 2015. It is also shown from the table that there is not a single year in which there is no technical decline in any DMU.

Table 3 shows technological change component, which also called frontier shift. The mean value of FS shows that there is negative shift of 2.1% in technical frontier during the period 2006 to 2015. So, TECHCH (Technological Change) scores show inconsistency because there is negative as well as positive shift in technical frontier during the period 2005-06 to 2014-15. There is not a single year in which all DMUs show technical improvement in all years. DMU. Apart from that there is not a single DMU which show technical improvement in all years. But, Andhra Pradesh, NCT of Delhi, Puducherry and Sikkim are the DMUs shows average positive shift in technical frontier during the period 2005-06 to 2014-15.

Table 4 discusses the components' shift in FS, which are based upon ratios described above. There are cross frontier shift in all years. Technology change at DMU level can be explained by taking example year. For example, in 2006-07 there are 9 DMUs namely Chhattisgarh, Kerala, Uttarakhand, West Bengal, Arunachal Pradesh, NCT of Delhi, Mizoram, Puducherry and Sikkim moving from negative facet to positive facet because their 1st ratio is greater than 1 and 2nd ratio is less than 1 which shows input trade off while Jammu & Kashmir and Jharkhand follow a consistent operating strategy because both the ratios are either greater than 1. In year 2014-15, all DMUs apart from Jharkhand, Kerala, West Bengal, NCT of Delhi and Goa follow a consistent operating strategy because both the ratios are either greater than 1 or less than 1. But Jharkhand, Kerala, West Bengal, NCT of Delhi and Goa are moving from one facet to another and changing their operating strategy. All these DMUs are moving from negative facet to positive facet because their 1st ratio is greater than 1 and 2nd ratio is less than 1 which shows input trade off and positive shift in strategy.

Table 5 shows the MPI. If we look at mean (geometric mean), we can say that there is productivity decline of 1.1% during period 2006 to 2015 while there is inconsistency in pattern of productivity change if we look at year wise mean. There is not a single DMU which show productivity improvement in all years from 2006 to 2015.

TABLE 2: EFFCH (Technical efficiency change)

DMUs	2007/06	2008/07	2009/08	2010/09	2011/10	2012/11	2013/12	2014/13	2015/14	MEAN
Andhra Pradesh	1.058	0.974	0.933	1.095	1.019	1.001	1.018	0.907	1.103	1.01
Assam	1.113	0.985	0.779	0.95	1.318	1.066	0.992	1.025	1.025	1.019
Bihar	1.11	1.141	0.885	0.761	1.466	0.943	1.175	1.155	0.892	1.04
Chhattisgarh	1.14	0.971	0.851	0.89	1.23	0.799	1.328	0.906	0.872	0.984
Gujarat	0.954	1.013	0.75	1.154	1.215	1.009	0.995	0.959	0.925	0.989
Haryana	1.236	0.909	0.926	0.879	1.443	0.598	1.462	1.044	0.982	1.019
Himachal Pradesh	1	1	1	1	0.944	0.974	0.947	1.042	1.101	1
Jammu & Kashmir	1.251	0.436	1.046	2.506	0.349	1.16	0.985	1.473	0.75	0.95
Jharkhand	1	1	1	1	1	1	1	1	1	1
Karnataka	1.006	1.021	1.08	0.737	1.31	1.03	1.006	0.994	0.977	1.008
Kerala	1	1	1	0.97	1.031	1	1	1	1	1
Madhya Pradesh	1.033	1.107	1.064	0.728	1.292	0.98	0.907	0.967	1.067	1.005
Maharashtra	1.082	1.052	0.747	0.988	1.456	1.06	0.953	0.912	1.013	1.015
Odisha	1	1	1	1	1	0.918	1.089	0.863	0.984	0.982
Punjab	0.997	1.066	0.907	1.043	1.236	1.113	0.972	1.004	0.933	1.026
Rajasthan	1.232	0.999	0.797	0.81	0.7	1.218	1.279	0.965	1.087	0.989
Tamil Nadu	1.046	0.906	0.877	0.83	1.216	1.263	0.788	1.237	0.927	0.995
Uttar Pradesh	1.186	1.064	1.157	0.798	1.244	0.898	1.24	0.703	1.114	1.026
Uttarakhand	0.982	0.87	0.821	1.105	1.572	1.061	0.937	1.068	0.829	1.008
West Bengal	1	1	1	1	1	1	1	1	1	1
Arunachal Pradesh	1.198	0.894	1.143	0.653	1.216	1.584	1.027	0.992	1.04	1.056
NCT of Delhi	1	1	1	1	1	1	1	1	1	1
Goa	1	1	1	0.905	1.106	1	0.849	1.178	0.931	0.992
Manipur	1.126	1.192	0.911	0.981	0.764	1.189	0.965	1.666	1.426	1.107
Meghalaya	1.125	1.338	0.804	0.98	1.254	0.894	0.937	0.935	1.083	1.026
Mizoram	0.974	0.939	0.943	0.688	1.039	1.634	1.015	1.014	0.923	0.995
Nagaland	1.107	1.167	0.814	0.932	0.74	1.253	1.091	1.523	0.841	1.027
Puducherry	1	1	1	1	1	1	1	1	1	1
Sikkim	0.962	1.061	1.229	0.85	1.177	1	1	1	1	1.025
Tripura	1.317	1.071	0.654	1.288	0.836	1.03	1.11	1.234	0.932	1.03
MEAN	1.07	0.993	0.928	0.952	1.068	1.039	1.027	1.043	0.985	1.01

(MEAN is equal to geometric mean of sample)

TABLE 3: TECHCH (TECHNICAL CHANGE) or FS (Frontier Shift)

DMUs	2007/06	2008/07	2009/08	2010/09	2011/10	2012/11	2013/12	2014/13	2015/14	MEAN
Andhra Pradesh	0.97	0.97	1.033	1.268	0.939	0.792	1.252	0.792	1.227	1.012
Assam	0.91	0.972	1.325	0.981	0.708	0.977	1.038	0.929	0.978	0.968
Bihar	0.84	0.976	1.087	1.177	0.728	1.012	1.069	0.955	1.02	0.976
Chhattisgarh	0.969	0.919	1.359	0.835	0.838	0.739	1.261	0.816	1.04	0.957
Gujarat	0.967	0.971	1.271	0.917	0.787	0.854	1.108	0.922	1.065	0.976
Haryana	0.905	1.004	1.095	1.215	0.714	0.973	1.034	0.989	1.089	0.993
Himachal Pradesh	0.728	1.055	1.124	1.005	0.95	1.042	1.126	0.994	0.912	0.986
Jammu & Kashmir	1.183	1.061	0.985	1.464	0.538	0.743	1.14	0.82	1.101	0.968
Jharkhand	1.2	0.951	1.086	0.943	1.045	0.812	1.313	0.718	0.735	0.959
Karnataka	0.953	0.959	1.061	1.044	0.753	0.939	1.213	0.774	1.022	0.959
Kerala	0.96	0.956	0.948	1.162	0.942	0.879	0.962	0.991	0.983	0.973
Madhya Pradesh	0.91	0.963	1.007	1.147	0.888	0.886	1.062	0.962	1.033	0.981
Maharashtra	0.923	0.963	1.192	1.018	0.703	0.93	1.051	0.987	1.066	0.973
Odisha	0.954	0.965	2.021	0.577	0.911	0.685	1.337	0.777	1.027	0.964
Punjab	0.871	0.987	1.14	1.077	0.684	0.947	1.075	0.982	1.067	0.971
Rajasthan	0.811	0.984	1.33	1.252	0.668	0.875	1.076	0.959	1.049	0.981
Tamil Nadu	0.951	1.002	1.003	1.173	0.839	0.783	1.229	0.846	1.056	0.977
Uttar Pradesh	0.908	1.068	0.914	1.163	0.789	0.912	1.134	0.907	1.114	0.982
Uttarakhand	0.994	0.956	1.297	0.954	0.736	0.953	1.108	0.955	1.039	0.989
West Bengal	0.977	1.095	0.992	1.344	0.797	0.783	1.003	1.007	1.014	0.99
Arunachal Pradesh	1	1.017	0.996	1.212	0.954	0.733	1.031	0.941	0.976	0.977
NCT of Delhi	1.002	0.873	1.479	1.06	1.074	1.169	0.951	1.008	1.093	1.068
Goa	0.957	0.983	1.026	1.022	0.865	0.87	1.11	0.991	0.939	0.971
Manipur	0.97	0.932	1.021	1.079	0.958	0.72	1.062	0.746	1.047	0.94
Meghalaya	0.8	0.98	1.326	1.034	0.757	1.027	1.117	0.953	1.034	0.991
Mizoram	1.003	0.985	0.964	1.236	0.962	0.707	1.006	1	1.02	0.978
Nagaland	0.904	0.9	1.138	0.995	0.966	0.753	0.981	0.758	1.054	0.931
Puducherry	1.038	0.997	0.951	1.008	1.019	1.066	1.059	0.903	1.035	1.007
Sikkim	1.022	1.003	1.131	0.898	1.098	1.112	1.173	1.021	0.819	1.025
Tripura	0.774	0.976	1.527	0.846	0.839	0.964	1.019	0.792	1.011	0.952
MEAN	0.94	0.98	1.143	1.055	0.838	0.879	1.099	0.901	1.018	0.979

TABLE 4(1): Components of MPI

Period	2007/06		2008/07		2009/08	
	$\frac{D^{2006}(X^{2007}, Y^{2007})}{D^{2007}(X^{2007}, Y^{2007})}$	$\frac{D^{2006}(X^{2006}, Y^{2006})}{D^{2007}(X^{2006}, Y^{2006})}$	$\frac{D^{2007}(X^{2008}, Y^{2008})}{D^{2008}(X^{2008}, Y^{2008})}$	$\frac{D^{2007}(X^{2007}, Y^{2007})}{D^{2008}(X^{2007}, Y^{2007})}$	$\frac{D^{2008}(X^{2009}, Y^{2009})}{D^{2009}(X^{2009}, Y^{2009})}$	$\frac{D^{2008}(X^{2008}, Y^{2008})}{D^{2009}(X^{2008}, Y^{2008})}$
Andhra Pradesh	0.966	0.974	0.964	0.977	1.025	1.041
Assam	0.909	0.910	0.981	0.963	1.299	1.350
Bihar	0.906	0.778	0.976	0.976	1.026	1.152
Chhattisgarh	1.032	0.911	0.959	0.881	1.314	1.407
Gujarat	0.958	0.976	0.959	0.983	1.246	1.296
Haryana	0.942	0.869	1.009	0.999	1.072	1.120
Himachal Pradesh	0.991	0.534	1.100	1.012	1.223	1.032
Jammu & Kashmir	1.120	1.248	1.108	1.017	0.995	0.974
Jharkhand	1.419	1.015	1.073	0.844	1.122	1.052
Karnataka	0.945	0.962	0.960	0.959	0.939	1.198
Kerala	1.019	0.904	1.016	0.898	0.991	0.907
Madhya Pradesh	0.902	0.918	0.960	0.965	0.950	1.066
Maharashtra	0.914	0.932	0.964	0.964	1.194	1.190
Odisha	0.999	0.911	0.981	0.950	3.008	1.357
Punjab	0.900	0.844	0.995	0.979	1.141	1.140
Rajasthan	0.815	0.808	0.989	0.978	1.255	1.410
Tamil Nadu	0.952	0.950	1.020	0.985	0.986	1.020
Uttar Pradesh	0.942	0.876	1.129	1.012	0.916	0.912
Uttarakhand	0.989	0.997	0.949	0.964	1.274	1.319
West Bengal	1.060	0.900	1.200	0.998	1.140	0.863
Arunachal Pradesh	1.003	0.998	1.019	1.015	1.017	0.978
NCT of Delhi	1.073	0.936	1.370	0.557	2.284	0.958
Goa	0.998	0.917	1.032	0.935	1.055	0.999
Manipur	0.972	0.967	0.967	0.901	1.048	0.998
Meghalaya	0.849	0.754	0.983	0.978	1.272	1.384
Mizoram	1.007	0.999	0.972	0.999	0.919	1.013
Nagaland	0.905	0.905	0.900	0.900	1.150	1.127
Puducherry	1.078	0.999	1.124	0.885	1.012	0.894
Sikkim	1.047	0.997	0.980	1.025	1.307	0.980
Tripura	0.763	0.784	0.976	0.977	1.575	1.480

Table 4(2): Components of MPI

Period	2010/09		2011/10		2012/11	
DMU	$\frac{D^{2009}(X^{2010}, Y^{2010})}{D^{2010}(X^{2010}, Y^{2010})}$	$\frac{D^{2009}(X^{2009}, Y^{2009})}{D^{2010}(X^{2009}, Y^{2009})}$	$\frac{D^{2010}(X^{2011}, Y^{2011})}{D^{2011}(X^{2011}, Y^{2011})}$	$\frac{D^{2011}(X^{2011}, Y^{2011})}{D^{2011}(X^{2010}, Y^{2010})}$	$\frac{D^{2011}(X^{2012}, Y^{2012})}{D^{2012}(X^{2012}, Y^{2012})}$	$\frac{D^{2011}(X^{2011}, Y^{2011})}{D^{2012}(X^{2011}, Y^{2011})}$
Andhra Pradesh	1.365	1.176	0.905	0.974	0.973	0.644
Assam	0.959	1.003	0.694	0.721	0.979	0.975
Bihar	1.162	1.193	0.711	0.746	1.041	0.983
Chhattisgarh	0.846	0.823	0.884	0.795	1.022	0.534
Gujarat	0.936	0.897	0.763	0.813	0.965	0.755
Haryana	1.230	1.199	0.705	0.723	0.983	0.963
Himachal Pradesh	1.033	0.978	0.938	0.964	1.041	1.042
Jammu & Kashmir	2.096	1.023	0.828	0.349	0.775	0.711
Jharkhand	1.169	0.760	1.135	0.962	1.467	0.449
Karnataka	0.915	1.192	0.740	0.767	0.970	0.909
Kerala	1.208	1.117	0.933	0.952	0.991	0.780
Madhya Pradesh	1.151	1.143	0.904	0.874	0.978	0.802
Maharashtra	1.051	0.986	0.721	0.686	0.960	0.900
Odisha	0.937	0.356	0.969	0.857	1.007	0.467
Punjab	1.040	1.114	0.691	0.676	0.966	0.929
Rajasthan	1.308	1.199	0.791	0.565	0.960	0.795
Tamil Nadu	1.183	1.163	0.837	0.840	0.784	0.782
Uttar Pradesh	1.126	1.201	0.763	0.817	0.989	0.840
Uttarakhand	0.982	0.927	0.721	0.750	1.011	0.898
West Bengal	1.745	1.036	0.980	0.649	1.022	0.600
Arunachal Pradesh	1.321	1.112	0.954	0.954	0.749	0.717
NCT of Delhi	1.275	0.882	1.296	0.889	1.614	0.847
Goa	1.021	1.022	0.894	0.837	0.874	0.866
Manipur	1.108	1.050	0.951	0.964	0.680	0.764
Meghalaya	1.053	1.014	0.780	0.734	1.031	1.022
Mizoram	1.333	1.145	0.963	0.961	0.748	0.669
Nagaland	1.043	0.949	0.969	0.964	0.784	0.722
Puducherry	1.047	0.970	1.172	0.887	1.275	0.891
Sikkim	1.024	0.787	1.305	0.925	1.190	1.040
Tripura	0.877	0.816	0.822	0.855	0.958	0.969

Table 4(3): Components of MPI

Period	2013/12		2014/13		2015/14	
DMU	$\frac{D^{2012}(X^{2013}, Y^{2013})}{D^{2013}(X^{2013}, Y^{2013})}$	$\frac{D^{2012}(X^{2012}, Y^{2012})}{D^{2013}(X^{2012}, Y^{2012})}$	$\frac{D^{2013}(X^{2014}, Y^{2014})}{D^{2014}(X^{2014}, Y^{2014})}$	$\frac{D^{2013}(X^{2013}, Y^{2013})}{D^{2014}(X^{2013}, Y^{2013})}$	$\frac{D^{2014}(X^{2015}, Y^{2015})}{D^{2015}(X^{2015}, Y^{2015})}$	$\frac{D^{2014}(X^{2014}, Y^{2014})}{D^{2015}(X^{2014}, Y^{2014})}$
Andhra Pradesh	1.507	1.041	0.955	0.656	1.462	1.030
Assam	1.022	1.054	0.955	0.905	0.980	0.976
Bihar	1.062	1.075	0.954	0.958	1.023	1.017
Chhattisgarh	1.502	1.057	0.964	0.691	1.042	1.037
Gujarat	1.159	1.059	0.965	0.881	1.070	1.059
Haryana	1.035	1.033	0.985	0.992	1.089	1.089
Himachal Pradesh	1.095	1.159	0.993	0.995	0.912	0.913
Jammu & Kashmir	1.138	1.144	0.779	0.866	1.048	1.158
Jharkhand	1.526	1.130	0.916	0.562	1.212	0.446
Karnataka	1.428	1.029	0.934	0.641	1.012	1.032
Kerala	1.018	0.910	0.990	0.992	1.008	0.959
Madhya Pradesh	1.070	1.055	0.960	0.966	1.036	1.029
Maharashtra	1.045	1.057	0.987	0.988	1.065	1.068
Odisha	1.665	1.074	0.970	0.623	1.015	1.040
Punjab	1.070	1.079	0.981	0.983	1.068	1.066
Rajasthan	1.083	1.071	0.971	0.946	1.048	1.051
Tamil Nadu	1.292	1.169	0.938	0.764	1.058	1.054
Uttar Pradesh	1.239	1.039	1.042	0.790	1.110	1.117
Uttarakhand	1.131	1.086	1.005	0.907	1.069	1.009
West Bengal	1.031	0.976	1.037	0.978	1.040	0.988
Arunachal Pradesh	1.027	1.034	0.913	0.969	0.988	0.964
NCT of Delhi	1.001	0.904	1.027	0.989	1.197	0.998
Goa	1.144	1.076	1.101	0.893	1.063	0.830
Manipur	1.101	1.025	0.682	0.816	1.002	1.094
Meghalaya	1.113	1.123	0.949	0.957	1.033	1.035
Mizoram	1.015	0.996	1.004	0.996	1.021	1.020
Nagaland	0.992	0.974	0.732	0.785	1.037	1.070
Puducherry	1.195	0.940	1.116	0.730	1.162	0.923
Sikkim	1.247	1.103	1.096	0.951	0.970	0.691
Tripura	1.034	1.006	0.882	0.711	0.986	1.037

TABLE 5: TFPCH (CHANGE)

DMUs	2007/06	2008/07	2009/08	2010/09	2011/10	2012/11	2013/12	2014/13	2015/14	MEAN
Andhra Pradesh	1.026	0.945	0.964	1.389	0.957	0.792	1.275	0.718	1.353	1.022
Assam	1.012	0.958	1.032	0.932	0.933	1.042	1.03	0.952	1.002	0.987
Bihar	0.932	1.114	0.963	0.896	1.067	0.954	1.256	1.104	0.91	1.016
Chhattisgarh	1.105	0.892	1.156	0.743	1.031	0.59	1.675	0.739	0.907	0.941
Gujarat	0.923	0.984	0.954	1.058	0.956	0.862	1.102	0.884	0.985	0.965
Haryana	1.118	0.913	1.015	1.067	1.031	0.581	1.512	1.033	1.069	1.011
Himachal Pradesh	0.728	1.055	1.124	1.005	0.897	1.015	1.067	1.036	1.005	0.986
Jammu & Kashmir	1.48	0.463	1.031	3.669	0.188	0.862	1.123	1.207	0.826	0.919
Jharkhand	1.2	0.951	1.086	0.943	1.045	0.812	1.313	0.718	0.735	0.959
Karnataka	0.959	0.979	1.146	0.769	0.987	0.967	1.22	0.769	0.999	0.967
Kerala	0.96	0.956	0.948	1.127	0.972	0.879	0.962	0.991	0.983	0.973
Madhya Pradesh	0.94	1.065	1.071	0.835	1.147	0.868	0.963	0.93	1.102	0.986
Maharashtra	0.998	1.013	0.89	1.006	1.023	0.986	1.002	0.9	1.081	0.987
Odisha	0.954	0.965	2.021	0.577	0.911	0.629	1.456	0.671	1.01	0.946
Punjab	0.868	1.051	1.034	1.123	0.845	1.054	1.045	0.986	0.995	0.996
Rajasthan	1	0.983	1.06	1.014	0.468	1.066	1.376	0.925	1.141	0.971
Tamil Nadu	0.994	0.908	0.88	0.973	1.021	0.988	0.969	1.046	0.979	0.972
Uttar Pradesh	1.077	1.137	1.058	0.928	0.982	0.819	1.406	0.638	1.24	1.008
Uttarakhand	0.976	0.832	1.065	1.054	1.156	1.011	1.038	1.019	0.861	0.997
West Bengal	0.977	1.095	0.992	1.344	0.797	0.783	1.003	1.007	1.014	0.99
Arunachal Pradesh	1.198	0.91	1.139	0.791	1.16	1.161	1.059	0.933	1.015	1.032
NCT of Delhi	1.002	0.873	1.479	1.06	1.074	1.169	0.951	1.008	1.093	1.068
Goa	0.957	0.983	1.026	0.925	0.956	0.87	0.942	1.168	0.874	0.963
Manipur	1.092	1.111	0.93	1.059	0.732	0.857	1.025	1.243	1.492	1.04
Meghalaya	0.9	1.311	1.067	1.013	0.95	0.919	1.047	0.891	1.12	1.017
Mizoram	0.978	0.925	0.909	0.85	1	1.156	1.021	1.013	0.942	0.974
Nagaland	1	1.05	0.926	0.927	0.715	0.944	1.071	1.154	0.886	0.956
Puducherry	1.038	0.997	0.951	1.008	1.019	1.066	1.059	0.903	1.035	1.007
Sikkim	0.983	1.064	1.39	0.763	1.293	1.112	1.173	1.021	0.819	1.051
Tripura	1.019	1.045	0.999	1.09	0.701	0.993	1.131	0.977	0.942	0.981
MEAN	1.006	0.973	1.06	1.004	0.894	0.913	1.129	0.94	1.003	0.989

TABLE 6: Malmquist Index Summary of Annual Means (Geometric Mean)

Year	Effch	Techch	pech	sech	Tfpch
2007/06	1.07	0.94	1.055	1.015	1.006
2008/07	0.993	0.98	0.999	0.993	0.973
2009/08	0.928	1.143	0.928	1	1.06
2010/09	0.952	1.055	1	0.952	1.004
2011/10	1.068	0.838	1.056	1.011	0.894
2012/11	1.039	0.879	0.98	1.059	0.913
2013/12	1.027	1.099	1.025	1.002	1.129
2014/13	1.043	0.901	1.038	1.004	0.94
2015/14	0.985	1.018	1.003	0.982	1.003
Mean	1.01	0.979	1.009	1.002	0.989

We know that Malmquist total factor productivity consists of technical efficiency change and technological change. Therefore, we can make this analysis on the basis of averages shown in table 6. In period 2006-07, there is improvement of 0.6% (approx) in average productivity and this is combined effect of both 7% improvement in technical efficiency change and 6% negative shift in technological frontier. So, more focus should be on technological advancement. Like this, if we make analysis for remaining period then we can find inconsistency in productivity scores as well as its reasons because technical efficiency change and technological change both are responsible. So, we should look at MEAN scores to get the overall picture. For period 2006 to 2015, there is decline of 1.1% in average productivity, which is combined effect of 1% improvement in overall technical efficiency and 2.1% negative shift in overall technological frontier. So, more focus should be on technological advancement to enhance productivity of DMUs.

As shown in table 6, we can see inconsistency in scores of effch, techch and tfpch in the study period. Tfpch shows progress apart from year 2007-08, 2010-11, 2011-12 and 2013-14. Similarly, effch and techch also shows score inconsistency over years. Only year 2012-13, both effch and techch show positive change with positive impact on tfpch. Effch average scores show improvement in efficiency by 1% which is a combination of both 0.9% positive change in pech (pure efficiency change) and 0.2% positive change in sech (scale efficiency change) average scores.

In table 7, we make analysis at DMU level, there is

overall average productivity gain for DMUs namely Andhra Pradesh, Bihar, Haryana, Uttar Pradesh, Arunachal Pradesh, NCT of Delhi, Manipur, Meghalaya, Puducherry and Sikkim out of them Andhra Pradesh, NCT of Delhi, Puducherry and Sikkim are only DMUs that show both improvement in technical efficiency and positive shift of technological frontier. Apart from these DMUs, all show positive shift of technological frontier that have negative impact on overall productivity.

Table 8 defines the various components in the form of ratio associated with productivity change. Let us take Sikkim where special attention needs to be paid. For period 2007 to 2008 and 2008 to 2009, table 8 shows productivity gain because its MPI > 1 in both time periods but if we look at table 8, we came to know that technology of this DMU move from positive facet to negative facet in period 2007 to 2008 while in period technology of same DMU move from negative facet to positive facet. So, we can conclude from this observation that though Sikkim scores productivity gain in both the period but the cause of productivity gain was different. Second, Madhya Pradesh in 2008-09 has shown productivity loss because its MPI < 1 but cause of productivity loss is combined negative impact of technological components on productivity while its technology move from positive facet to negative facet which show unfavorable change similarly, Mizoram in 2013-12 has productivity loss and cause of productivity loss is combined negative impact of technological components on productivity but this time its technology move from negative facet to positive facet which show

TABLE 7: Malmquist Index Summary of Firms Means (Geometric Mean)

Firm	effch	techch	pech	sech	Tfpch
Andhra Pradesh	1.01	1.012	1	1.01	1.022
Assam	1.019	0.968	1.02	0.999	0.987
Bihar	1.04	0.976	1.049	0.992	1.016
Chhattisgarh	0.984	0.957	0.991	0.993	0.941
Gujarat	0.989	0.976	1	0.989	0.965
Haryana	1.019	0.993	1.019	1	1.011
Himachal Pradesh	1	0.986	1	1	0.986
Jammu & Kashmir	0.95	0.968	0.966	0.984	0.919
Jharkhand	1	0.959	1	1	0.959
Karnataka	1.008	0.959	1	1.008	0.967
Kerala	1	0.973	1	1	0.973
Madhya Pradesh	1.005	0.981	1.009	0.996	0.986
Maharashtra	1.015	0.973	1	1.015	0.987
Odisha	0.982	0.964	0.986	0.996	0.946
Punjab	1.026	0.971	1.01	1.016	0.996
Rajasthan	0.989	0.981	0.977	1.013	0.971
Tamil Nadu	0.995	0.977	1	0.995	0.972
Uttar Pradesh	1.026	0.982	1.039	0.988	1.008
Uttarakhand	1.008	0.989	1.018	0.989	0.997
West Bengal	1	0.99	1	1	0.99
Arunachal Pradesh	1.056	0.977	1.03	1.025	1.032
NCT of Delhi	1	1.068	1	1	1.068
Goa	0.992	0.971	0.999	0.993	0.963
Manipur	1.107	0.94	1.068	1.036	1.04
Meghalaya	1.026	0.991	1.026	1.001	1.017
Mizoram	0.995	0.978	1.011	0.984	0.974
Nagaland	1.027	0.931	1.038	0.989	0.956
Puducherry	1	1.007	1	1	1.007
Sikkim	1.025	1.025	1	1.025	1.051
Tripura	1.03	0.952	1.011	1.019	0.981
MEAN	1.01	0.979	1.009	1.002	0.989

TABLE 8(1): Malmquist Productivity Change Information

PERIOD	2007/06				2008/07				2009/08				2010/09			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
DMU / RATIO																
Andhra Pradesh	<1	<1	>1	>1	<1	<1	<1	<1	>1	>1	<1	>1	>1	>1	>1	<1
Assam	<1	<1	>1	>1	<1	<1	<1	<1	>1	>1	<1	>1	<1	>1	<1	>1
Bihar	<1	<1	>1	<1	<1	<1	>1	>1	>1	>1	<1	>1	>1	>1	<1	<1
Chhattisgarh	>1	<1	>1	<1	<1	<1	<1	<1	>1	>1	<1	>1	<1	<1	<1	<1
Gujarat	<1	<1	<1	<1	<1	<1	>1	<1	>1	>1	<1	>1	<1	<1	>1	<1
Haryana	<1	<1	>1	>1	>1	<1	<1	>1	>1	>1	<1	>1	>1	>1	<1	<1
Himachal Pradesh	<1	<1	=1	>1	>1	>1	=1	>1	>1	>1	=1	>1	>1	<1	=1	>1
Jammu & Kashmir	>1	>1	>1	<1	>1	>1	<1	>1	<1	<1	>1	>1	>1	>1	>1	<1
Jharkhand	>1	>1	=1	<1	>1	<1	=1	<1	>1	>1	=1	>1	>1	<1	=1	<1
Karnataka	<1	<1	>1	<1	<1	<1	>1	<1	<1	>1	>1	>1	<1	>1	<1	<1
Kerala	>1	<1	=1	<1	>1	<1	=1	<1	<1	<1	=1	<1	>1	>1	<1	<1
Madhya Pradesh	<1	<1	>1	>1	<1	<1	>1	<1	<1	>1	>1	<1	>1	>1	<1	<1
Maharashtra	<1	<1	>1	>1	<1	<1	>1	<1	>1	>1	<1	>1	>1	<1	<1	<1
Odisha	<1	<1	=1	>1	<1	<1	=1	<1	>1	>1	=1	>1	<1	<1	=1	<1
Punjab	<1	<1	<1	<1	<1	<1	>1	<1	>1	>1	<1	>1	>1	>1	>1	>1
Rajasthan	<1	<1	>1	>1	<1	<1	<1	<1	>1	>1	<1	>1	>1	>1	<1	>1
Tamil Nadu	<1	<1	>1	<1	>1	<1	<1	>1	<1	>1	<1	<1	>1	>1	<1	<1
Uttar Pradesh	<1	<1	>1	>1	>1	>1	>1	<1	<1	<1	>1	>1	>1	>1	<1	<1
Uttarakhand	<1	<1	<1	<1	<1	<1	<1	>1	>1	>1	<1	>1	<1	<1	>1	>1
West Bengal	>1	<1	=1	>1	>1	<1	=1	>1	>1	<1	=1	>1	>1	>1	=1	<1
Arunachal Pradesh	>1	<1	>1	>1	>1	>1	<1	<1	>1	<1	>1	>1	>1	>1	<1	>1
NCT of Delhi	>1	<1	=1	>1	>1	<1	=1	>1	>1	<1	=1	<1	>1	<1	=1	>1
Goa	<1	<1	=1	<1	>1	<1	=1	>1	>1	<1	=1	<1	>1	>1	<1	<1
Manipur	<1	<1	>1	>1	<1	<1	>1	>1	>1	<1	<1	>1	>1	>1	<1	<1
Meghalaya	<1	<1	>1	>1	<1	<1	>1	<1	>1	>1	<1	>1	>1	>1	<1	<1
Mizoram	>1	<1	<1	<1	<1	<1	<1	>1	<1	>1	<1	>1	>1	>1	<1	>1
Nagaland	<1	<1	>1	<1	<1	<1	>1	>1	>1	>1	<1	>1	>1	<1	<1	<1
Puducherry	>1	<1	=1	>1	>1	<1	=1	<1	>1	<1	=1	>1	>1	<1	=1	>1
Sikkim	>1	<1	<1	<1	<1	>1	>1	>1	>1	<1	>1	>1	>1	<1	<1	>1
Tripura	<1	<1	>1	<1	<1	<1	>1	<1	>1	>1	<1	>1	<1	<1	>1	<1

TABLE 8(2): Malmquist Productivity Change Information

PERIOD	2011/10				2012/11				2013/12			
	1	2	3	4	1	2	3	4	1	2	3	4
DMU / RATIO	1	2	3	4	1	2	3	4	1	2	3	4
Andhra Pradesh	<1	<1	>1	<1	<1	<1	>1	>1	>1	>1	>1	<1
Assam	<1	<1	>1	<1	<1	<1	>1	<1	>1	>1	<1	>1
Bihar	<1	<1	>1	>1	>1	<1	<1	<1	>1	>1	>1	<1
Chhattisgarh	<1	<1	>1	>1	>1	<1	<1	<1	>1	>1	>1	>1
Gujarat	<1	<1	>1	<1	<1	<1	>1	>1	>1	>1	<1	<1
Haryana	<1	<1	>1	>1	<1	<1	<1	>1	>1	>1	>1	>1
Himachal Pradesh	<1	<1	<1	<1	>1	>1	<1	>1	>1	>1	<1	>1
Jammu & Kashmir	<1	<1	<1	<1	<1	<1	>1	>1	>1	>1	<1	>1
Jharkhand	>1	<1	=1	>1	>1	<1	=1	<1	>1	>1	=1	>1
Karnataka	<1	<1	>1	<1	<1	<1	>1	<1	>1	>1	>1	>1
Kerala	<1	<1	>1	<1	<1	<1	=1	>1	>1	<1	=1	<1
Madhya Pradesh	<1	<1	>1	>1	<1	<1	<1	<1	>1	>1	<1	>1
Maharashtra	<1	<1	>1	>1	<1	<1	>1	>1	>1	>1	<1	<1
Odisha	<1	<1	=1	<1	>1	<1	<1	<1	>1	>1	>1	>1
Punjab	<1	<1	>1	<1	<1	<1	>1	>1	>1	>1	<1	>1
Rajasthan	<1	<1	<1	<1	<1	<1	>1	>1	>1	>1	>1	>1
Tamil Nadu	<1	<1	>1	>1	<1	<1	>1	<1	>1	>1	<1	<1
Uttar Pradesh	<1	<1	>1	<1	<1	<1	<1	<1	>1	>1	>1	>1
Uttarakhand	<1	<1	>1	>1	>1	<1	>1	>1	>1	>1	<1	>1
West Bengal	<1	<1	=1	<1	>1	<1	=1	>1	>1	<1	=1	<1
Arunachal Pradesh	<1	<1	>1	>1	<1	<1	>1	<1	>1	>1	>1	>1
NCT of Delhi	>1	<1	=1	>1	>1	<1	=1	>1	>1	<1	=1	>1
Goa	<1	<1	>1	<1	<1	<1	=1	<1	>1	>1	<1	>1
Manipur	<1	<1	<1	<1	<1	<1	>1	>1	>1	>1	<1	<1
Meghalaya	<1	<1	>1	<1	>1	>1	<1	>1	>1	>1	<1	>1
Mizoram	<1	<1	>1	=1	<1	<1	>1	<1	>1	<1	>1	<1
Nagaland	<1	<1	<1	<1	<1	<1	>1	<1	<1	<1	>1	<1
Puducherry	>1	<1	=1	>1	>1	<1	=1	>1	>1	<1	=1	<1
Sikkim	>1	<1	>1	>1	>1	>1	=1	<1	>1	>1	=1	>1
Tripura	<1	<1	<1	<1	<1	<1	>1	>1	>1	>1	>1	<1

Table 8(3): Malmquist Productivity Change Information

PERIOD		2014/13				2015/14			
Dmu	RATIO	1	2	3	4	1	2	3	4
Andhra Pradesh		<1	<1	<1	<1	>1	>1	>1	>1
Assam		<1	<1	>1	>1	<1	<1	>1	>1
Bihar		<1	<1	>1	>1	>1	>1	<1	<1
Chhattisgarh		<1	<1	<1	<1	>1	>1	<1	>1
Gujarat		<1	<1	<1	<1	>1	>1	<1	<1
Haryana		<1	<1	>1	<1	>1	>1	<1	>1
Himachal Pradesh		<1	<1	>1	>1	<1	<1	>1	<1
Jammu & Kashmir		<1	<1	>1	>1	>1	>1	<1	>1
Jharkhand		<1	<1	=1	=1	>1	<1	=1	>1
Karnataka		<1	<1	<1	<1	>1	>1	<1	<1
Kerala		<1	<1	=1	=1	>1	<1	=1	<1
Madhya Pradesh		<1	<1	<1	>1	>1	>1	>1	<1
Maharashtra		<1	<1	<1	<1	>1	>1	>1	<1
Odisha		<1	<1	<1	<1	>1	>1	<1	<1
Punjab		<1	<1	>1	>1	>1	>1	<1	<1
Rajasthan		<1	<1	<1	<1	>1	>1	>1	=1
Tamil Nadu		<1	<1	>1	<1	>1	>1	<1	<1
Uttar Pradesh		>1	<1	<1	<1	>1	>1	>1	>1
Uttarakhand		>1	<1	>1	>1	>1	>1	<1	<1
West Bengal		>1	<1	=1	=1	>1	<1	=1	<1
Arunachal Pradesh		<1	<1	<1	>1	<1	<1	>1	>1
NCT of Delhi		>1	<1	=1	=1	>1	<1	=1	>1
Goa		>1	<1	>1	>1	>1	<1	<1	<1
Manipur		<1	<1	>1	>1	>1	>1	>1	>1
Meghalaya		<1	<1	<1	<1	>1	>1	>1	<1
Mizoram		>1	<1	>1	<1	>1	>1	<1	<1
Nagaland		<1	<1	>1	>1	>1	>1	<1	=1
Puducherry		>1	<1	=1	=1	>1	<1	=1	>1
Sikkim		>1	<1	=1	=1	<	<1	=1	<1
Tripura		<1	<1	>1	>1	<1	>1	<1	>1

(Where first ratio is, $\frac{D^t(X^{t+1}, Y^{t+1})}{D^{t+1}(X^{t+1}, Y^{t+1})}$ second ratio is $\frac{D^t(X^t, Y^t)}{D^{t+1}(X^t, Y^t)}$, third ratio is TEC $\frac{D^{t+1}(X^{t+1}, Y^{t+1})}{D^t(X^t, Y^t)}$,

and fourth ratio is M $\left[\frac{D^t(X^{t+1}, Y^{t+1})}{D^{t+1}(X^{t+1}, Y^{t+1})} \times \frac{D^t(X^t, Y^t)}{D^{t+1}(X^t, Y^t)} \right]^{\frac{1}{2}}$

favorable change. Therefore, we can say that ratio component of frontier shift can help us in making further explanations of reason and sources of productivity change.

6. Conclusion

In this study, non parametric approach of MPI has been used to measure change in total factor productivity of electricity distribution utilities (state wise) in India from year 2006 to 2015. Result indicates that electricity distribution utilities experiencing negative change in TFP by an average of 1.1% for period 2006-2015 while average technical efficiency progress is 1% and technological progress is (-)2.1% for the same time period. We know TFP is combination of efficiency change and technological change, therefore we can say that TFP is negative because positive technical efficiency change is less than negative technological change. So, productivity can be improved by technological advancement.

There is overall average productivity gain for DMUs namely Andhra Pradesh, Bihar, Haryana, Uttar Pradesh, Arunachal Pradesh, NCT of Delhi, Manipur, Meghalaya, Puducherry and Sikkim out of them Andhra Pradesh, NCT of Delhi, Puducherry and Sikkim are only DMUs that show both improvement in technical efficiency and positive shift of technological frontier.

Apart from above, result shows that NCT of Delhi had a mean productivity improvement of 6.8% that is composed of unity average positive efficiency change and 6.8% average positive technological change. NCT of Delhi got first rank among other 10 DMUs that got productivity improvement in total factor productivity change for study period. Therefore, techch (technological change) had more impact of TFP than effch (efficiency change) in NCT of Delhi case. By further analyzing effch, we came to know, positive effch is due to average positive change in pech (pure technical efficiency) and positive change in sech (scale efficiency).

When we analyze the other side, Jammu & Kashmir had the worst DMU among other 20 DMUs that show productivity decline for study period because of it highest

8.1% productivity decline. The source of productivity decline is combination of both negative effch and techch. But effch of (-5%) has more impact than of 3.2% negative techch. By further analyzing we found the source of its negative efficiency change. Its negative effch is due to both (-) 3.4% pech and (-) 1.6% sech. Therefore, Jammu & Kashmir performance can be enhanced by improving managerial performance as well as by operating on MPSS (Most Productive Scale Size).

MPI is further interpreted to find out the source of productivity change and managerial implications by further analyzing the components of productivity change. This study will also help authorities in taking effective steps to overcome shortcomings of electricity distribution sector because further decomposition of MPI help them in find out the source and pattern of productivity change. It is also helpful in finding out about changes in particular DMU strategy and managerial implications and to know whether such strategic shifts were favorable or not.

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“Sustainable global food security is attainable if we have open minds on technology and focus on high productivity and efficiency. We cannot feed tomorrow’s world with yesterday’s technology.”

– Aalt Dijkhuizen

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