Focus: Rural Development

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Productivity

Contents

Global Climate Change and Confronting the Challenges of Food Security

A. N. SARKAR

Over the past centuries the global climate has been changing as a result of industrial uses of fossil fuels and various anthropogenic activities, resulting in greenhouse gas emissions, global warming, etc. Climate change and its impact has been quite pronounced in the past two decades. Among other things, one of the significant impacts experienced in recent times is in the areas of environment, ecology, economy, agricultural production and productivity as well as global food security including human nutrition. This article discusses in a nutshell the impact of climate change, among other things, on environment, agriculture and food security.

Introduction

Global climate has undergone phenomenal changes over past centuries, leaving behind trails of devastation of all conceivable kinds. Accumulated scientific evidences suggest that these changes are mainly triggered by intensive and wide-spread use of fossil-fuels and various anthropogenic actions, causing 'greenhouse effect' and consequential 'Global warming'. The resulting impacts of these are evident in the forms of melting glaciers, rise of ocean water, natural disasters, loss of lives and biodiversity, to mention a few. The compounded effects of these impacts are manifested, among others, on lower agricultural, aquatic and livestock productivity, in general, and the emerging threat on food security and livelihood support systems in particular. According to the UN's Food and Agriculture Organisation (FAO, 2015), food security exists when 'all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life'. The scale of food security ranges from complete food security, through various stages of hunger, malnutrition and famine. The achievement of global food security depends on the production of enough food for all, alongside the adequate distribution of food around the world. Food security is a pressing issue in developing nations, but with a global population of over seven billion, it's an issue that affects us all. The major threats to global food security include a rapidly increasing global population, climate change and the consequent reduction of land suitable for agriculture, rising numbers of pests and diseases and increasing resistance to pesticides.

IPCC Assessment Reports on Climate Change

A deeper understanding and quantification of these processes and their incorporation in climate models have progressed rapidly since the publication of the IPCC First

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Assessment Report in 1990. As climate science and the earth's climate have continued to evolve over recent decades, increasing evidence of 'anthropogenic' influences on climate change has been found. Correspondingly, the IPCC has made increasingly more definitive statements about human impacts on climate. Debate has stimulated a wide variety of climate change research. The results of this research have refined but not significantly redirected the main scientific conclusions from the sequence of IPCC assessment. The IPCC's three-volume *Third Assessment Report* was finalized in early 2001 (IPCC, 2001). Its message is clear: intensive climate research and monitoring gives scientists much greater confidence in their understanding of the causes and consequences of global warming. The assessment presents a compelling snapshot of what the earth will probably look like in the late 21st century, when a global warming of 1.4 fi 5.8°C (2.5–10.4°F) will influence weather patterns, water resources, the cycling of the seasons, ecosystems, extreme climate events and much more. Even greater changes are expected in the more distant future (IPCC, 2001)

The IPCC Assessment confirms that well-designed, market-oriented policies can reduce emissions and the costs of adapting to the unavoidable impacts of climate change while simultaneously generating significant economic benefits. These benefits include more cost-effective energy systems, more rapid technological innovation, reduced expenditures on inappropriate subsidies and more efficient markets. Cutting emissions can also reduce damage from local environmental problems, including the health effects of air pollution. Until recently, most assessments of the impact of climate change on the food and agriculture sector have focused on the implications for production and global supply of food, with less consideration of other components of the food chain. The Intergovernmental Panel on Climate Change has left no doubt that global climate change will have a profound impact on agriculture during the coming decades. The impact of climate change and the rapid pace of world population growth threaten global food security. The recent energy crisis, food price inflation and the global economic recession revealed the vulnerability of communities everywhere and, in particular, the lasting hardship imposed on the poor. Together, these trends present agriculture with a truly daunting set of challenges as well as a potentially great opportunity

Impact of Global Warming on Climate Change

Global warming has resulted in the warming of the oceans, rising of the sea levels, melting of glaciers and diminished snow cover in the Northern Hemisphere. An analysis was conducted by the Goddard Institute for Space Studies (GISS), in New York City based on temperatures recorded at meteorological stations around the world and satellite data over the oceans. The constructed climate map illustrates how much warmer temperatures were in the decade (2000–09) compared to average temperatures recorded between 1951 and 1980. The Arctic regions exhibited the most severe warming as depicted in red colour. The blue coloured areas show the lower than normal temperatures and thus are very few. The recent catastrophic climatic events like the massive floods in Pakistan and India, the Hurricane Katrina in the United States, the prolonged droughts in Australia, China, Pakistan, India and Texas, are all the results of increased temperatures due to global warming (http://www.climateemergencyinstitute.com/uploads/GLOBAL_WARMING_AND_ITS_IMPACTS_ON_CLIMATE_OF_INDIA.pdf).

Global warming is already underway with consequences that must be faced today as well as tomorrow. Evidence of changes to the Earth's physical, chemical and biological processes is now evident on every continent. To fully appreciate the urgency of climate change, it's important to understand the ways it affects society and the natural environment. Sea levels are rising and glaciers are shrinking; record high temperatures and severe rainstorms and droughts are becoming increasingly common. Changes in temperatures and rainfall patterns alter plant and animal behavior and have significant implications for humans. Rising sea levels and increasing incidence of extreme events pose new risks for the assets of people living in affected zones, threatening livelihoods and increasing vulnerability to future food insecurity in all parts of the globe. Such changes could result in a geographic redistribution of vulnerability and a relocalization of responsibility for food security—prospects that need to be considered in the formulation of adaptation strategies for people who are currently vulnerable or could become so within the foreseeable future.

Water, Energy and Food Security Nexus

Water, energy and food is essential for human well-being, poverty reduction and sustainable development. Global projections indicate that demand for freshwater, energy

and food will increase significantly over the next decades under the pressure of population growth and mobility, economic development, international trade, urbanization, diversifying diets, cultural and technological changes, and climate change. Agriculture accounts for 70 percent of total global freshwater withdrawals, making it the largest user of water. Water is used for agricultural production, forestry and fishery, along the entire agro-food supply chain, and it is used to produce or transport energy in different forms. At the same time, the food production and supply chain consumes about 30 percent of total energy consumed globally. Energy is required to produce, transport and distribute food as well as to extract, pump, lift, collect, transport and treat water. Cities, industry and other users, too, claim increasingly more water, energy and land resources, and at the same time, face problems of environmental degradation and in some cases, resources scarcity. This situation is expected to be exacerbated in the near future as 60 percent more food will need to be produced in order to feed the world population in 2050. Global energy consumption is projected to grow by up to 50 percent by 2035. Total global water withdrawals for irrigation are projected to increase by 10 percent by 2050 (FAO, 2014).

As water becomes scarce, and competition is growing between the energy and agricultural sectors, there is still a lack of reliable and policy-relevant data and information to guide water allocation choices. As demand grows there is increasing competition for resources between water energy agriculture fisheries livestock forestry mining transport and other sectors with unpredictable impacts for livelihoods and the environment. Large-scale water infrastructure projects, for instance, may have synergetic impacts, producing hydropower and providing water storage for irrigation and urban uses. However this might happen at the expense of downstream agro-ecological systems and with social implications, such as resettlements. Similarly, growing bio-energy crops in an irrigated agriculture scheme may help improve energy supply and generate employment opportunities, but it may also result in increased competition for land and water resources with impacts on local food security (FAO, 2014). Climate change and energy are two major factors redefining the world food equation and having an enormous impact on the food security of poor people. Climate change is now not only a better-understood scientific fact, but also a phenomenon which has already affected global temperatures, regional weather patterns, and physical and biological systems.

At the global level, food system performance today depends more on climate than it did 200 years ago; the possible impacts of climate change on food security have tended to be viewed with most concern in locations where rain-fed agriculture is still the primary source of food and income. However, this viewpoint is short-sighted. It does not take into account of the other potentially significant impacts that climate change could have on the global food system, and particularly on market prices. These impacts include those on the water and energy used in food processing, cold storage, transport and intensive production, and those on food itself, reflecting higher market values for land and water and, possibly, payments to farmers for environmental services.

Climate Change affecting Food Security

Climate change will affect all four dimensions of food security: food availability, food accessibility, food utilization and food systems stability. It will have an impact on human health, livelihood assets, food production and distribution channels, as well as changing purchasing power and market flows. Its impacts will be both short term, resulting from more frequent and more intense extreme weather events, and long term, caused by changing temperatures and precipitation patterns. People who are already vulnerable and insecure are likely to be the first to be affected. Agriculture-based livelihood systems that are already vulnerable to food insecurity face immediate risk of increased crop failure, new patterns of pests and diseases, lack of appropriate seeds and planting material, and loss of livestock. Food systems will also be affected through possible internal and international migration, resource-based conflicts and civil unrest triggered by climate change and its impacts (FAO, 2008). Agriculture, forestry and fisheries will not only be affected by climate change, but also contribute to it through emitting greenhouse gases. They also hold part of the remedy; however, they can contribute to climate change mitigation through reducing greenhouse gas emissions by changing agricultural practices. At the same time, it is necessary to strengthen the resilience of rural people and to help them cope with this additional threat to food security (FAO, 2008). Particularly in the agriculture sector, climate change adaptation can go hand-in-hand with mitigation. Climate change adaptation and mitigation measures need to be integrated into the overall development approaches and agenda. Food security is the outcome of food system processes all along the food chain. Climate change will affect food security through its impacts on all components

of global, national and local food systems. Climate change is real, and its first impacts are already being felt. It will first affect the people and food systems that are already vulnerable, but over time the geographic distribution of risk and vulnerability is likely to shift. Certain livelihood groups need immediate support, but everybody is at risk.

Climate Change and Impact on Global Food Production and Nutrition

According to the Food and Agriculture Organization of the United Nations, global demand for food is expected to increase by at least 50 percent from now to 2050 (FAO, 2014; 2015). Food production to meet the growing demand is severely limited by both climate change and air pollution. High temperature extremes and air pollutants such as ground-level ozone are highly damaging to crops. Future food production is highly vulnerable to both climate change and air pollution with implications for global food security. Climate change adaptation and ozone regulation have been identified as important strategies to safeguard food production, but little is known about how climate and ozone pollution interact to affect agriculture, nor the relative effectiveness of these two strategies for different crops and regions. The relative contribution of these factors to the overall variability of food production is different in different regions. It also depends on the current level of production variability in the region.

Recent research has focused on regional and national assessments of the potential effects of climate change on agriculture. These efforts have, for the most part, treated each region or nation in isolation, without relation to changes in production in other places. At the same time, there has been a growing emphasis on understanding the interactions of climatic, environmental, and social factors in a wider context, leading to more integrated assessments of potential impacts in national impact studies completed in the United States, Canada, Brazil and Indonesia, Malaysia, and Thailand. Regional studies have been conducted in high latitude and semi-arid agricultural areas, and the US Midwest. The results of these and other agricultural impact studies have been summarized in the IFCC Working Group II Report (Rosenzweig et al., 1993). Sensitivity studies of world agriculture to potential climate changes have indicated that the effect of moderate climate change on world and domestic economies may be small, as reduced production in some areas is balanced by gains in others. However, there has to date been no integrated (i.e., combined biophysical and economic) assessment of the potential

effects of climate change on world agriculture (Rosenzweig et al., 1993).

Climate change acts as a multiplier of existing threats to food security and of hunger and malnutrition. It will make climate disasters more frequent and intense, land and water more scarce and difficult to access, and increases in agricultural productivity even harder to achieve. This could accelerate urbanization and intensify conflicts over even scarcer resources, likely to lead to new humanitarian crises, migration and displacement. A significant body of research shows that changes in climatic conditions have already affected the production of some staple crops. Higher temperatures impact yields, while changes in rainfall could affect both crop quality and quantity. Climate change will also affect people's access to food and their nutrition. Climate change could increase the prices of major crops in some regions. For the most vulnerable people, lower agricultural output would also mean lower income. Under these conditions, the poorest people – who already use most of their income on food – would have to sacrifice additional income to meet their nutritional requirements. Nutrition will be further affected by impacts on dietary diversity, water quality, care practices and health. Already, more than 20 percent of variation in height in developing countries is determined by environmental factors, particularly drought. Drought has severe impacts on dietary diversity and reduces overall food consumption.

Mitigation and Adaptation of Climate Change for ensuring Food Security

To assess all aspects of climate change and its impact and formulate realistic strategies to mitigate these effects, the Intergovernmental Panel on Climate Change (IPCC) was founded in 1988. Last month, the IPCC released its 5th Assessment Report (AR5), which synthesizes and evaluates research related to impacts, adaptation and mitigation of climate change since the previous Assessment Reports (IPCC, 2013). *The IPCC Report on Food security and Food production systems was developed by the IPCC's three working groups. Working Group II focused on two very challenging and interrelated topics; agriculture and food security. Chapter 7, 'Food security and food production systems,' details the current effects of climate change, the expected decline in crop production by 2030 as a result of climate change, and what farmers can do to mitigate some of the negative impacts. As stated by the chapter authors: 'The questions for this chapter are how far climate and its*

change affect current food production systems and food security and the extent to which they will do so in the future. (IPCC. 2013)'.

A key conclusion of the authors is that climate challenge will increase the risk of reduced crop productivity associated with heat and drought stress. Negative impacts in average crop and pasture yield will likely be clearly visible by 2030. For example, in parts of Brazil, rice and wheat yields are could decline by 14 percent, according to their forecast. To mitigate the effects, they recommend the following crop management adaptations:

- Cultivar adjustment (e.g., developing new crop varieties that are tolerant to drought. heat and salt via breeding or genetic modification)

- Planting date adjustment

- Combined planting date and cultivar adjustment

- Irrigation optimization

- Fertilizer optimization

Mitigating climate change means reducing greenhouse gas emissions and sequestering or storing carbon in the short term and of even greater importance making development choices that will reduce risk by curbing emissions over the long term. Although the entire food system is a source of greenhouse gas emissions primary production is by far the most important component. Incentives are needed to persuade crop and livestock producers agro-industries and ecosystem managers to adopt good practices for mitigating climate change. In the food and agriculture sector adaptation and mitigation often go hand in hand so adopting an integrated strategic approach represents the best way forward. Several funds within the United Nations system finance specific activities aimed at reducing greenhouse gas emissions and increasing resilience to the negative impacts of climate change. Because many mitigation actions that would have high payoffs also represent good options for adaptation. Within the food and agriculture sectors of low-income developing countries it may be possible to obtain additional resources from bilateral and multilateral aid agencies which are becoming increasingly interested in investing development resources in adaptive responses to climate change. The ultimate goal of FAO's climate change work is to inform and promote local dialogue about what the impacts of climate change are likely to be and what options exist for reducing vulnerability. and to provide local communities with site-specific solutions.

Millennium Development Goals (MDGs) and addressing Food Security

Despite considerable efforts of national governments and the international community to reduce hunger and malnutrition in the context of the Millennium Development Goals (MDGs) and other initiatives. the proportion of undernourished people in developing countries has been largely constant since the mid-1990s (FAO, 2015). While some progress in hunger reduction had been made until 2007. the 2008 global food price crisis and subsequent food price spikes in local markets have pushed or kept millions of people in food insecurity. The main causes of this rise in global and national food insecurity include trade restrictions imposed by major food exporters. bio-fuels policies, and increased food commodity speculation combined with poor national and local governance to cope with such shocks. Besides, longer-term dynamics such as climate change and mounting food demand through changing dietary patterns and growing populations have strained international food markets and are expected to lead to further rising food prices and increasing price volatility. A broad range of policies has been proposed to reduce the vulnerability of the world's poor to global food price spikes. including amendments in global trade rules that restrict the possibility of food exporters to impose export bans. stricter rules on bio-fuel production and food commodity speculation the institutionalization of grain reserves to stabilize prices in times of crises. and the creation and expansion of national social safety mechanisms. in addition to a boost in investments to raise agricultural productivity and adapt to changing climate sustainably.

UNFCCC's Commitment to Global Food Security under the Climate Change Regime

Agriculture and the future of Global food security figure very importantly in climate change negotiations. As stated in Article II of the *United Nations Framework Convention on Climate Change* (UNFCCC). the goal is to ensure stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Agriculture. rural livelihoods. sustainable management of natural resources and food security are inextricably linked within the development and climate change challenges of the twenty-first century. Indeed, not only is food security an explicit concern under climate change; successful adaptation and mitigation responses in agriculture can only

be achieved within the ecologic, economic and social sustainability goals set forth by the World Food Summit, the Millennium Development Goals and the UNFCCC.

The international negotiations on climate change are taking place in pursuance of the Bali Action Plan adopted in 2007 and all Parties of the UNFCCC are working to reach an agreed outcome at Copenhagen in December 2009. The Climate change discourse covers a wide range of issues that include a shared vision for long term cooperation under the Convention, adaptation to and mitigation of climate change and provision of technology and financing for addressing Climate Change. As part of these negotiations, India has expressed its views on several issues, in particular the issues affecting developing countries. It has also put forward proactive submissions to the UNFCCC on various issues. The twelve (12) papers contained in this publication encapsulate the major submissions made by India on the relevant topics in the course of the negotiations during 2008 and 2009. Of particular note are India's submissions on technology and forestry. On technology, India has presented a proposal to establish a mechanism for the development and transfer of technologies needed by developing countries for addressing climate change. On forestry, India has put forth an innovative proposal on forestry-related emissions, in which the emphasis is not only on reducing deforestation, but also on forest conservation, sustainable forestry management and enhancement of forest carbon stock.

Impacts of Climate Change on Agriculture

Agriculture is the world's largest use of land, occupying about 38 percent of the Earth's terrestrial surface. The agricultural community has had tremendous successes in massively increasing world food production over the past five decades and making food more affordable for the majority of the world's population, despite a doubling in population. In order to continue to meet the needs of a growing and changing population, the food system needs to deliver a new wave of innovation. Innovation which for example, tackles food waste, improves nutritional outcomes, increases resilience or restores the natural environment. The impact of climate change is vast. One of its threatening sectors is agriculture. Food production is adversely affected. Global warming (climate change) leads to sea-level rise with its attendant consequences, and includes fiercer weather, increased frequency and intensity of storms, floods, hurricanes, droughts, increased frequency of fires, poverty, malnutrition and series of health

and socio-economic consequences. It has a cumulative effect on natural resources and food production.

Climate change is already affecting agriculture with effects unevenly distributed across the world. Future climate change will likely negatively affect crop production in low latitude countries while effects in northern latitudes may be positive or negative. Climate change will probably increase the risk of food insecurity for some vulnerable groups, such as the poor. Agriculture contributes to climate change by (i) anthropogenic emissions of greenhouse gases and (ii) by the conversion of non-agricultural land (e.g., forests) into agricultural land. Agriculture, forestry and land-use change contributed around 20 to 25 percent to global annual emissions in 2010. There are ranges of policies that can reduce the risk of negative climate change impacts on agriculture, and to reduce GHG emissions from the agriculture sector. By affecting agricultural productivity, climate change has already begun to impact crop yields, food prices, and livelihoods and as a result is starting to impact on food security and hunger outcomes. The world food crisis of 2007–2008 pushed 44 million people into severe poverty and hunger between June 2010 and February 2011 alone. Nearly half of the economically active population in developing countries—2.5 billion people—relies on agriculture for their livelihoods. Climate change is expected to increase child malnutrition 20% by 2050 (http://www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_2050.pdf).

Agriculture accounts for 70 percent of all freshwater drawn from rivers, lakes and aquifers, including 80–90 percent of water that is consumed and not returned. One-third of the world's population lives in moderate to high water-stressed areas. With population growth, industrial development, and the expansion of irrigated agriculture, water demand in the next 20 years will exceed supply if business-as-usual approaches continue. The water gap is closely tied to food provision and trade. Population growth and globalization are increasing the demand for and availability of freshwater, resulting in widespread freshwater stress and vulnerability. Almost half the world population (47 percent or 3.9 billion people, which is one billion more people than today) will be living under severe water stress by 2030 if no new policies are introduced. This could equate to 62–76 percent of the global land area. A recent study found that 20 percent of the world's aquifers are overexploited, some even more so. The groundwater

footprint for the Upper Ganges aquifer is more than 50 times the size of the aquifer. In China, 20 percent of the global population lives on only 5 percent of the world's freshwater supply, the water table is falling fast and the price of water is rising. President Hu Jintao has noted that water shortages impact China's economic security, ecological security, and national security (http://www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_2050.pdf)

The most important challenge for agriculture in the 21st century is the need to feed increasing numbers of people—most of whom are in developing countries—while at the same time, conserving the local and global environment in the face of limited soil and water resources and growing pressures associated with socio-economic development and climate change. Projected population and socio-economic growth will double current food demand by 2050. To meet this challenge in developing countries, cereal yields need to increase by 40 percent; net irrigation water requirements by 40–50 percent and 100–200 million hectares of additional land may be needed, largely in sub-Saharan Africa and Latin America. Food insecurity will continue to be a serious issue in coming decades. Despite significant projected overall reductions in hunger projected by the end of the century—from the current 850 million to about 200–300 million—many developing countries will continue to experience serious poverty and food insecurity, due to localized high population growth rates, poor socio-economic capacity and continued natural resource degradation. By the end of the century, 40 to 50 percent of all undernourished are expected to live in sub-Saharan Africa. Projections indicate that MDG for undernourishment will not be met, despite robust projected economic growth. Indeed, prevalence of hunger may indeed be halved, but not before 2030, unless additional policy measures are implemented (FAO, 2014, 2015).

World Food Summits and concerns for Food Security

During the World Food Summit in 1996 'Food Security' was defined as a situation 'when all people at all times have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life'. This definition stressed the importance of elements that go beyond the availability of food which are: access (individual entitlement for obtaining food), food safety and nutritious value, and stability through time. In the last century, the primary focus has been on enhancing food productivity and during the

'Green Revolution' (1966–1985) research and technological improvements led to significant increases in yields, which meant that the overall global production kept ahead of the overall demand. Besides the above scenario relating to food security, due to the steep rise in food price and the resulting protests across countries in the developing world, the issue of food security has risen dramatically in the international agenda culminating in the High-Level Conference on World Food Security or the Food Crisis Summit in Rome, June 2008. The challenge facing decision-makers emanates from the multidimensional character of food security and its linkage to a number of issues on the international agenda such as climate change, trade and development and questions surrounding international governance (http://www.fao.org/foodclimate/hlc-home/en/).

Confronting the Challenges of Food Security' in the 21st Century

The global food system confronts many challenges in the 21st century. To feed the global population with healthy and nutritious food by 2050, the food system must simultaneously produce more food for a population expected to reach about 9.3 billion, improve livelihoods for the hundreds of millions of rural poor and reduce environmental impacts, including ecosystem degradation, high greenhouse gas emissions and water scarcity. Whilst 850 million are still hungry and suffer from malnutrition, there is an emerging obesity crisis, impacting over 1.4 billion people, which impacts health care systems in many countries, within both the developed and developing world.

Projections show that feeding the population in 2050 would require a 70 percent increase in production from 2005–50 with significant increases in key commodities. By 2030, demand for food will increase by 50 percent (85, percent for meat). Demand for cereals and oilseeds are predicted to increase by 15–20 percent in the next decade, driven by consumption in emerging economies such as Indonesia, Vietnam and India. Understanding the need for change within the food system and the principles that would make a sustainable food system is only the beginning of the journey. Innovative action is now needed by all sections of the sector's value network in all parts of the world—not just in Europe, but also in China, India, Africa, Latin America and South East Asia—to act on these opportunity areas for innovation and start to create a global sustainable food system (Forum for the Future, 2014).

There is widespread agreement that today the global food system is unsustainable. Our global population is rapidly growing and becoming wealthier, one reason of that being our dietary patterns which are changing and our demand for land, scarce resources and resource intensive foods, such as meat and dairy, continues to rise. At the same time the demands on our planet are on the increase. These conditions are further compounded by changing environmental conditions (increasing climate variability, water scarcity, etc.) which make food production increasingly difficult or unpredictable in many regions of the world. Our food system also continues to undermine many of the key ecosystems and ecosystem services on which it ultimately depends. Agriculture is the world's largest use of land, occupying about 38 percent of the earth's terrestrial surface. The agricultural community has had tremendous successes in massively increasing world food production over the past five decades and making food more affordable for the majority of the world's population, despite a doubling of population. In order to continue to meet the needs of a growing and changing population, the food system needs to deliver a new wave of innovation. Innovation which, for example tackles food waste, improves nutritional outcomes, increases resilience or restores the natural environment. Food, the bedrock of life and the foundation of our physical, spiritual and emotional well-being, is at the heart of many of the critical environmental, social and economic challenges we confront in the 21st century. Food sustainability, food security and feeding the 850 million who are hungry are central issues which now exercise the minds of businesses, governments and civil society as never before. Put this in the context of a population that will reach 9.3 billion by 2050 and changing dietary patterns, particularly in China and parts of the Far-East, the challenge becomes even more daunting.

Conclusion

Global climate change has been one of the greatest concerns of humanity in this century. Unless there are no positive interventions in policies or slowing down processes of global climate change incidences at the regional, national and local levels there will be no abatement or respite from the adverse consequences, especially in terms of environmental quality, loss of biodiversity, decline in agricultural production and productivity. A threat to the global food security is looming large in the near future. Some of the significant steps that the government should take in this direction would be: (i) gradual cut of greenhouse gas emissions through ongoing negotiation projects; (ii) international funding of climate projects focusing on mitigation and adaptation; (iii) gradual switching over to renewable in the energy mix, thus cutting on the quantum of use of fossil-fuels in the power, transport, manufacturing and domestic sector; (iv) scientific carbon management and emission trading with carbon taxation provisions and (v) waste management, recycling and low-cost technology to foster green economy in a sustainable manner.

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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

Productivity Improvement of Agro Based Farm Workers using Ergonomic Approach

T. RAMESH BABU AND N. DINESH KARTHIK

The agriculture sector satisfies the needs of human beings by providing food to survive and employment to a large amount of workforce. Over 58 percent of rural households depend on agriculture as their principal means of livelihood in India. Agricultural export constitutes 10 percent of the country's exports. Agriculture is becoming a risky occupation because of various factors ranging from economic problems to psychological issues faced by agriculture workers. As per the recent survey taken by National Sample Survey Organisation (NSSO), agriculture occupies nearly 49 percentage of total workforce and there are 24.6 crore workers employed in agricultural sector. But low income from agriculture sector will hinder the growth of this sector. Agriculture workers have been undergoing many challenges such as low income, uncertainty in monsoon, no guaranteed job and income. They are also undergoing many physical problems because the farming work needs more physical excretion and posture. In this paper the authors are making an attempt to study the postural problems using ergonomic study and highlight the importance of ergonomics on productivity improvement.

1. Introduction

During the last two decades Indian agriculture has been facing major challenges like declining input efficiency, conversion of agriculture land to other purposes, degradation of natural resources, etc. This affects the unorganized sector agro workers. As per latest estimates released Central Statistical Office (CSO) the share of agricultural products/agriculture and allied sector in the Gross Domestic Product (GDP) of the country was 51.9 percent in 1950-51, which has now come down to 13.7 percent in 2012-13. This may be due to various problems which affects farming activities directly and indirectly.

2. Agriculture Sector In India

Indian agriculture is the backbone of the Indian economy. It supports almost 17 percent of world population from 2.3 percent of world geographical area and 4.2 percent of world's water resources. Indian agriculture is characterized by agro-ecological diversities in soil, rainfall, temperature, and cropping system.

Besides favourable solar energy, the country receives about 3 trillion cubic meter of rainwater. Traditionally, animate power was used for field operations and processing activities.

To sustain the projected population of 1.363 billion by 2025 the productivity has to be increased by 100 percent from the present level by intensification of agriculture.

3. Problem Faced by Agriculture Workers

Agriculture workers are facing various problems such as musculoskeletal injuries, insect bites, stress and psychological disorders, animal handling, incorrect application techniques, pesticides, vehicle hazards, heat-

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related illness, etc., these problems may turn productivity still lower in agriculture sector.

3.1 Musculoskeletal Disorder

According to Occupational Health and Safety Council of Ontario's (OHSCO), "musculoskeletal disorder" (MSD) is an injury or disorder of the musculoskeletal system resulting from repeated exposure to various hazards and/or risk factors in the workplace. MSD hazards are general classified into three categories as follows:

1. Biomechanical hazards

2. Additional hazards

3. Individual hazards

3.1.1 Biomechanical Hazards

Biomechanical hazards are also referred as the primary risk factors. There are three biomechanical risk factors: high force, awkward posture, and repetition. Any one of these hazards may lead to an MSD by themselves. When two or more hazards are combined together, the risk for an MSD increases substantially.

Repetition:

The risk of developing an MSD increases when the same parts of the body are used repeatedly, with few breaks or chances for rest.

- Highly repetitive tasks can lead to fatigue, tissue damage, and eventually, pain and discomfort.

- This can occur even if the level of force is low and the work postures are not very awkward.

- With repetitive tasks, it is not only important to consider how repetitive the task is but also how long workers perform the task, the posture required and the amount of force being used.

3.1.2 Additional Hazards

Additional hazards for MSD include vibration, temperature, contact stress, and work methods.

3.1.3 Individual Hazards

Individual hazards include age, body size, previous injuries, and genetic predisposition. These hazards are very difficult to control, which emphasizes the need to control the biomechanical and additional hazards even more. Controlling MSD is accomplished through ergonomics. MSD hazards should first be controlled at the source, then along the path, and finally at the worker. The physical risk factors for Musculoskeletal Injury (MSI) are the physical demands of a task, including force, repetition, work posture, local contact stress, etc.

3.2 MSD in Agriculture

Agriculture activities are accompanied with repeated stooping and bending. Based on the field data collection it is found that many agriculture activities are repetitive (biomedical hazards) in nature.

4. Ergonomic Approaches

4.1 What is ergonomics?

The term "ergonomics" comes from the Greek word "ergon" meaning work and "nomoi" meaning natural laws. It is the science of refining the design of products to optimize them for human use.

Ergonomics can be defined simply as the study of work. More specifically, ergonomics is the science of designing the job to fit the worker, rather than physically forcing the worker's body to fit the job. Adapting tasks, work stations, tools, and equipment to fit the worker can help reduce physical stress on a worker's body and eliminate many potentially serious, disabling work related MSDs.

Ergonomic approaches help to solve many real-time problems in many stages of agriculture activities. Recent advancements in ergonomics have good scope in emerging industrial environment, but the contribution made to unorganized sector agriculture workers is less because of various reasons. Ergonomic approaches will bring good work environment in the farmland because of easy and effective implementation.

4.2 Postural Analysis Approach

Posture is derived from the Latin verb "ponere", and Greek word "analyein". Postural analysis is the process of "breaking up" the body to determine where it properly positioned or not. Using postural analysis the working position of agriculture workers can be analyzed using various software packages like Human CAD software, Digital Human Modeling Software and ERGO MASTER software.

Stoop posture is unavoidable in many agriculture activities. Investigation of MSD in labour-intensive agriculture reveals the fact that MSDs in labour-intensive agriculture are still ranked among the top health problems faced by agricultural workers and there are several intervention approaches to solve this problem in

agriculture through engineering and administrative controls (Fathallah, 2010, 738).

Using this approach the strain experienced by field workers will be quantitatively explained using RULA score. RULA (Rapid Upper Limb Assessment) score will give weather existing posture cause musculoskeletal injury. Scores are categorized into four levels which will give the severity of posture.

4.2.1 Importance of Postural Analysis on Productivity

According to the National Commission for Enterprises in the Unorganized Sector (NCEU), 64 percent of the unorganized sector workers are in agriculture. It is not possible for all the workers to use advanced tools or mechanization of farm land because of economic condition. They are in the condition to work in farmland for long duration.

Manual workers in agricultural industry are frequently exposed to work related discomfort and pain while performing their work tasks. This leads to common health problems such as Work-related Musculoskeletal Disorders (WMSDs) which occur due to the feeling of discomfort while performing daily tasks, which in turn affect their work performance (Deros et al., 2014, 287). The work performance will not only decreases productivity but also affects their health in nearby future.

4.3 Farm Tool Design Approach

For small and marginal scale farmers mechanization of farming activities is not feasible mainly because of economic criteria. But simple and cost efficient farm tools will be used to improve productivity and reduces musculoskeletal injuries in farming activities.

4.3.1 Importance of Farm Tool on Productivity

Farm tools are simple substitute to perform repetitive task quickly. These tools can be created or modified easily. They can eliminate stooping posture of certain agriculture activities. Some of the farm tools are suggested in this work.

5. Postural Analysis From Field Data

This is done in the following steps:

- Study existing postural discomforts faced by agriculture workers

   —Literature survey

—Expert opinion

- Data collection

   —Field survey

   —Face-to-face interviews

   —Video recording

- Pre-analysis and post-analysis

   —ERGOMASTER software

- Recommendations

5.1 Stages of Analysis

1. Field data collection and expert opinion
2. Questionnaire
3. Video-to-image conversion
4. Selecting solvable postural problems
5. Software analysis and RULA score

Based on the analysis. critical working posture will be identified and RULA score wi l be obtained to various working postures. Postural analysis software will not only help to identify the postural problems faced by agriculture workers but also provides recommendations to solve postural issues. Software used for postural analysis is ERGOMASTER and Human CAD. Working posture will be loaded into this software for analysis purpose.

5.1.1 Field Data Collection and Expert Opinion

Data is collected from farmlands in Theni district of Tamil Nadu.

5.1.2 Questionnaire:

Standardized Nordic questionnaire for analysis of musculoskeletal symptoms is used.

5.1.3 Video-to- Image Conversion:

Various activities are recorded and postural problems are identified from video.

5.1.4 Solvable Postural Problems:

Agriculture workers are facing many problems, but problems solvable by postural analysis are identified.

5.1.5 Software Analysis and Rula Score

Software analysis plays a vital role because it is not possible to compute RULA score manually for all working

posture. ERGO MASTER software (from NEX GEN ERGONOMICS) is used for analysis purpose. The software system can obtain images from a variety of popular packages and receive such images even through internet. The system includes a database, which has modules to easily save and retrieve data. This stage involves analyzing the work posture using ERGOMASTER software. During this analysis various modules of ERGOMASTER software is used which are as follows;.

- Lift Analyst
- Biomechanic Analyst
- Task Analyst
- Posture Analyst
- Workstation Analyst
- Ergo Product Database.

Posture analyst module plays a vital role for RULA score calculation. Various sub-modules of postural analyst are as follows.

- Postural assessment
- RULA
- Discomfort survey
- Dimensional assessment.

6. Field Data Analysis

6.1 Field Data

Field data provides input for postural analysis. The following are list of agriculture activities considered for postural analysis.

6.2 Manure Application to Drum Stick Plant

A male worker is preparing agriculture land for applying manure. He is working for six hours with intermediate breaks of 30 minutes (Figure 1).

Figure 1: Manure Application to Drum Stick Plant

6.3 Irrigation Work in Sugar Care Crop

A male worker is preparing agriculture land for irrigation work. He is doing multiple tasks, such as removing weeds, using hand tools for irrigation activities, etc. (Figure 2).

Figure 2: Irrigation Work in Sugar Cane Crop

6.4 Collecting Ladies Finger using Traditional Vegetable Collector

A female worker is collecting ladies finger. She collects maximum of 3 to 4 kg of ladies finger using traditional vegetable collector and works for three to four hours a day (Figure 3).

Figure 3: Collecting Ladies Finger using traditional Vegetable Collector

6.5 Final Harvesting of Chilly Crop

A female worker is collecting mature chilies. She is working in a stooped posture because of the short height of the plant (Figure 4).

Figure 4: Final Harvesting of Chilly Crop

6.6 Unpluging Brinjals

A female worker is collecting brinjals. They are working for more than five hours in stooped posture with less brake intervals (Figure 5).

Figure 5: Collecting Brinjals

6.7 Collecting Napier Grass For Feeding Cows

A female worker is collecting Napier grass using her hand tools. Her working time depends upon number of bundles of grass required for cows (Figure 6).

Figure 6: Collecting Napier Grass for Feeding Cows

7. Calculation of Rula Score

RULA technique is a simple and effective tool to study about postural risk in work environment. RULA calculation is carried out in following stages

Stage 1: Preperatory Stage

In this stage, workers are interviewed and their movements and postures during various agriculture activities are recorded.

Stage 2: Posture Selections

Selection of the postures to be evaluated should be based on the following:

1) The most difficult postures and work tasks based on worker interview and initial observation.

2) The posture sustained for the longest period of time.

3) The posture where the highest force loads occur. After interviewing and observing the worker, decision can be made weather analysis is needed for only one side or an assessment is needed for both sides.

Stage 3: Calculation

Calculating the RULA score includes 15 steps which are as follows

Step 1: Locate upper arm position

Step 2: Locate lower arm position

Step 3: Locate wrist position

Step 4: Wrist twist

Step 5: Look-up Posture Score in RULA table

Step 6: Add Muscle Use Score

Step 7: Add Force/Load Score

Step 8: Find row in RULA table

Step 9: Locate neck position

Step 10: Locate trunk position

Step 11: Leg score

Step 12: Look-up Posture Score in RULA table

Step 13: Add muscle use score

Step 14: Add Force/Load Score

Step 15: Find column in RULA table

Table 1: Activity Rula Score Table

Sl. No	Activity	Rula Score
1	Land preparation for applying manure to drum stick plant	7
2	Irrigation work in sugar cane crop	5
3	Collecting ladies finger using traditional vegetable collector	6
4	Final harvesting of chilly crop	5
5	Collecting brinjal in farmland	5
6	Collecting Napier grass for feeding cows	7

This takes a long time for calculation so computerized RULA technique can be done as follows.

7.1 Rula Module In Ergo Master Software

- RULA module in ERGOMASTER software computes score for various postures and it is done in five stages.

- In each stage, separate score for various parts will be calculated and final score will come in RULA wizard window.

- The final score classification on the RULA wizard will indicate whether the working posture is to be investigated or not. List of activities and RULA score is tabulated in Table 1.

7.2 Various Levels of Rula Score

- Level 1 (a RULA score of 1 or 2) indicates that posture is acceptable if it is not maintained or repeated for long periods.

- Level 2 (a RULA score of 3 or 4) indicates that further investigation is needed and changes may be required.

- Level 3 (a RULA score of 5 or 6) indicates that investigation and changes are required soon.

- Level 4 (a RULA score of 7 or 8) indicates that investigation and changes are required immediately.

RULA score for various postures are found using RULA wizard (Figure 7). It is found that RULA score for various postures are in range of 5 TO 7. Based on the RULA score it is evident that agriculture workers are not working in proper working posture, so recommendations are needed to achieve good working conditions.

8. Nature of Working Posture

The nature of work in agriculture is different for various crops but in general working posture depends upon

- Plant height

- The level of difference between ground and root bed

- Type of tool

- Nature of activity

- Certain other factors like nature of land and time to complete the task, etc.

Many agriculture practices are carried out in stooped posture. Certain factors like plant height or nature of activity cannot be changed easily in real environment. Better work environment can be achieved through selecting proper tools for an activity and following proper working posture. Recommendations for various working posture can be given using software and by ergonomic approach.
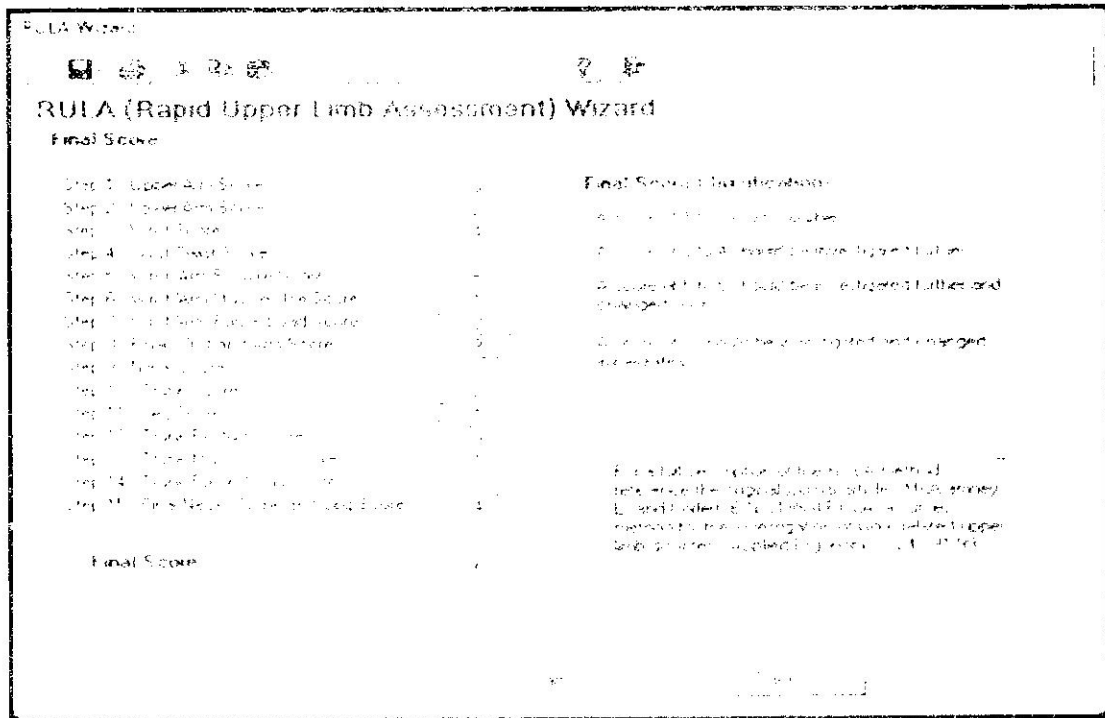
Figure 7 Rula Wizard of Ergo Master Software

Productivity Improvement of Agriculture Farm Workers using Ergonomic Approach

8.1 Stooped Posture Risk

Maintaining a stooped posture to carry a load places strain on the muscles of the back and shoulder as well as the spinal discs. Information from the National Institute for Occupational Safety and Health(NIOSH) indicates that stooped posture is closely associated with a high incidence of low back disorders, including injuries to muscles, nerves, discs, and ligaments of the low back. Various levels of stooped posture risk are suggested by the University of California Agriculture and Natural Resources Risk and Safety Services (2008) (http://safety.ucanr.edu/files/60534.pdf) which are as follows:

8.2 Moderate Injury Risk

This injury is associated with back bent forward more than 30 degree for more than two hours a day.

8.3 Significant Injury Risk

● This injury risk is associated with back bent forward more than 30 degrees for more than four hours a day.

● This injury risk is associated with back bent forward more than 45 degrees for more than two hours a day.

8.4 Results of Postural Analysis

Based on the interview with workers during field data collection reveals the fact that unorganized agriculture worker have lack of ergonomic awareness. The results of RULA analysis from ERGOMASTER software indicate the fact that the workers are subjected to musculoskeletal injuries and the level of injury is also very high. If they work in the same work environment their productivity will be reduced and this will affect the agriculture sector to great extent in nearby future.

The underlying fact is that industrial environment gives more importance to ergonomic approaches like postural analysis to improve productivity. But the contribution of ergonomic approaches is very less in agriculture sector because of lack of awareness among farmers.

9. Farm Tool Design

Usage of tools reduces the stooping posture to a great extent in the farm land. This will not only improve productivity but will also reduce risk of musculoskeletal injury.

Multi-disciplinary nature of ergonomics can play a unique role in the protection of people's health and in the prevention of work-related health hazards. The productivity of farming activity depends on equipment design and work

place design. Most of the farming activities can cause fatigue and work-related illnesses, which in turn reduce productive capacity. The multi-disciplinary nature of ergonomics can play a unique role in the protection of people's health and in the prevention of work-related health hazards. Certain common disorders farmers facing are back-ache and neck-ache attributed to heavy lifting, poor working posture, poor machine design, and poor organization of work (Jafry and, O'Neill, 1999, 263-68). Some of the farm tool designs are as follows:

9.1. Napier Grass Cutter

This manual grass cutter is a 1.5m long weightless grass cutting tool for flexible usage. The shaft of the tool is made of PVC for the purpose of reducing weight. The cutting blade is made with rust-free stainless steel. The spring tension helps the blades to be in open position always after cutting. The blade is arranged in such a way that, it moves parallel to the ground and gives maximum efficiency (Figure 8).
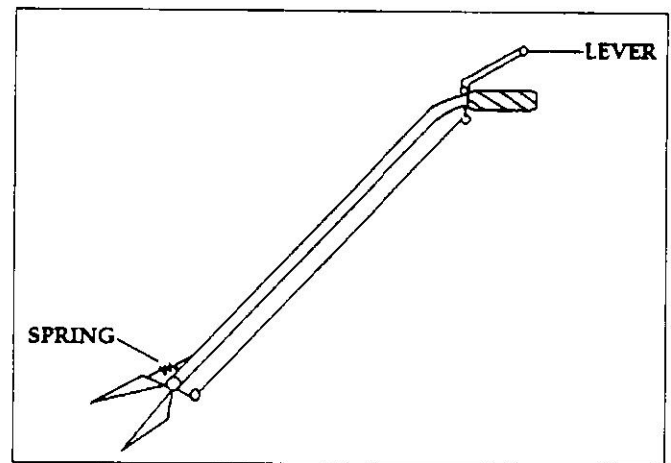
Figure 8. Manual Grass Cutter

9.2. Adjustible Trenching Hoe

It is a multi-positioned locking hoe, made for the purpose of handling make easy. The height of the hoe can be adjusted according to the nature of field. For smaller lengths, it is possible to handle the hoe at two ends and it will reduce the effort to work (Figure 9).

9.3 Low Cost Fabricated Farm Tool

The model of Napier grass cutter tool is shown in Figure 10. It is made up of following components

● PVC pipe of 1.5 metres

● Cutter

● Actuation by cycle brake system
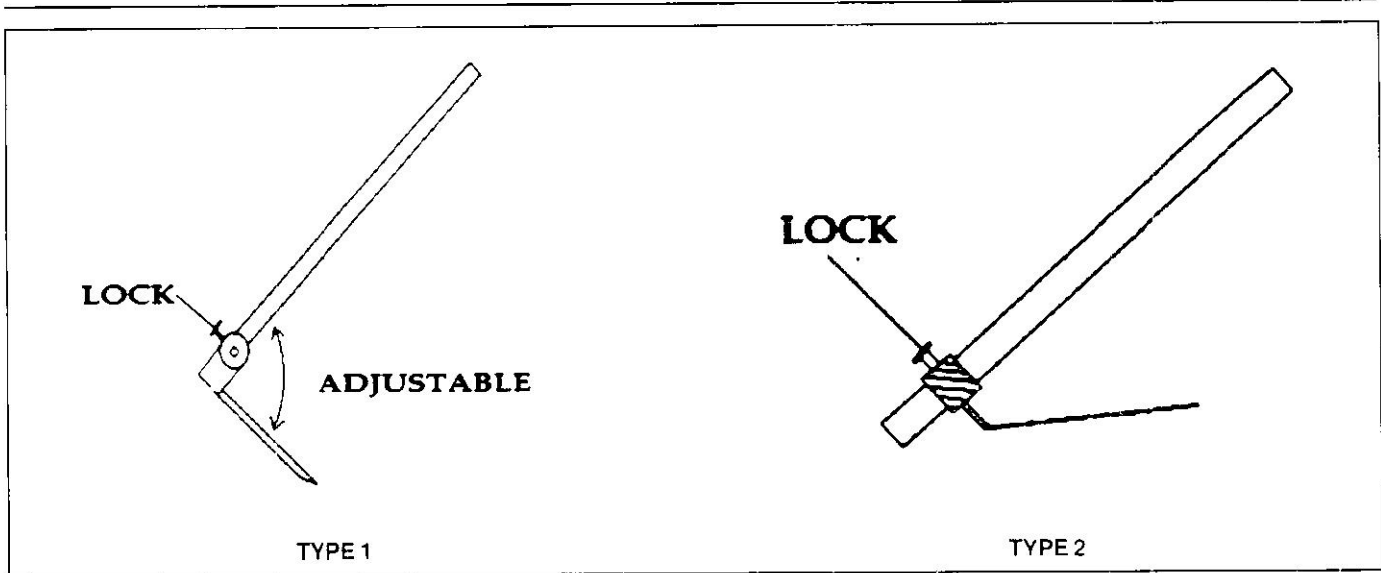
Figure 9 Adjustable Trenching Hoe

Figure 10 Model of manual Grass Cutter

- Bonding agents

A manual grass cutter is a flexible hand-made grass cutting device used for cutting Napier grass. This device can be easily made with conventional junk materials. The specialty of the device is its less weight. The main parts of the cutter are the spring actuated scissor. PVC pipe shaft, a cycle break, lever, and cable. This device is developed for the purpose of reducing human effort on grass cutting process. This device helps the workers to cut Napier grass without bending their hip portion. It will decrease the body pain and thereby increase the efficiency of workers.

The ease of construction of this device helps the workers to fabricate it by themselves. The cutting tool is directly attached to the bottom of the shaft. A cycle lever is used to actuate the tool for cutting. The tool is connected with the lever by a meta cable so that it can provide required force. Since it is actuated manually the height of cut can be monitored constantly. Even though there are many state-of-the-art cutting tools available, it is cheap and maintenance free. The affordability and ease of making crosses its peak advantage. Farm tools will be more useful to improve productivity in agriculture activities, but they must be of low cost, readily available or easily fabricable.

10. Conclusion

Postural problems are common at al workplaces. Almost all individuals suffer from these problems in one form or another. But the severity is very less in normal workplaces.

In certain cases, such as the agriculture sector, the situation is entirely different because agro workers are doing their activities in repeated work cycles and within very less time interval which results in larger work load on certain area of the body. This result in musculoskeletal injuries and hinders productivity. Thus various ergonomic approaches, such as postural analysis, simple and efficient farm tool design are needed to improve productivity in agriculture sector.

10.1 Scope for Future Work

- Recommendations will be implemented and the improvement in productivity and reduction in musculoskeletal injuries will be quantitatively analyzed.

- With the help of advanced software like Human CAD further analysis will be made to solve postural issues which exist after implementation of ergonomic working postures.

- Work will be done to improve/modify the pattern of agriculture practices, like relay farming, which will not only reduce postural problems but will also result in a better work environment for farmers.

11. Acknowledgement

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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

Challenges to Agriculture Sector in Telangana Economy

KOTI REDDY AND I. R. S. SARMA

This paper examines the performance and challenges to the Telangana agricultural sector. The study using the annual data for the period 2004–05 to 2014–15 reveals that the structural change in the composition of Gross State Domestic Product by Industrial origin is the consequence of the process of economic growth during the last 10 years. In this paper an attempt has been made to study reasons for backwardness of agricultural sector in Telangana economy. The key challenges documented are related with small size of land holdings, low yields and high risk, lack of assured irrigation, growing indebtedness of the farmer households, weak institutions and poor infrastructure. The study highlights that in order to overcome the challenges and unleash the opportunities there is a need to reform agriculture sector, invest in agriculture, optimum utilization of micro irrigation potentiality, reprioritize agricultural research, connect invention and innovations, link farmers with markets, strengthen institutions and improve infrastructure.

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Introduction

Agriculture has been the backbone of Telangana's economy. In Telangana, the agriculture sector is mainly rain fed and depends to a significant extent on the depleting ground water. Good performance of this sector is vital for inclusive growth. Telangana went in for the Green Revolution in rice cultivation in the 1970s. There have been significant changes in the structure and performance of the agrarian economy in the state in the recent years.

As nearly as 55.49 percent of the state's population is dependent on some form of farm activity for livelihoods, it is imperative to increase the farm incomes and ensuring sustainable growth in Telangana to reduce poverty. Highest priority is accorded to the agriculture sector in the state with the objective of shifting the excess labour force from this sector to other non-farm rural sectors such as rural industry through skill development. Ensuring food security and provision of gainful employment continue to be the essential premise of the socioeconomic development and employment guarantee schemes like MGNREGS and rural livelihoods programmes. The rural areas are the biggest markets for low-priced and middle-priced consumer goods, including consumer durables. Besides, rural domestic savings are an important source of resource mobilization. Any change in the agricultural sector, positive or negative, will have a multiplier effect on the entire economy. Besides, the allied sectors like horticulture, animal husbandry, dairy and fisheries have an important role in improving the overall economic conditions and health and nutrition of the rural masses. Telangana agricultural system is predominantly a mixed crop–livestock farming system, with the livestock segment supplementing farm incomes by providing employment, draught animals and manure.

The share of livestock sector in Telangana is around one-third of the total agriculture and allied sectors of GSDP during 2014–15. The growth of this sector is stable as compared to that of crop sector during the last decade. However, there has been a slowdown in its growth during the last two years. The growth of livestock sector gains significance in the light of the decline in the share of agriculture and allied activities share in GSDP. To maintain the ecological balance there is a need for sustainable and balanced development of both agriculture and the allied sectors.

Agriculture has been the source of supply of raw materials to the leading industries. Many small-scale and cottage industries, like handloom weaving, oil crushing, rice husking etc., depend upon agriculture for their raw materials. In recent years, the importance of food processing industries is being increasingly recognized both for generation of income and for generation of employment. Transport systems secure bulk of their business from the movement of agricultural goods. Agricultural growth has direct impact on poverty eradication. It is also an important factor in containing inflation, raising agricultural wages and for employment generation.

Telangana's agricultural system is predominantly a mixed crop-livestock farming system, with the livestock segment supplementing farm incomes by providing employment, draught animals and manure. The Annual Credit Plan for 2014–15 was Rs. 27,231. [...] in Telangana towards agriculture credit, nearly Rs. 17,644 crores (65 percent) was disbursed under agriculture credit. An amount of Rs. 13,561 crores (72 percent) was disbursed under crop loans as against the target of Rs. 18,717.95 crores and an amount of Rs. [...] crores (45 percent) was disbursed as against the target of Rs. 6,238.48 crores under Agriculture Term Loan, of which Rs. 3,132.29 crores (137 percent) was disbursed as against the target of Rs. 2,277.16 crores under allied activities (Government of Telangana 2015).

The paper has been divided into four sections. Apart from the introduction, Section II discusses the performance of the agricultural sector in Telangana's economy. Section III covers the challenges to Telangana's agricultural sector and Section IV deals with agenda for reforms in Telangana's agricultural sector and draws conclusions.

II. Performance of Agricultural Sector in Telangana Economy

Agriculture, including crop and animal husbandry, fisheries, forestry and agro processing, constitute the underpinnings of our food and livelihood security. Agriculture provides significant support for economic growth and social transformation of the country. The importance of agriculture in Telangana needs no exaggeration. It has a strategic role both in terms of absorbing labour force and generating incomes. Through forward and backward linkages, it affects considerably the fortunes of industrial and service sectors. It is a net earner of foreign exchange.

2.1. Share of Agriculture in GSDP:

The share of the primary sector (of which agriculture is the major constituent) in Gross State Domestic Product (GSDP) has varied from 23.9 percent in 1993–94 to 12.8 percent in 2014–15.

Table 1: Share of Agriculture in GSDP of Telangana (at 2004–05 Prices)

Year	GSDP (In Rs. Crores)	Agricultural and Allied (in Rs. Crores)	Share of agri and Allied in GSDP (per cent)
2004–05	89,946	16,112	17.9
2005–06	104,033	20,177	19.4
2006–07	121,143	20,979	17.3
2007–08	128,618	23,347	18.2
2008–09	145,502	24,751	17.0
2009–10	147,677	21,664	14.7
2010–11	172,146	25,855	14.8
2011–12 (RE)	189,269	25,765	13.6
2012–13 (RE)	197,056	28,726	14.6
2013–14 (SRE)	206,407	31,136	15.1
2014–15 (AE)	217,432	27,926	12.8

Source: Directorate of Economics & Statistics, Hyderabad

Table 1 reveals that GSDP of Telangana at 2004–05 prices was Rs. 89,946 crores in 2004–05. Since then it has grown at a modest rate and stood at Rs. 217,432 crores in 2014–15. It is evident from the table that agriculture and allied activities contribution to GSDP was Rs. 16,112 crores in 2004–05. It rose to Rs. 24,751 crores in 2008–09 and declined to Rs. 21,664 crores in 2009–10 and thereafter it has shown a steady increase and stood at Rs. 31,136 crores in 2013–14. There has been a serious setback to agriculture in 2014–15 whereby its contribution to GSDP has come down to Rs. 27,926 crores.

In percentage terms, the share of agriculture and allied activities in GSDP was 17.9 percent in 2004–05. As the process of industrialization and economic growth

gathered momentum under reform period with manufacturing and service sectors growing rapidly and agricultural sector limping along, the percentage share of agriculture in GSDP declined and reached to a level of 12.8 percent in 2014–15.The main cause of decline is a rapid fall in the share of agriculture alone.

2.2 Sector-wise Percentage Contribution of GSDP:

The growth rate of GSDP denotes the performance of state economy; the sectoral performance reflects the change in the magnitude and composition of GSDP of the state economy over time. The change in the relative sectoral shares in GSDP manifests the structural change in the economy. The economy has been classified as agriculture, industry and services. The agriculture sector consists of agriculture, livestock, forestry and fisheries. The industry sector consists of mining and quarrying, manufacturing, electricity, gas and water supply and construction sectors. The services sector consists of trade, hotels and restaurants; transport by other means and storage; railways; communications; banking and insurance; real estate, ownership of dwellings and business services; public administration and other services.

The Telangana economy has undergone some structural changes during the post-reform period. The decline in the share of agricultural production to GSDP is compensated by increase in the shares of mainly service sector, followed partly by industrial sector. The decline in the share of agriculture in the GSDP in certain years in the earlier phase of economic planning did not reflect any structural change in the economy. It merely indicated the failure of agriculture to contribute its due share to the GSDP as a result of unfavourable weather conditions. In recent years, the service sector has grown faster than the agriculture and this fact is reflected in the estimates of GSDP by industry of origin. Table 2 gives sector-wise percentage contribution of GSDP at constant prices (2004–05).

It is evident from Table 2 that notable structural changes occurred in income shares of the sectors. The share of agricultural sector has been decreased from 17.9 percent in 2004–05 to 14.7 percent in 2009–10 and further declined to 12.8 percent in 2014–15.This was partially neutralized by an increase in the share of secondary sector from 28.3 percent in 2004–05 to 29 percent in 2009–10.The share of industrial sector in GSDP has fallen consistently since 2010–11.The share of services in GSDP was as high as 62.9 percent while the share of industry being 24.3 percent in 2014–15.The rapid growth of service sector

Table 2: Sector-wise Percentage Contribution of GSDP (at 2004–05 Prices)

Year	Agricultural Sector	Industrial Sector	Service Sector
2004–05	17.9	28.3	53.8
2005–06	19.4	27.8	52.9
2006–07	17.3	29.1	53.6
2007–08	18.2	28.0	53.8
2008–09	17.0	28.7	54.4
2009–10	14.7	29.0	56.3
2010–11	14.8	28.7	56.5
2011–12 (TRE)	13.6	27.9	58.5
2012–13 (SRE)	14.6	25.7	59.7
2013–14 (FRE)	15.1	24.6	60.3
2014–15 (AE)	12.8	24.3	62.9

Source: Directorate of Economics & Statistics, Hyderabad

in Telangana economy reflects the structural transformation of the economy. The structural change in the composition of GSDP by industrial origin is the consequence of the process of economic growth during the study period. The emerging structural change in GSDP shares witnessed a big decline in the share of agriculture coupled with modest increase in the share of industry and a much sharper increase in the share of services which now account for nearly 60 percent of the total GSDP

2.3 Sector-wise Growth Rates of GSDP:

Table 3: Sector-wise Growth Rates of GSDP (at 2004–05 Prices)

Year	Agricultural Sector	Industrial Sector	Service Sector
2005–06	25.2	13.8	13.9
2006–07	–0.5	17.1	13.2
2007–08	16.3	6.4	10.9
2008–09	6.0	16.0	14.6
2009–10	–12.5	2.3	4.8
2010–11	19.4	16.8	18.3
2011–12	–0.4	5.7	12.5
2012–13	11.5	–4.1	6.3
2013–14	8.4	0.1	5.9
2014–15	–10.3	4.1	9.7

Source: Directorate of Economics & Statistics, Hyderabad

Table 3 reveals that the growth rate of GSDP in agriculture and allied activities 2005–06 was highly respectable (25.2 percent). Since then especially during

Challenges to Agriculture Sector in Telangana Economy

2006–07, 2009–10, 2011–12 and 2014–15 agricultural production declined deeply negative rate of growth. In 2014–15, the growth rate of GSDP is highest in services sector with 9.7 percent followed by Industry sector with a growth of 4.1 percent and agriculture sector expected a negative growth of (–) 10.3 percent. The negative recorded in agriculture and allied sector, attributed mainly to the adverse seasonal conditions. This may be regarded from the development point of view a progressive change in the structure of the economy.

2.4 Share of Allied Sectors in Agricultural GSDP at Current Price :

Table 4: Share of Allied Sectors in Agricultural GSDP at Current Price

Sector	2011–12	2014–15
Crop Husbandry sector (Agriculture & Horticulture)	57.7	51.8
Livestock	34.4	39.7
Forestry and Logging	5.5	5.0
Fisheries	2.4	3.5
Total Agriculture Sector	100.0	100.0
Share of Agri & Allied sector in GSDP	18.6	17.9
Share of Animal Husbandry in GSDP	6.4	7.1

Source : Directorate of Economics & Statistics Hyderabad

Table 4 reveals that the share of crop husbandry sector (agriculture and horticulture) in agricultural GSDP at current price declined from 57.7 percent in 2011–12 to 51.8 percent in 2014–15. Livestock contribution to GSDP has increased from 34.4 percent to 39.7 percent for the same period. There is a contraction in the share of forestry from 5.5 percent in 2011–12 to 5 percent in 2014–15. Fisheries share in agricultural GSDP was increased from 2.4 percent to 3.5 percent for the same period. At current price the share of agriculture and allied activities in GSDP showed a decline from 18.6 percent in 2011–12 to 17.9 percent in 2014–15.

2.5 Productivity :

Agricultural development has been receiving a special emphasis since 1965. Since then, more public expenditure was allocated for the development and modernization of the agricultural sector. All these initiatives have led to:

a) A steady increase in area under cultivation

b) A steady raise in agricultural productivity

c) A rising trend in agricultural production

Table 5 : Productivity (Kg/Hectare) of Major Food Crops during 2009–10 to 2014–15

Year	Rice	Jowar	Redgram	Greengram	Maize
2009–10	2,932	877	380	125	2,400
2010–11	3,303	913	443	537	4,056
2011–12	2,942	1,122	304	552	3,200
2012–13	3,277	1,094	554	735	4,440
2013–14	3,297	1,015	530	694	4,685
2014–15 (Kharif)	3,054	1,119	441	489	2,720

Source. Directorate of Economics & Statistics Hyderabad

Table 5 gives the productivity of major crops during the last six years, i.e., from 2009–10 to 2014–15. A close look at the table reveals that productivity (production in kilogramme per hectare of land) of rice crop is almost stable during the period 2009–10 to 2014–15 (Kharif), but the productivity of rice during Kharif 2014–15 decreased to 3,054 Kgs/Ha as against 3,227 Kgs/Ha during same period of the previous year. i.e. 2013–14. The yield rate of maize crop during Kharif 2014–15 is 2,720 Kgs/Ha as against 4,408 Kgs/Ha during the same period in the previous year. Yield rate of jowar crop during Kharif 2014–15 was 1,119 Kgs/Ha as against 1085 Kgs/Ha during last year in Kharif season. The yield rate of Green gram crop during Kharif 2014–15 was 489 Kgs/Ha as against 662 Kgs/Ha during previous year Kharif season. Red gram crop yield was estimated at 441 Kgs/Ha during Kharif 2014–15 as against 529 Kgs/Ha during Kharif season of last year. For most crops, productivity was lower during Kharif 2014–15 when compared to previous Kharif (2013–14), which is due to adverse seasonal conditions.

2.6 Area and Production of Foodgrains:

The data pertaining to area and production of food grains in Telangana economy from 2004–05 to 2014–15 is furnished in the following:

Table 6 reveals that from a low level of about 41.68 lakh tonnes in 2004–05, food grains output rose gradually to 82.48 lakh tonnes in 2008–09. There was a steep decline in production, just next year due to adverse weather conditions. Food grains output in that year was 51.89 lakh tonnes in 2009–10. After many fluctuations, the output of food grains rose to 82.42 lakh tonnes in 2012–13 and touched 107.49 lakh tonnes in 2013–14.

Table 6: Area and Production of Foodgrains from 2004-05 to 2014-15

Year	Production (In Lakh Tonnes)	Area (In Lakh Hectares)
2004-05	41.68	24.97
2005-06	75.29	31.31
2006-07	65.21	30.81
2007-08	81.34	30.09
2008-09	82.48	31.72
2009-10	51.89	26.49
2010-11	92.60	34.43
2011-12	75.01	31.09
2012-13	82.42	28.36
2013-14	107.49	34.56
2014-15 (Kharif Only)	44.30	16.05

Source: Directorate of Economics & Statistics, Hyderabad

There are fluctuations in area and production of food grains in the past decade due to adverse seasonal conditions like drought, floods and heavy rains. It can be observed that the area under food grains has increased from 24.97 lakh tonnes in 2004-05 to 34.56 lakh tonnes in 2013-14.

2.7 Source of Irrigation in Telangana:

To perform the agricultural operations smoothly controlled, assured and continuous water supply is very much essential. In India, the distribution of rainfall is not evenly spread over various regions and more over the rainfall is also very much uncertain due to vagaries of monsoons. In Deccan, Central India, Punjab and Rajasthan rainfall is very scanty and thus without proper irrigation facilities agricultural operation is impossible in those regions. Moreover, the success of intensive cultivation through IADP, HYVP and multiple cropping depends solely on controlled, assured and continuous water supply through irrigation. In India, various sources of irrigation include canals, wells including tube wells, tanks and other sources. In percentage terms net area irrigated in Telangana by source of irrigation from 2008-09 to 2013-14 is given in Table 7.

Tank irrigation was more prominent in Telangana in 1956-57. Tank irrigation is alone accounted for 66 percent of the total irrigated area. Even then its relative importance has come down from 13.03 percent in 2008-09 to 10.05 percent of the total net area irrigated in 2013-14. This is

evident from Table 7. Net area irrigated by wells was the highest in 2009-10 at 84.33 percent and fell to 74.83 percent in 2013-14.The growth of well irrigation has been

Table 7: Percentage of Net Area Irrigated by Source of Irrigation from 2008-09 to 2013-14

Year	Net Irrigated Area	Canals	Tanks	Wells
2008-09	18.28	11.55	13.03	72.09
2009-10	14.93	9.18	3.82	84.33
2010-11	20.04	15.76	11.87	69.63
2011-12	19.85	16.37	9.22	71.69
2012-13	17.74	5.07	8.91	83.77
2013-14	22.89	12.67	10.05	74.83
2014-15 (Kharif)	14.87	10.52	6.05	81.05

Source: Directorate of Economics & Statistics, Hyderabad

at the expense of irrigation from tanks and other sources. The area irrigated by canals has increased from 5.07 percent in 2012-13 to 12.67 percent in 2013-14. In Telangana, it is well irrigation, particularly tube well irrigation, which has made the most spectacular progress. During the given period, on an average, 76 percent of net irrigated area was through wells, showing the heavy dependence on well irrigation.

Table 8 reveals cropping intensity in both the states of Telangana and Andhra Pradesh for the period 1956-57 to 2011-12. In 1957, the cropping intensity by the ratio of gross cropped area to net sown area was 1.137 in Andhra and 1.036 in Telangana. However cropping intensity in Telangana grew somewhat faster than Andhra since mid seventies. The difference between cropping intensity in these two states has been declined by 2011-12. The cropping intensity in Telangana in 2011-12 was recorded at 1.24, while it was 1.31 in Andhra Pradesh. It is evident from the table that the net irrigated area has grown in both the states. The overall growth rate of net irrigated area has been much faster in Telangana (1.68 percent per annum) than Andhra Pradesh (0.57 percent per annum) during the study period 1957-2012. Thus, the growth of net irrigated area in Telangana has been nearly 2.95 times that of Andhra over the last 55 years. On the other hand, the growth rates of net irrigated areas have not been uniform across the decades. It is observed

Table 8 : Cropping Intensity in Telangana and Andhra Pradesh

Year / State		Sown Area (000 ha) (Net)	Gross Cropped Area (000 ha)	Cropping Intensity (3 = 2/1)	Index Numbers of Col. 3 (1956–57 = 100)
		1	2	3	4
1956–57	Telangana	4.835	5.008	1.04	100
	Andhra Pradesh	6.539	7.436	1.14	100
1960–61	Telangana	4.873	5.018	1.03	99
	Andhra Pradesh	5.911	6.798	1.15	101
1970–71	Telangana	5.149	5.639	1.1	106
	Andhra Pradesh	6.586	7.708	1.17	103
1980–81	Telangana	4.523	4.907	1.09	105
	Andhra Pradesh	6.217	7.375	1.19	104
1990–91	Telangana	4.373	5.035	1.15	111
	Andhra Pradesh	6.649	8.158	1.23	108
2000–01	Telangana	4.432	5.182	1.17	113
	Andhra Pradesh	6.678	8.361	1.25	110
2010–11	Telangana	4.551	5.947	1.31	126
	Andhra Pradesh	6.717	8.667	1.29	113
2011–12	Telangana	4.620	5.722	1.24	119
	Andhra Pradesh	6.541	8.546	1.31	115

Sources. Compendium of Area & Land Use Statistics. 2006. Statistical Abstracts, AP

Note: Cols 1 * 2 figures given under 'Land Utilization' and under 'Crop Pattern' in the above referred to sources. The differences may be due to consideration of provisional and revised data

a slow growth in net irrigated area in Telangana till 1980 with 0.53 per annum followed by a sharp acceleration (nearly 2 percent) in the remaining period. Thus. the growth rate of net irrigated area almost quadrupled in Telangana after 1980. With regard to Andhra Pradesh state. net irrigated area grew at about 0.75 percent per annum till 2000. after which it doubled to 1.6 percent albeit with very large fluctuations.

III. Challenges to Telangana Agriculture

3.1 Low Productivity :

The condition of Telangana agriculture still largely remains backward although it is considered as the backbone of the Telangana Economy. A comparison of productivity levels in Telangana agriculture with the levels in other states shows how the low productivity in Telangana agriculture is. This would be clear from Table 9

Table 9 : Average/Maximum and minimum yield of major crops: 2013–14 (Kg/Ha)

Crops	All-India Average	Maximum		Minimum		Productivity in Telangana
Rice	2,416	3952	(Punjab)	Madhya Pradesh	(1.474)	3,297
Maize	2.676	5372	(Tamil Nadu)	Assam	(898)	4.685
Jowar	957	1661	(Andhra Pradesh)	West Bengal	(280)	1,015
Groundnut	1,764	2668	(Gujarat)	Himachal Pradesh	(600)	1,691
Soyabeen	1.012	1612	(Andhra Pradesh)	Uttar Pradesh	(577)	1.610
Cotton	510	750	(Punjab)	Maharashtra	(358)	423

Source: (1) Economic Survey, 2014–15

(2) Productivity in Telangana: Socio-Economic Outlook 2015. Govt. of Telangana

Table 9 compares the productivity of major crops in Telangana with the rest of the states in India. It reveals that the productivity was higher in Telangana than the national average for some of the crops like rice, maize, jowar and soyabeen in 2013-14. Productivity in Telangana was below the national average. Productivity of rice per hectare in Punjab was 3,952 kg. while it was 3,297 kg in Telangana. In case of some other major crops the yield per hectare in Telangana was lower than some of the states achieving higher productivity.

3.2 Farmers' suicides in Telangana in 2014 and 2015:

From June 2014 to December 2014, 400 farmers have committed suicides. These farmer suicides are being reported by the Telugu daily newspapers through their ground level surveys. However, the government of Telangana reports that there are only 69 farmer suicides during this period. The government of Telangana did not recognize that most of farmers' suicides reported in the nationalized newspapers are due to agricultural crisis. The government claims that there has been no single farmer suicide in Warangal district in the last four years. However, it is not clear why the government has underreported the famers' suicides. *Praja Shakthi*, a Telugu daily newspaper, reports that out of the 400 farmers who committed suicides most

of them were cotton-growing farmers and were marginal, small and tenant farmers. The highest number of suicides was reported in Medak with 76 suicides, followed by Adilabad district and the least from Ranga Reddy district. The opposition parties allege that from June 2014 to September 2015, 1,200 farmers have committed suicides.

3.3 Small Size of Holdings :

The average size of landholding in Telangana is 1.11 hectares. Thus, the size of agricultural holding is quite uneconomic, small and fragmented. There is continuous subdivision and fragmentation of agricultural land due to increasing pressure of population and breakdown of the joint family system and also due to forced selling of land for meeting debt repayment obligations. Thus, the size of operational holdings has been declining year by year leading to increase in the number of marginal and small holdings and fall in the number of medium and large holdings. All these have resulted in continuous subdivision and fragmentation of land holdings in the country. This increasing trend of subdivisions and fragmentation has resulted in the efficient use of land almost impossible leading to the problem of increasing volume of capital equipment on the farm along with low productivity.

Table 10: Land holdings and area operated

Category	Number of Holdings (Lakh No.)	Area Operated (Lakh Hectare)	No. of Holdings (Percent)	Area Operated (Percent)
Marginal	34.41	15.67	61.96	25.28
Small	13.27	18.69	23.90	30.17
Semi-medium	6.03	15.85	10.86	25.58
Medium	1.67	9.27	3.00	14.96
Large	0.16	2.49	0.28	4.01
Total	55.54	61.97	100.00	100.00

Table 10 reveals that the number of holdings in the state amounted to 55.54 lakh and the area held by these holding was 61.97 lakh hectares. The average size of the holdings in the state is 1.11 hectares, which is highly uneconomical to operate. In the state, 61.96 percent of the holdings are marginal(less than 1 hectare) and the percentage of small holdings (1 to 2 hectares) is 23.9 percent. Thus, marginal and small holdings constitute about 85.9 percent of total agricultural holdings in the state, making agriculture a subsistence source of livelihood for the majority of the population. More than 60 percent holdings are marginal in Nizamabad, Karimnagar, Medak,

Khammam and Warangal districts. However, percentage of area held by semi-medium and small holdings is higher than marginal holdings average size of land holding is highest (1.40 hectares) for Adilabad district and lowest (0.92 hectares) for Nizamabad district.

3.4 Absence of proper Irrigation Facilities:

Farmers face the problem of high cost of production and most of the times do not get proper return on investment, this act as a disincentive for the farmers to invest and thereby affecting the quality of their produce. Public investment in the primary sector has been shrinking

considerably over the years. Many farmers in Telangana depend on diesel operated tube wells and with the rising price of fuel they are not able to carry out their farming activities and add to this canal irrigation is not sufficiently developed enough to meet the needs of the growing requirement. Many farmers because of lack of proper monsoon and inadequate irrigation facility fall in the debt trap and to come out of it, have to sell off their land and machinery. Whatever irrigation potential that has been developed in Telangana, a very limited number of farmers can avail the facilities. In the absence of assured and controlled water supply, the agricultural productivity in Telangana is bound to be low. In Telangana, out of 14.85 lakh hectares of net irrigated area irrigated with ground water, as on now only 4.7 lakh hectares are only covered under micro irrigation, leaving a balance potential for micro irrigation area of 10.00 lakh hectares.

3.5 Growing Indebtedness of the Farmers:

One of the greatest problems of Telangana agriculture is its growing indebtedness. Farmers are borrowing a heavy amount of loan regularly for meeting their requirements needed for production, consumption and also for meeting their social commitments. Thus the debt passes from generation to generation. Nearly 52 percent of agricultural households in India are indebted and levels of debt are as high as 93 percent in Andhra Pradesh and 89 percent in Telangana. Telangana farmers fall into the debt trap as a result of crop failure, poor income arising out of low prices of crops, exorbitantly high rate of interest charged by the money lenders, manipulation and use of loan accounts by the money lenders and use of loan for various unproductive and social purposes. Though the government has taken various steps to improve the system of agricultural credit through establishment of credit cooperative societies, land development banks, regional rural banks, NABARD services with regard to agricultural credit are not found satisfactory.

IV Policy Implications and Conclusion:

To improve the resilience of the agricultural sector and achieve food security—including availability and affordable access—own strategy for agriculture has to focus on improving yield and productivity. There is a possibility of raising production by increasing yield of most of the crops without necessarily increasing prices. The adoption of improved varieties and crop management technologies enhances the production and productivity of cereals, pulses and other field crops. Achievement of food and nutrition

security and alleviation of poverty and unemployment on a sustainable basis depend on the efficient and judicious use of natural resources (land/soil, water, agri–biodiversity and climate).

Farmers have to rely on progressive farmers, media and private commercial agents such as dealers of farm inputs like seeds, fertilizers and pesticides for technical information. Extension services need to be geared up to address the emerging technological and information needs. Effectiveness of the lab-to-farm programme can be improved by leveraging information technology and e-and mobile (m-) applications, participation of professional NGOs, etc.

Focus on micro-irrigation systems such as drips and sprinklers would significantly increase water-use efficiency and productivity. The wide gap between gross cropped area and gross irrigated area which has not improved much since the last 10 years needs to be bridged for increasing production, productivity and resilience.

The government of Telangana should design a separate agricultural policy which will ensure food security, particularly for the vulnerable, through timely and efficient procurement and distribution of food grains. This involves procurement of food grains from farmers at remunerative prices, building up and maintenance of buffer stocks, storage, movement and distribution of food grains to consumers at affordable prices and stability of food grain prices.

Agricultural credit services have not reached fully to the target group. There is lack of coordination between different agencies operating in the same area; as a result, there is multiple financing, over financing in some areas and under financing in others. The major problem faced by the lending institutions is the most unsatisfactory level of over dues. Cooperative credit still forms a small portion of the total borrowing of the farmers and they are not able to ensure adequate and timely credit for the borrowing farmers due to weak financial position. To make agricultural credit services more effective there is a need of coordination between various financial institutions in order to avoid multiple financing. Banks should educate the farmers and get them into the habit of regular repayment. Banks should develop a suitable set of rules and procedures to determine the circumstances in which defaults might be condoned on account of crop failures and the manner in which the farmer–borrower might be given relief. Banks should extend credit to small and poor

farmers. i e. target group, and should cover more tribal area. Credit at minimum rates of interest helps to break the cycle of low investment, high cost and low returns. Inadequate targeting of beneficiaries and monitoring/ supervision of the end-use of short term crop loans for which interest subvention scheme is applicable and decline in long-term investment credit to agriculture, and issues that need to be addressed on priority basis.

For removing the defects of rural marketing, the markets should be very near to the villages with adequate facilities for grading, weighing and storage of all commodities. The regulated markets should be strengthened in terms of adequate market yard, market functionaries, warehousing and storage facilities. Extension education in marketing should be improved through regulated markets, primary cooperative marketing societies and farmer's servicing societies. An efficient marketing system helps to increase the disposable incomes of rural people and this in turn generate market for manufactured products.

Special attempts have to be made by the state government to implement the land reform legislation forcefully so that the slogan 'Land to the tiller' is translated into practice. Unless this is done, the tiller will have no incentive to invest in land and adopt new agricultural techniques. Coordination between central government and state governments ensures greater coordination between agricultural price policy and agricultural trade policy. The focus of public expenditure for agriculture so far has been on provision of subsidies and it is time it shifted towards investments to boost productivity.

The key challenges documented are related with small size of land holdings, low yields and high risk, lack of assured irrigation, growing indebtedness of the farmer household weak institutions, and poor infrastructure. The study highlights that in order to overcome the challenges and unleash the opportunities, there is a need to reform agriculture sector, invest in agriculture, reprioritize agricultural research, connect invention and innovations, link farmers with markets, strengthen institutions and improve infrastructure. Policy makers need to initiate policy actions and public programmes to build a solid foundation for a much more productive, internationally competitive, and diversified agricultural sector.

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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

Poverty in Irrigated and Rainfed Ecosystems: Village Studies in Tamil Nadu

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This paper analyses the poverty issue under two different ecosystems irrigated and rainfed, in the villages of drought prone Pudukkotai district in Tamil Nadu. The data, generated through field survey, were analysed by using both descriptive and regression analysis. The study indicated that employment, income and consumption pattern were higher in irrigated ecosystem than in rainfed areas. Further the level of rural poverty was higher as expected in rainfed ecosystem than in the irrigated areas. In addition, among the variables included for the regression analysis, irrigation determined predominantly the rural poverty, suggesting that irrigation was the major factor in determining poverty.

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Introduction

Increased economic growth, measured by high level of Gross Domestic Product (GDP) and employment in agriculture, were the central factors for poverty reduction [Dollar and Kraay, 2000; Fan et al., 1999; Thirtle et al., 2001]. There was a significant acceleration in economic growth that reduced poverty during the commencement of economic reforms in 1991 [Garcia et al., 2000; Jha, 2000; Srinivasan, 1999]. However agriculture still provides 58 percent of employment. Agriculture supplies food to the people, raw materials to industries, exports to traders, releases surplus capital and employment to farm and non-farm sectors and stimulates demand for local goods and services [Wiggins, 2001]. Hasnip et al (1999) revealed that agricultural productivity was the key to poverty reduction in many developing countries because agricultural growth contributed to the economic growth and reduced the rural poverty. Thus, there has been strong linkage between agricultural development and rural poverty [Ahluwalia, 1978; Fan et al., 1999; Datt and Ravallion, 1996; Ravallion and Datt, 1996, Sundaram and Tendulkar, 1988] and among the agricultural inputs irrigation is the major prerequisite for agricultural growth [Gadgil 1948, Reddy 1995]. Although irrigation had the potential to produce such profound impact on agricultural growth and reduction of rural poverty in the literature, an attempt was not made to study rural poverty by using irrigation as an explanatory variable till the year 2001. After Narayanamoorthy's (2001) publication, a few attempts were made to study the relationship between irrigation development and rural poverty in India and other countries of the world [Bhattarai and Narayanamoorthy, 2003; Hussain 2007; Hussain and Hanjra 2003, 2004; Lipton 2007, Narayanamoorthy, 2007; Narayanamoorthy, and Hanjra, 2010; Narayanamoorthy and Beero, 2014;

Saleth et al., 2003; Shah and Singh, 2004; Smith, 2004].

Irrigation played a major role in determining poverty by providing employment opportunities to the rural people, both on and off the farm (Hussain et al., 2006). There is ample evidence to prove that improved access to irrigation infrastructure enhanced crop yield, agricultural production and farm income and in turn, reduced inequality and rural poverty [Bhattarai et al., 2002]. Likewise, Mellor (2002), Hussain (2004), Huang et al.(2005) and Molden et al. (2007) asserted that there were strong linkages between irrigation and rural poverty. In another study, Narayanamoorthy and Hanjra (2010) used secondary data for seven time points (1973–74 to 2004–05), covering 29 districts of Tamil Nadu and revealed that the incidence of rural poverty was significantly less among districts having irrigation above the state average (DIASA) compared to districts having below the state average (DIBSA), implying that irrigation helped in the reduction of rural poverty in Tamil Nadu. Ghosh et al. (2011, 2012) analysed irrigation, agriculture and level of living in Odisha and identified through the regression analysis that irrigation determined 71 percent of rural poverty alleviation. Thus, it can be proved that the irrigated agriculture is the strategy for poverty reduction.

Further, Janaiah et al. (2000), through their intensive household surveys in six villages of Chhattisgarh region under two different ecosystems (irrigated and rainfed), found that incidence, depth and severity of rural poverty were substantially lower in the irrigated ecosystem than in the rain-fed ecosystem. Similarly, Garcia et al. (2000) demonstrated that the level of poverty was higher in rainfed area than irrigated area in Myanmar.

A few village studies were conducted in the 1970s and 1980s for evaluating rural poverty in various Asian countries [David and Outsuka, 1994] and also some Indian states [Garcia et al., 2000; Janaiah et al., 2000; Jayaraman and Lajouw 1999]. But no such village study was attempted in Tamil Nadu where 21.20 percent of the population are still below the poverty line. Further, information on rural poverty, based on village studies for both irrigated and rainfed ecosystems, is limited during the post reform period in India. In addition, studies are not available in connection with rural poverty in irrigated area and un-irrigated area, even at the micro and macro level. Studies are not available for evaluating rural poverty under the two different ecosystems in Puddukkottai district. Therefore, keeping this in view, an attempt has been made in this study to fill up this gap with following

objective to measure and analyse rural poverty in irrigated and un-irrigated ecosystems.

II Data and Methods

Two sample villages—Ayangudi and Veeramangalam in Aranthangi taluk of Pudukkottai—were selected on the basis of irrigated and rainfed/un-irrigated ecosystems. Ayangudi was identified as sample Irrigated Village (IRV) because groundwater irrigation source was predominantly used in Ayangudi and Veeramangalam was identified as the sample Rainfed Village (RFV) because irrigation sources were not found at Veeramangalam. Farmers of Veeramangalam depend only on rainfall for farming. The logic behind the selection of two sample villages was to compare poverty level of rainfed village with irrigated village. Purposely, agricultural labourer households were selected as the sample respondents because according to severa studies made by researchers and report of the Government of India, most of the poor people are of agricultural labourers. Lists of households of agricultural labourers were collected from the Village Administrative Officers (VAO) of respective sample villages. After visiting these villages several times and discussing with the respective villagers for two months, these villages were selected. Random sampling techniques were followed to select 50 samples of respondents from each village. Thus a total of 100 households was taken as sample respondents. A pre-tested schedule was used as a pilot survey to collect the required information for the study and then it was modified in the light of feedback from the sample respondents. The revised interview schedule was used for data collection. The heads of sample households were interviewed and in case a respondent was not having time or refused to be interviewed, head of the next household was interviewed. Thus the data were collected for the period 2013–14.

According to Tendukar Methodology (2011–12), Monthly Per Capita Consumption Expenditure (MPCE) was used to estimate poverty level under both the ecosystems. At the outset, MPCE was estimated and then based on the rural poverty line of Tamil Nadu (2011-12), which is Rs. 880, poverty variable PPBPL (Percentage of Population Below Poverty Line) was identified to study sample villages.

There are so many poverty determinant variables. However, the study could identify only eight variables such as Wage Rate of Agricultural Labourer (WRAL), Average

Employment Days (AED), Dependency Ratio (DR), Family Size (FS). Monthly Per Capita Consumption Expenditure (MPCE), Monthly Per Capita Income (MPI),

Percentage of Farm Wage Income to Total Wage Income

(PFWTWI) and Percentage of Non-Farm Wage Income to Total Wage Income (PNFWTWI), with the expectation that these variables will be relevant in determining rural poverty.

The WRAL is defined as the average wage rate per day for male and female. Agricultural wage was considered as one of the variables to study the rural poverty by Ghosh (1996). Narayanamoorthy(2001) and Narayanamoorthy and Beero(2014) because agricultural wage enhances the income of the households and in turn, reduces rural poverty. The AED stands for employment opportunities for the people. More employment days means more income for agricultural labourers, which helps them to overcome the poverty barrier. The DR indicates how many people were depending on the working people in those households. If dependent people were more than that of the working population, it shows that poverty must be prevalent in those households. MPCE is an important variable which is used to measure and estimate poverty in India. If the MPCE is lower than the rural poverty line fixed by the Planning Commission (2011–12), they are under the poverty line. The MPI is another important variable for poverty delimitation because MPCE depends on monthly income. Theoretically, more the income, more will be expenditure and that will keep agriculture labourers above the poverty line. Two variables like PFWTWI and PNFWTWI were also included for the analysis to understand which of these variables was more pronounced in determining poverty because, in this current agricultural scenario, non-farm wage rate wouldincrease the income of agricultural labourers. It is also found that rural non-agricultural earnings (income) have been growing faster than agricultural earnings, particularly for agricultural labourers since the last two decades (Nayyar, 1996. Vaidyanathan. 1994; Visaria and Basant, 1994).

Both descriptive and regression analysis were employed for the study. At the outset, the particulars or characteristics of sample villages, sample households and sample respondents were investigated by using the descriptive analysis. Second two types of regression analysis (Simple and Multiple Regressions) were performed to explain the variation of rural poverty in irrigated

and rainfed ecosystem. Simple regressions equation is as follows:

$$PPBPL = \alpha + b_1 D_i + U \dots\dots\dots\dots (1)$$

Where,

PPBPL - Percentage of population below poverty line

D - Irrigation dummy (IRV = 1 and RFV = 0)

b_i - Regression parameter to be estimated and

α - Constant.

In equation (1), PPBPL was considered as dependent variable and D_i (irrigation dummy) was the independent variable to examine variation of poverty in IRV and RFV. The irrigation variable was considered as dummy variable (D) where IRV = 1 and RFV = 0.

After analysing the independent relationships between irrigation and rural poverty, multiple regression analysis was performed because it is a known fact that rural poverty is determined by several factors. It was also essential to carry out multiple regression analysis to understand which of the selected poverty determinants was playing a major role in influencing rural poverty and what was the contribution of irrigation towards poverty reduction as compared to the rainfed condition. The regression equation, used for the analysis, is as follows:

$$PPBPL = \alpha + b_1 AED + b_2 DR + b_3 FS + b_4 MPI + b_5 PNFWTWI + b_6 WRAL + b_7 D + U_i \dots\dots (2)$$

Where,

PPBPL - Percentage of population below poverty line

AED - Average employment days/month

DR - Dependency ratio (percent)

FS - Family size (number of person)

MPI - Monthly per capita income (Rs.)

PNFWTWI - Percentage of non-farm wage rate to total wage income

WRAL - Wage rate of agricultural labourers/day

D - Irrigation dummy (IRV = 1 and RFV = 0)

b_1 - Regression parameter to be estimated and

α - Constant

In equation (2), PPBPL was considered as the dependent variable and other variables (AED. DR, FS. MPI.

PNFWTWR, WRAL and D) as independent variables to identify which of the poverty determinant variables was significantly associated with poverty and also whether contribution of irrigation in reducing rural poverty or not. Therefore, irrigation variable was considered as dummy variable (D) where IRV = 1 and RFV = 0.

III Profile of the Study Villages

Aranthangi is the only town in Aranthangi taluk. The distance from Ayangudi (IRV) to Aranthangi is 12 kms. Similarly, the distance from Aranthangi to Veeramangalam (RFV) is also 12 kms. The average distance from two villages to Aranthangi is 12 kms, which is equal to the distance of each village to Aranthangi (Table 1). This indicates that Aranthangi influenced the villages equally in terms of demographic and socio-economic conditions.

According to Table 2, the average age of the respondents from IRV was 47.78 years. Similarly, RFV recorded 47.09 years. This shows that majority of agricultural labourers from four villages were above 45 years, indicating that agriculture wages was the only source for their sustainability. Regarding literacy rate, among the two villages, while the population of IRV was more educated, RFV recorded less educated people. The average Family Size (FS) of IRV (4.64) and RFV (4.72) were almost equal to the average FS of two villages (4.56). While the DR was low in IRV (40.52), it was very high (49.58) in RFV. DR of RFV was above the average DR (43.48) of two villages but the DR of IRV was below the average DR of two villages. This shows that DR was high in RFV and less in IRV. The demographic situation of two sample villages represents that people of IRV far better than IRF in terms of employment, income and consumption expenditure.

Table 1: Particulars of Sample Villages by Ecosystems

Name of the Village	Village Type	Distance From Town (km)	No. of Sample HHs	No. of Sample Population
Ayangudi	Irrigated Village (IRV)	12	50	232
Veeramangalam	Rainfed Village (RFV)	12	50	236
Total		24	100	468

Source : Computed from field survey data.

Table 2: Demographic Characteristics of Households in Irrigated and Rainfed Ecosystem.

Variables	Description of Variables	Unit	Village Type		
			IRV	RFV	All
AGE	Average Age of the Respondents	Year	47.78(10.81)	47.09(12.09)	47.43(11.41)
LITE	Literacy Rate	%	82.83(0.62)	77.34(0.72)	40.07(0.17)
FS	Average Family Size	N	4.64(1.41)	4.72(1.60)	4.68(1.50)
DR	Dependency ratio	%	40.52(20.96)	49.58(17.94)	43.48(20.22)

Notes: Values in the brackets are Standard Deviation; IRV: Irrigated village, RFV: Rainfed village.

IV Results and Discussion

The WRAL was Rs. 271.03, which was more or less the same in IRV as well as in RFV. This shows that agriculture wage rate was the same for all those who worked in agriculture (Table 3). The average employment days of IRV and RFV were 19.19 days and 10.68 days respectively. While IRV recorded the highest employment days for a month, Veeramangalam (RFV) recorded the lowest number of employment days, indicating that IRV provided more employment opportunities than RFV. The average employment days of two villages was 15.33 per month

and the RFV recorded less than the average employment days (10.68).

While the average DR was 43.48, average family size was 4.01. The average monthly per capita consumption expenditure and per capita income were Rs 1082.61 and Rs.1484.72 respectively for the two villages. Monthly per capita expenditure of IRV was above the total average but rainfed village was below the total average. The same situation was witnessed in monthly income of the villages. Judging by the expenditure and income, it can be inferred that RFV recorded the highest number of poor people as

Table 3: Description Results of the Variables used for analysis

Variables	Unit	Village Type		
		IRV	RFV	All
FS	N	4.64(1.41)	4.72(1.60)	4.01(1.40)
DR	%	40.52(20.96)	49.58(17.94)	43.48(20.22)
WRAL	Rs/day	230.22(59.29)	278.91(110.78)	271.03(93.66)
AED	Days/month	19.19(4.44)	10.68(12.07)	15.33(5.88)
MPCE	Rs	1289.22(406.04)	815.47(210.66)	1082.61(408.34)
MPI	Rs	2004.74(799.93)	849.11(342.96)	1484.72(875.13)
PFWTWI	%	65.63(12.26)	51.46(15.26)	59.44(15.17)
PNFWTWI	%	34.37(12.26)	48.54(15.26)	40.56(15.17)
PHHBPL	%	22.00(0.84)	60.00(0.99)	20.50(0.99)
PPBPL	%	27.16(41.85)	63.98(49.49)	45.73(49.43)

Notes: Values in the brackets are Standard Deviation; IRV: Irrigated village. RFV: Rainfed village.

compared to IRV. The PFWTWI was 59.44 percent and PNFWTWI was 40.56 percent. The PHHBPL was 22 in IRV and 60 in RFV. Similarly, PPBPL was 27.16 for IRV and 63.98 for RFV. Under both PHHBPL and PPBPL, IRV recorded a lower poverty ratio than RFV. Also it is clearly brought out that RFV was above the total average of PHHBPL and PPBPL. Therefore, it can be said that poverty ratio was the highest in rainfed ecosystem and comparatively less in irrigated ecosystem.

As per Table 3, irrigation provided more employment opportunities, generated more income to the people and, in turn, increased consumption pattern of the people. Hence the living standard of the people in IRV was relatively better. In the case of rainfed area, people of RFV could manage to work in farm only in rainy days and that too not for full months and as a result, generated less income and consumption also was less compared to IRV. Thus their living standard was relatively poor. During the year 2013–14, not only in surveyed villages but also in entire Tamil Nadu, there was very little rainfall. Therefore, it was a difficult situation for the agriculture labourers of RFV to sustain themselves. Therefore, majority of the RFV people migrated to other states for income generation. The survey found that more number of agriculture labourers' households and people of those particular households in RFV were under distress.

In conclusion, the analysis confirmed that irrigation was the effective factor in rural poverty reduction. There are lots of studies with regard to irrigation and rural poverty. Irrigation increases cropping intensity and land intensity,

increases production and productivity, provides employment opportunities (year-round), more income and raises the living standard wherein more poor people can be identified (Narayanamoorthy, 2001; Narayanamoorthy and Beero, 2014). It is clear from the characteristics of sample households of sample irrigated and rainfed villages that there was a close association between irrigation and rural poverty. However, one may not strongly assert from the descriptive statistics that irrigation influenced rural poverty. Therefore, simple and multiple regression analysis were employed to understand whether irrigation played a pivotal role in determining rural poverty and also which of the poverty determining variables significantly and predominantly influenced the rural poverty reduction.

Simple regression was computed to establish the independent relationship between irrigation and rural poverty, by treating PPBPL as the dependent variable and irrigation variable as independent variable. The irrigation variable was considered as dummy variable (D_i) where IRV = 1 and RFV = 0. The result of the regression showed that the coefficient of irrigation (D_i) was highly significant and negative. It demonstrates that the role of irrigation in reducing rural poverty was remarkable. The value of R^2 was found to be 0.149, indicating that 14 percent of the variation in rural poverty was explained by irrigation alone. It is pointed out that the poverty level was high in rainfed area as compared to the irrigated areas. On the whole, according to the Table 4, regression results revealed that there was strong, inverse and significant relationship between irrigation and rural poverty.

Table 4: Impact of Irrigation on Rural Poverty: Regression Results

Variable	Regression Results
D (IRV = 1, RFV = 0)	-38.000[a] (-4.146)
Constant	60.000[a] (9.258)
R^2	0.149
Adjusted R^2	0.141
F	17.190
N	100

Notes: IRV : Irrigated village
RFV : Rainfed village.
D : Dummy variable (Irrigation)

After analysing the independent relationships between irrigation and rural poverty, multiple regression analysis was performed. Using the equation (2), regression results are demonstrated in Table 5. In this regression, PPBPL was considered as the dependent variable and other variables (AED, DR, FS, MPI, PNFWTWI, WRAL and D) as independent variables, to identify which of the poverty determinant variables was significantly associated with poverty and also to understand what was the contribution of irrigation in reducing rural poverty as compared to rainfed area. Therefore, irrigation variable was considered as dummy variable (D) where GIV = 1 and RFV = 0. Regression results showed that the value of R^2 was found to be 0.330, indicating that 33 percent of the variation in poverty was explained by the independent

Table 5: Factors Determining Rural Poverty: Regression results

Variables	Regression Results
WRAL	-0.076[a] (-1.158)
AED	0.324[a] (0.249)
DR	0.900[a] (1.942
FS	6.683[a] (2.181)
MPI	0.000[a] (0.024)
PNFWTWI	-0.054 (0.871)
D (IRV=1, RFV=0)	-35.982[a] (-2.019)
Constant	5.872[a] (0.190)
R^2	0.330
Adjusted R^2	0.279
D.W.	1.941
F	6.472
N	100

variables included in the equation (2) and displayed in Table 5. The coefficient of D (irrigation) was found to be negative and significant, suggesting that irrigation variable played a major role in determining rural poverty which was expected in this study. Similarly the coefficient of PNFWTWI (non-farm wage income) was found to be negative and significant. This reveals that PNFWTWI determined rural poverty significantly. It is for this reason that people seek opportunities to support their income from non-agricultural resources in rainfed ecosystem (Hussain et al. 2006). It is also found that rural non-farm income which has grown faster than farm income, has supported the agricultural labourers wherein large numbers of poor are noticed, for better standard of living (Narayanamoorthy, 2001; Narayanamoorthy and Beero, 2014; Nayyar, 1996; Vaidyanathan, 1994; Visaria and Basant, 1994). The regression coefficient of WRAL turned out to be negative but not significant, surprisingly implying the fact that WRAL played a lesser role in determining the rural poverty.

The regression coefficient of DR was found to be significantly positive. This shows that with an increase in DR, poverty ratio increased. However, the regression equation of FS turned out to be significant but not negative, showing that there was not much effect of FS on poverty reduction. On the whole, as expected, the regression coefficient of irrigation (D) turned out to be a highly negative and significant factor in determining rural poverty. This reveals that there was strong and significant relationship between irrigation and rural poverty compared to rainfed area. It is also indicated that irrigation is a very significant factor in reducing rural poverty, as expected in this study.

V Summary and Policy Implications

The aim of the study was to analyse the poverty level in irrigated and rainfed ecosystem by using field data. Two sample villages were selected based on the irrigated and rainfed ecosystems. The data were collected by using simple random sampling for the year 2013–14. The descriptive statistics revealed that PPBPL and PHHBPL were found to be higher in RFV but comparatively less in IRV. This information confirmed that the capacity of irrigation was high in reducing rural poverty as compared to rainfed area.

In addition, the study demonstrated that among the variables included for the analysis, irrigation variable predominantly and significantly determined the rural poverty. On the whole, irrigation generates employment

opportunities. income to the agriculture labourers as well as to the producers, lowers food prices due to increased production, enhances purchasing power of agriculture labourers by increased incomes and then finally, increases the standard of living of the people by helping them to cross the poverty barriers. which are confirmed by this study. Thus, the severity of poverty was substantially lower in the irrigated ecosystem than in rainfed ecosystem. suggesting that irrigation was the crucial factor in reducing rural poverty. Therefore, effective implementation of irrigation and establishment of more number of irrigation sources are crucial to the rainfed

ecosystems forgenerating more employment opportunities which, in turn, improves household income and brings down rural poverty in the rainfed areas. Further, non-farm employment opportunities should be created to enhance the income of the agricultural labourers in the rainfed area that can reduce rural poverty. Perhaps MGNREGA work with developing irrigation structure like, ponds and tank will enhance irrigation intensity and in farming. thereby poverty can be reduced

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> *A sustainable world means working together to create prosperity for all.*
>
> —*Jacqueline Novogratz*

Industry and Rural Development with Reference to Odisha

SEEMA MALLIK

Since the 1990s there has been a shift towards liberalization and neoliberal policies in India that are being argued by development economists to achieve high growth rates. This shift towards a neoliberal state has resulted in a close nexus between the state and business groups. This alliance between the state and big businessis responsible both for releasing economic dynamism and for also limiting the spread of its resulting gains. Several groups feel alienated and marginalized from this developmental process. Economic growth has been unbalanced and unsustainable, failing to meet basic minimum needs of a large section of the population and poverty continues to be was widespread.

Further the close state–corporate nexus has led to "land grabs" by the state which is acquiring land forcibly from poor farmers and tribals across the country in the name of development. This has adversely hit agriculture in the country where the contribution to GDP has gone down despite agriculture being the largest employer in the country.

In this context, the present paper analyses that despite being one of the most mineral rich states, Odisha remains one of the poorest states of India. It argues that the development strategy towards heavy industrialisation to overcome poverty has further alienated poor farmers, creating greater social inequalities. Thus, in an economy where agriculture is the backbone of the country, damaging of the backbone will weaken the state and lead to uneven development. The paper concludes that heavy industrialisation and mining is not the solution but an inclusive, participatory growth with a right balance between agriculture and industry can bring about people-centred growth and contribute to the strengthening of the democratic institutions and processes in India. This argument is substantiated by case studies of Vedanta in Kalahandi district, which is amongst the poorest districts in the country.

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Introduction

Since the 1990s, there has been a shift from the Nehruvian socialist roots toward a neoliberal State where the State and business groups have solidified their political and economic alliance and observers have characterised India as "India incorporated" (Kohli, 2012:3), India has been climbing up the ladder of per capita income while slipping down the slopes of social indicators (Dreze and Sen, 2013:8). Agriculture has taken a beating and its contribution to the GDP has gone down. Although agriculture and allied activities employ nearly 60 percent of the population, its contribution to India's GDP is less than 20 percent. It will shrink further, as there is a mass movement from rural to urban India (Corbridge, 2009:21).

Large-scale land acquisition for industries, SEZs, IT sectors, real estate has further challenged agricultural growth and livelihoods of the rural poor. The poor face the threat of losing their lands in the name of "development". Therefore the question arises on the viability of these schemes and their justification of alleviating rural poverty. Therefore, the question arises, development for whom? Those who are forced dispossession of their lands do not benefit from this business transaction where a new class of those enjoying the profits are created. These areas are highly knowledge-intensive and not labour-intensive which is beyond the capabilities of the vast, poor, illiterate farmers of India (Levian, 2013).

The present paper attempts to analyse that despite being one of the most mineral rich states, Odisha remains one of the poorest states in the country. In the light of continuous farmers suicide cases in Odisha this year (2015–16), this paper argues that development strategies towards heavy industrialisation by both national and international multinational companies to exploit natural

resources to overcome poverty has resulted in forceful land acquisition from small, poor farmers, mainly tribals, creating more poverty and greater social inequalities. The paper further argues that in an economy where agriculture continues to be the largest employer and the backbone of the country, damaging the backbone will weaken the State and lead to uneven development. Industrialisation is needed to stimulate economic growth but growth needs to be balanced with human happiness and not at the cost of the poor. This has led to the stalling or closure of several mega-projects in the country. This argument is substantiated by case studies of Vedanta in Kalahandi district, which is amongst the poorest districts in the country.

ODISHA: A BACKGROUND.

According to the Economic Survey Report of Odisha, 2014–15, Odisha constitutes about 4.9 percent of India's total area and 3.6 percent of total population of the country. As per the 2001 Census, its density of population at 236 per square kilometre is lower than India's 324. In current prices, the per capita net state domestic product at Rs. 22,630 in 2007–08 is 68 percent of India's per capita net national product. Compared to all India average, the share of agriculture in gross state domestic product (GSDP) is relatively greater (25 percent to 19 percent, 2005–06), share of forest area to total area is greater (37 percent to 22 percent, 2002–03), net sown area to total reported area is lower (37 percent to 44 percent, 2002–03), net area irrigated to net sown area is lower (23 percent to 40 percent, 2002–03), fertiliser consumption is lower than half (2004–05) and yield of rice is less than three-fourths (2003–04) of the all India average (GOO, 2008). Workforce composition of 2001 suggests that 65 percent are dependent on agriculture (30 percent cultivators and 35 percent agricultural labourers) whereas it is 58 percent for all India.

Odisha is one of the poorest states in the country. It can be described as "the poor rich state". Based on the NSS data and Tendulkar Committee Methodology, the poverty head ratio (i.e., percentage of people below poverty line) remains high for Odisha vis-à-v s India from 1973–74 to 2011–12 (Table 1.1). Although there is a decrease from 2009–10 of 37 percent to 32.59 for 2011–12, which is impressive, it remains amongst the highest in the country at 32.59 percent followed only by Binar at 33.34 percent as seen in Table 1.4

Table 1.1: Poverty Head Count Ratio for Odisha and India, 1973–74 to 2011–12

Year	Odisha (%)		Total	India (%)		Total
	Rural	Urban		Rural	Urban	
Expert Committee Methodology						
1973–74	67.28	55.62	66.13	56.44	49.01	54.88
1983	67.53	49.15	65.29	45.65	40.79	44.48
Tendulkar Committee Methodology						
1993–94	63.00	34.50	59.10	50.10	30.80	45.30
2004–05	60.80	37.60	57.20	41.80	25.70	37.20
2009–10	39.20	25.90	37.00	33.80	20.90	29.80
2011–12	35.69	17.29	32.59	25.70	13.70	21.92

Source Economic Survey, Odisha, 2014–15, 7/2.

The high incidence of poor among Scheduled Tribes (STs) and Scheduled Castes (SCs) and in southern and northern regions is a matter of concern. Understandably, agricultural and other labourers in rural Odisha and casual labourers in urban Odisha have a greater incidence of poverty. What is worrying is incidence of 46 percent for poor among those self-employed in agriculture. Those self-employed in non-agriculture also have a greater incidence than the all India average and for urban Odisha the self-employed have a greater incidence than the state average.

The Agricultural Sector

However, agriculture remains a major employer with a majority of small and medium farmers. An examination of landholdings as seen from Table 1.2 for the year 2000–01 shows that large farmers comprise only 0.3 percent operational holdings while marginal, small, semi-medium and medium constitute 56.4 percent, 27.4 percent, 12.3 percent and 3.6 percent, respectively. Incidence of poor by size-class of land indicates a greater burden among

Table 1.2: Distributions of Operational Holdings in Odisha, 1990–91 to 2000–01

Size-class	1990–91		2000–02	
	Operational holdings (%)	Area (%)	Operational holdings (%)	Area (%)
Marginal	53.6	19.7	56.4	22.7
Small	26.2	26.9	27.4	30.4
Semi-medium	15.2	29.5	12.3	26.5
Medium	4.7	19.1	3.6	16.1
Large	0.4	4.8	0.3	4.3
Total	100.0	100.0	100.0	100.0
Total value*	39.48	52.96	40.67	50.81
Gini	0.4456		0.4318	

Source: GOO (2007) and www.indiastat.com

marginal and small farmers. This indicates that Odisha's rural households largely consist of marginal and small farmers (57 percent) and the landless (36 percent). Thus, Odisha with a weak agricultural base, despite rich mineral resources, remains one of the poorest states of India. Incidence of poverty, despite a decline, remains at 32.59 percent, much higher than the national average of 21.92 percent (Table 1.3).

Table 1.3: Incidence of Poverty in Odisha vis-à-vis other States, 1973–74 to 2011–12

Sl. No.	States	1973–74	1993–94	2004–05	2009–10	2011–12
1	Andhra Pradesh	48.86	22.19	29.90	21.10	9.20
2	Bihar	61.91	54.96	54.40	53.50	33.34
3	Gujarat	48.15	24.21	31.80	23	16.43
4	Haryana	35.36	25.05	24.10	20.10	11.16
5	Karnataka	54.47	33.16	33.40	23.60	20.91
6	Kerala	59.79	25.43	19.70	12.00	7.05
7	Madhya Pradesh	61.78	42.52	48.6	36.70	31.65
8	Maharashtra	53.24	36.86	38.10	24.50	17.35
9	Odisha	66.18	48.56	57.20	37	32.59
10	Punjab	28.15	11.77	20.9	15.9	32.59
11	Rajasthan	46.14	27.41	34.4	24.8	14.71
12	Tamil Nadu	54.94	35.03	28.9	17.1	11.28
13	Uttar Pradesh	57.07	40.85	40.9	37.7	11.26
14	West Bengal	63.43	35.66	34.3	26.7	19.98
	All India	54.88	35.97	37.2	29.8	21.92

Source: Odisha Economic Survey, 2014–15, 7:5.

A sectoral analysis of Odisha's economy, according to Economic Survey, Odisha (2014–15), indicates a structural shift in the state economy, from agriculture towards industry and services sectors. As per 2014–15 (advance estimates), share of the services sector (as per CSO classification) is expected to be about 51.2 percent of the GSDP followed by those of the industry (33.4 percent) and the agriculture (15.4 percent) in real terms at 2004–05 prices as shown in Figure1. The growth patterns also exhibit similar trend at an all-India level. The high growth rates recorded by the state in the 10th and 11th Five Year Plans were mainly due to high growth registered by the industry sector and the services sector. The performance of the agricultural sector continues to be highly volatile mainly due to adverse impact of natural shocks such as cyclones, droughts and floods.
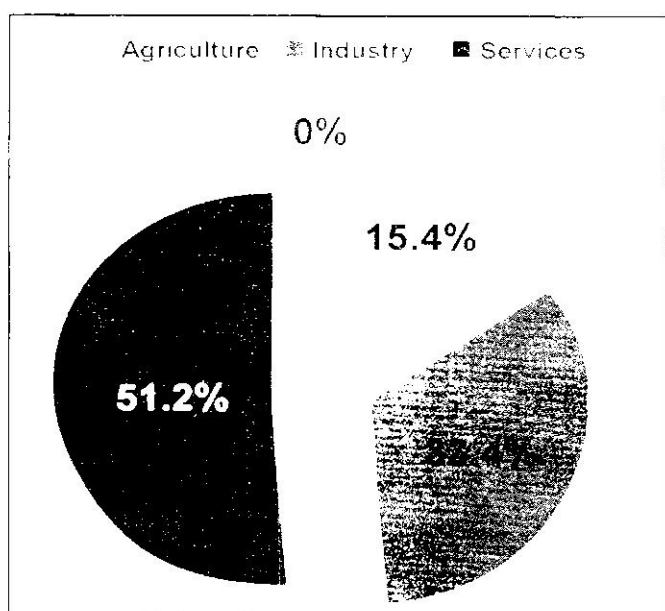
Figure 1 Sectoral Composition of Odisha's Economy, 2014–15 at 2004–05 prices (in Percent)

Source: Odisha Economic Survey, 2014–15.

This sectoral shift has been in the context of the state following the new economic policies enunciated at the Centre in 1991. The Government of Odisha adopted economic reforms, liberalising the investment environment, adopting policies and regulations to remove institutional hurdles to able private investors the right space for investments. This resulted in structural changes wherein there was a shift from an agrarian economy to an industrialising one. This led to a transformation in the economy from "agriculture based" to "industries and service sectors driven".

The Industry Sector

The industry sector has contributed about 33.45 percent share of Odisha's GSDP in real terms as per the estimates of 2014–15. In spite of global economic slowdown, disruption and other problems in the mining and quarrying sub-sector the advance estimate for the sub-sector shows a growth rate of 2.30 percent in 2014–15. Most large-scale industries in Odisha are mineral based. A look at the mineral wealth will justify the argument that Odisha is a poor rich state. The main minerals deposits in Odisha are represented in Figure 2. Coal reserves amount to 86 percent, iron ore amounts to 7 percent, bauxite and limestone 2 percent, while others constitute 3 percent. The state has 25 percent of total iron ore reserves of the country and is also the largest aluminium producer in India.
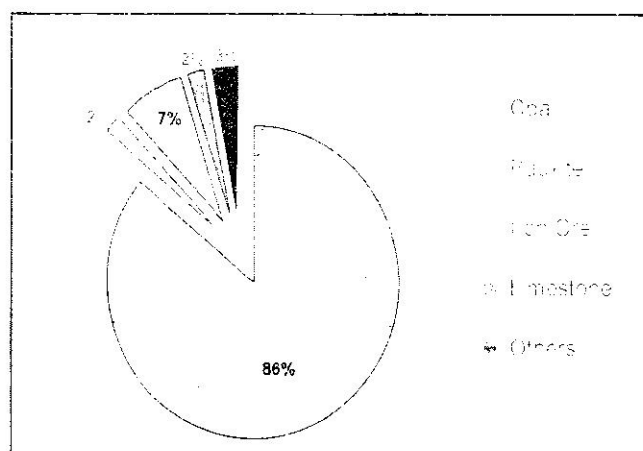
Figure 2 Minerals Reserve in Odisha, 2013-14

Source: Odisha Economic Survey, 2014–15.

As regards a state-wise scenario during 2013–14, the value of mineral production (excluding atomic and minor minerals) from off-shore region was the highest at Rs. 54.435 crore or 24.1 percent of the total value of mineral production followed in order of importance by Rajasthan Rs. 24.714 crore or 11.0 percent. Odisha Rs. 22.932 crore or 10.2 percent. Jharkhand Rs. 20.645 crore or 9.1 percent. Chhattisgarh Rs.19.566 crore or 8.7 percent. Gujarat Rs.12.389 crore or 5.5 percent. Andhra Pradesh Rs. 11.867 crore or 5.3 percent, West Bengal Rs. 11.751 crore or 5.2 percent, Assam Rs. 11.153 crore or 4.9 percent, Madhya Pradesh Rs. 11,077 crore or 4.9 percent. Maharashtra Rs. 6.899 crore or 3.1 percent. Tamil Nadu Rs. 6.075 crore or 2.7 percent. Karnataka Rs. 5.742 crore or 2.5 percent and Uttar Pradesh Rs. 3.234 crore or 1.4 percent. Odisha stands second only to Rajasthan (11 percent) at 10.2 percent in mineral production.

Thus because of its rich mineral resources, Odisha has become the chosen destinations of both national and international multinational corporations (MNCs, such as POSCO, Vedanta, Tatas and Mitthal, to name a few. A pro-industry approach welcomed these projects, believed to remove poverty and generate growth in Odisha Thus, heavy industrialisation has been seen as the panacea to poverty eradication. Table 1.4 highlights the list of mega-projects signed in Odisha amounting to a whopping amount of Rs. 108,586 crores.

However, despite being a rich source of minerals and heavy industrialisation to overcome poverty, the state lags behind in Human Development Indicators (HDI), as compared to other states of the country, which have low levels of heavy industrialisation but are high up in HDI. This will be explained in the following section.

Human Development Indicators in Odisha

Since the 1990s, a pro-industry approach has not been successful in removing inequalities in education, health,

Table 1.4: List of Mega Steel Plant Project in Odisha as on November 2005

SI. No.	Company	Location	District	Capacity million ton per annum	Investment Crores in Rs.	Year of MoU
1	Tata Iron and Steel	Kalinga Nagar, Duburi Jajpur	Jajpur	6.0	15.4000	2004
2	Sterlite Iron and Steel	Palasponga, Keonjhar	Keonjhar	5.1	12.502	2004
3	Hygrase Pellets	Paradeep Jagatsingpur	Jagatsingpur	4.0	10.721	2005
4	POSCO-India	Paradeep, Jagatsingpur	Jagatsingpur	12.0	51.000	2005
5	Jindal Steel and Power	Deojhar, Keonjhar, Angul	Keonjhar, Angul	6.0	13.135	2005
6	Bhusan Steel and Strips	Meramundali, Dhenkanal	Dhenkanal	3.0	5.828	2005
7	Total			36.1	108.586	2005

Source. httl:/orissagov.nic.in

income distribution all of which have a crucial bearing on economic growth as well as on the final income distribution profile. According to HDI and the Inequality-adjusted Human Development Index(IHDI) estimates of states in India, as shown in Table 1.5. HDI is the lowest for Odisha (0.444), followed by Bihar (0.4777) and Madhya Pradesh(0.451). HDI is the highest for Kerala (0.625), followed by Nagaland (0.609) and Mizoram (0.581) which have low mineral resources but are high on HDI.

The relative ranking of all states highlights the following factors.

● Kerala is the only state in the country which remains in "Very High HD" with respect to all dimensions, followed by Nagaland, Mizoram and Punjab which fare well in most of the indicators.

● BIMAROU states (Bihar, Madhya Pradesh, Rajasthan, Odisha, Uttar Pradesh) and the states formed in 2000 (Jharkhand, Chhattisgarh, Uttarakhand) and Assam belong to 'Low HD' group, by almost all indicators.

However, an interesting observation that can be made from the above statistics is that the states with heavy industrialisation projects are the mineral rich states as seen in Table 1.4 which comprise the BIMAROU states. But these states comprise the BIMAROU states with low HDI. Many of the industrial projects have not been able to take off, such as POSCO, and some have had to shut down operations, such as Vedanta. Mitthal has withdrawn from the state. These cases, along with Kalinganagar, have become symbols of protests where local communities have protested against their establishment and continuance. This study will now focus on the field study conducted at Vedanta in Kalahandi district.

CASE STUDY: VEDANTA AND DONGRIA KONDHAAS

Kalahandi is one of the 30 districts of Odisha. Since 2 October 1992, the former Kalahandi has been reorganised into two districts, viz., Kalahandi and Nawapara (Map 3) The present Kalahandi district occupies 115th rank in India so far as its land area is concerned.

Table 1.5: Estimated HDI and IHDI across States for the Year 2012–13

State	HDI	IHDI	HDI Rank
Andhra Pradesh	0.485	0.332	19
Arunachal Pradesh	0.527	0.356	13
Assam	0.474	0.341	20
Bihar	0.447	0.303	26
Chhattisgarh	0.458	0.297	24
Gujarat	0.514	0.368	15
Haryana	0.545	0.375	8
Himachal Pradesh	0.558	0.403	5
Jammu & Kashmir	0.525	0.371	14
Jharkhand	0.470	0.312	21
Karnataka	0.508	0.353	18
Kerala	0.625	0.520	1
Madhya Pradesh	0.451	0.290	25
Maharashtra	0.549	0.397	7
Manipur	0.556	0.400	6
Meghalaya	0.539	0.400	10
Mizoram	0.581	0.450	3
Nagaland	0.609	0.444	2
Odisha	0.442	0.296	27
Punjab	0.569	0.410	4
Rajasthan	0.468	0.308	23
Sikkim	0.5333	0.375	11
Tamil Nadu	0.544	0.396	9
Tripura	0.510	0.358	16
Uttar Pradesh	0.468	0.307	22
Uttarakhand	0.531	0.356	12
West Bengal	0.509	0.360	17
India	0.504 (world Average is 0.624)	0.343	Medium Human Development Countries

Source: HDR 2012–13.

The landmass of Kalahandi district is 7,920 sq. km. representing 4.68 percent of the area of the state. It comprises 3.64 percent of the total population of the state. The literacy rate in the district is 62.45 percent as per the 2001 Census. STs constitute 28.84 percent while SCs constitute 17.67 percent of the total population of Odisha. It is one of the poorest districts in the country, infamous for its droughts and famine.

Kalahandi happens to be a bowl of rich resources with regard to agriculture, minerals and forest produce.
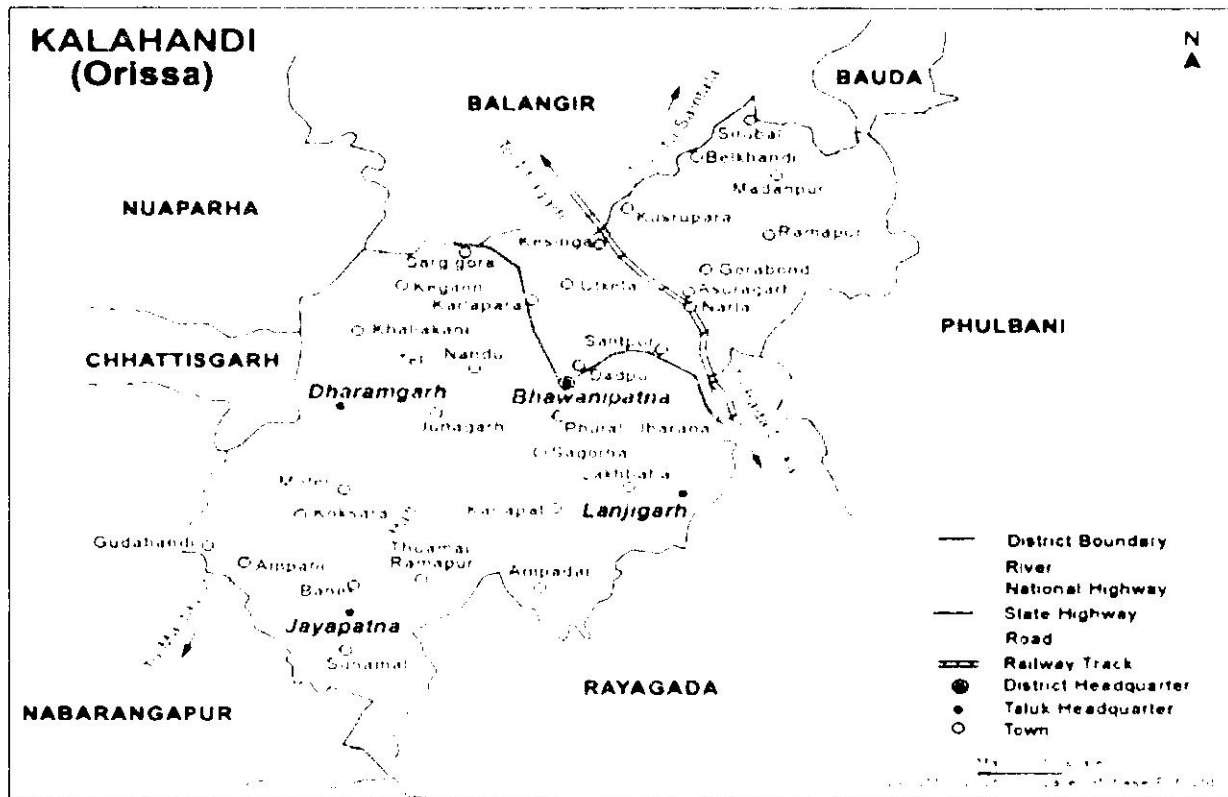
Figure 3. Map of Kalahandi District

Despite rich resources, it continues to reel under poverty. Therefore, the state government has launched, as in other parts of Odisha, heavy industrialisation to remove poverty.

In 2003, Vedanta Resources signed a Memorandum of Understanding (MoU) with the Government of Odisha for construction of a refinery for aluminium production, a power plant and related mining development at Lanjigarh in Kalahandi district. M/s Sterlite Industries (India) Limited (SIIL), fully owned and controlled by Vedanta Resources, proposed to set up a refinery with a capacity of 1.0 million tonnes per annum (MTPA) for processing aluminium for export. It also proposed to extract bauxite from the area adjoining the refinery, which is estimated to have approximately 73 million tonnes of mineable ore. The plant site is about 3.7 km from Lanjigarh. The plant is located on the road connecting state highway NH-6 (Bhawanipatna–Rayagada) to Lanjigarh. Lanjigarh in the district of Kalahandi is situated 450 kms from the state capital, Bhubaneswar.

The villages displaced in the first phase were Kinari, Borbhotta, Kothdwara and Chhatrapur. From the above, the whole village of Kinari has been displaced and being settled in the rehabilitation colony on the hill slopes. Two other villages, namely. Renopalli and Basantapada,were also displaced later. The current study covered six villages displaced by VAL. The study has interviewed around 165 villagers from different villagers namely, Kinari, Borbhotta. Kothdwara and Chhatrapur. Kothadwar. Bundel and Sindh bahal. As per the field study, all these villages have lost their agricultural land. There were 826.56 acres of agricultural land taken by Vedanta Aluminium Limited (VAL). The land requirement by Vedanta is given in Table 1.6. As per the MoU, the Odisha government was required to make 150 million tonnes of bauxite. a key

Table 1.6: Land Requirement by Vedanta

Existing Land (1.0 MMTPA)		
Purpose	Acres	Hectares
Main plant	691.58	279.87
Red mud	452.06	182.94
Ash mud	235.79	95.42
Township	129.61	52.45
Railway	132.96	53.81
Total	1642	6664.49

Source: Report of Environmental Impact Assessment (REIA), 2007

raw material for alumina production, available for the company. In 2007, it again required additional land (about 1343 Ha) for accommodating the additional facilities of the plant, red mud pond, township and railway corridor

Socio-Economic status of the study area

There are two Particularly Vulnerable Tribal Groups (PVTGs) in Niyamgiri area. These are the *Kutia Kondhas* who live on the plains and the *Dongria Kondhas* who live in the top of the Niyamgiri hills. The *Kutia Kondhas* reside on the plains of the Niyamgiri hill and had small patches of agricultural land, where the entire family was engaged in cultivation. The *Dongria Kondhas*, with a still smaller population than the Kutias, reside on the Niyamgiri hills. The Kutia Khondas have lost their lands to VAL.

There has been a strong resistance by local communities, and the protests have been led by *Dongaria Kondhas*. They enjoy a critical and symbiotic relationship with the Niyamgiri forests. The Dongrias believe that the hill country belongs to Niyam Raja Penu, a male deity. They claim to be descendants of the Niyam Raja. The *Dongrias* have derived their name from "dongar" meaning agricultural and on hill slopes. If one claims to be a *Dongaria Kondha*, he must reside in the Niyamgiri hills and possess land of his own, and pass on to his posterity (Daspattnaik, 1984:26). The Dongrias have a distinguished heritage because of their dress style, mode of living, indigenous skills, cultural pattern and social system interlinked with nature and forests. Both culturally and ecologically, the Niyamgiri hills are extremely rich and significant and have some of the most pristine forests in Odisha, besides being home to the *Dongaria Kondhas*.

The socio-economic condition of the tribals in Lanjigarh has remained a grim area of concern where they have to fight for their daily survival and livelihood. Notwithstanding their toil and hardship for subsistence, they live in abject poverty.

The tribal economy was mainly confined with the forest products as most of the areas are under the forest coverage. They also depended on agriculture, having small holdings of 0.5 to one acre or even less. Land is fertile and paddy and vegetable production was good and adequate production was there. When interviewed about the agricultural condition, the villagers emphasised that they had a good agricultural production before VAL.

Land Acquisition and Displacement for the Refinery

Land acquisition for this refinery was initiated in June 2002 when the Kalahandi district collector's office sent a letter to affected landowners in 12 villages in the Lanjigarh area—Bundel, Borbhata, Kothadwar, Bandaguda, Sindbaheli, Basantpada, Jagannathpur, Kinari, Kappaguda, Belamba, Boringpaddar and Tiriguda. The letters declared that the district administration intended to acquire their lands—391 hectares of private land and 628 hectares of common village land—compulsorily for the Sterlite India's refinery project. The letter also explained that the families who would be fully displaced (who would lose their homes in addition to their lands) would be compensated and resettled, while the families whose lands would be taken over, would be compensated (Letter from NHRC Eastern Region's Special Rapporteur to NHRC, 14 May 2011).

Vedanta offered the 1,702 families, whose farmlands had been compulsory acquired for the refinery, the option of one-time cash compensation in lieu of employment: initially, 46 families and later 1,372 families received compensation. Around 1,010 families preferred not to take cash compensation and sent one person each for technical training at Vedanta's expense. Of these 87 individuals completed the training and Vedanta claimed that 11 of them were provided with employment in the refinery. However, it was not clear if the remaining 319 families (who did not take the initial cash offer or send people for technical training) received cash compensation. According to Vedanta officials, 220 of the families had not applied for cash compensations (Letter from NHRC Eastern Region's Special Rapporteur to NHRC, 14 May 2011). The villagers displaced were rehabilitated in the Vedanta rehab colony at the foothills of Niyamgiri (Niyam Dongar), the Niyamgiri Vedanta Nagar (NVN colony).

Resettlement and Rehabilitation Policy

The resettlement and rehabilitation policy stated that one member each from fully displaced families would be provided with employment by the company. VAL recently stated that as on 1 February 2009, one person each from 63 of these families has been employed in the refinery and one person each from the rest of the families had opted for the alternatives available under the policy—a one-time additional cash compensation or technical training towards self-employment (as per employment details released by Vedanta Aluminium as on 1 February 2009). Of the 1,220 families from whom farmlands were acquired, the policy states that one person each from the families is to be given priority in employment in the refinery depending on the context of the land acquired out of the family's possession. If this is not acceptable, one-time cash assistance, also graded on the basis of the land acquired, is to be made to the family.

Many expressed concern that the impacts of mining on water and forests or the noise and dust from the mine may make it impossible for them to continue to live in their traditional lands. Some of the villagers pointed out that Niyamgiri is full of pineapple, mango and jackfruit trees. They were cultivating these products from the time of their forefathers and getting a good income from the local markets. Further, their god, the *Niyam Raja Penu* is watching them. He will be angry if they give their land to Vedanta Steel Plant. It is this argument which has resulted in a strong resistance by the *Dongaria Kondhas* preventing bauxite mining from the Niyamgiri hills. This finally led to ban on all mining by the Supreme Court of India that has led to Vedanta to stop all operations in Lanjigarh.

VEDANTA AND DONGRIA KONDHA

The main conflict which has caught worldwide attention is Vedanta's mining lease to mine bauxite for its Lanjigarh complex from the sacred Niyamgiri hills, home of the PVTGs, the *Dongria Kondhas*. The *Dongria Kondhas* are a particularly vulnerable tribal group (PVTG) of about 8000, residing in the Niyamgiri hill range stretching in the Rayagada and Kalahandi districts of Odisha (refer map of Odisha). Niyamgiri is an area of densely forested hills and a store house of bauxite. For a decade, however, the *Dongrias* have lived under the threat of mining by Vedanta Resources, which wanted to extract the estimated $2 billion worth of bauxite (aluminum ore) that lies under the surface of the hills. This would prove disastrous and spell the end of the *Dongria Kondha* as a distinct people. In 2003, before receiving legal clearance to mine, Vedanta built a refinery at the foothills of Lanjigarh. The construction of the refinery forced over a hundred families of *Majhi Kondha*, a neighbouring tribe of the *Dongria*, to move to a settlement known as "the rehab colony", where a member of each family has been provided with a job in the refinery.

Vedanta, after making huge investments in the Lanjigarh plant, started work on a six-fold expansion of its facilities when gross violations of the Forest Rights Act (FRA 2006) were detected. A four-member Ministry of Environment and Forests (MoEF) panel headed by N.C. Saxena recommended against granting environmental clearance to mining in the Niyamgiri hills. It recommended "that allowing mining in the proposed mining lease(PML) area, by depriving two primitive tribal groups off their rights over the proposed mining site in order to benefit a private company would shake the faith of the tribal people in the law of the land. Since the company has repeatedly violated the law, allowing it further access to the PML area, at the cost of the *kutia and Dongria Kondhaas*, will have serious consequences for the security and well-being of the entire country".

In April 2013, in a judgement with important implications for all of India's tribal peoples, the Supreme Court ruled that communities affected by the mining project must be consulted. It asked the Government of Odisha to seek the consent of the concerned villages as per the provisions of the FRA 2006 that stated "that primitive tribal groups" have a customary right to worship the mountains and whether the mining by Vedanta would threaten their religious rights of worshipping Niyam Raja. However, the Odisha state government singled out only 12 of more than a hundred Dongria villages in which to conduct the consultations. By August 2013, all 12 *Dongria* gram sabhas unanimously voted against Vedanta's mining in the Niyamgiri hills. The results of the consultations are now being considered by India's MoEF, who will have the final say on the mine. However, there is a fear that the mine will be given the green light. Meanwhile, the MoEF rejected the grant of forest clearance for the Niyamgiri mining project after local gram sabhas rejected the mining proposal. Vedanta has decided to close down its one million tonne alumina refinery at Lanjigarh due to non-availability of bauxite ore and falling global metal prices.

CONCLUSION

The study has focused on the patterns of development adopted in India which aim at a uniform Western, capital-intensive models and does not take into consideration the uniqueness of local communities, particularly, the vulnerable sections of society. This has, therefore led to stiff resistance by local communities to these mega-projects. What is important is that the marginalised sections of the rural society have raised their voices against a pro-business State which is forcibly acquiring land from them to support corporate giants.

The Vedanta Project in Lanjigarh has also been affected by the landmark Supreme Court decision which prevented Vedanta from mining bauxite to feed its Lanjigarh plant. This has been a significant decision as it secured the rights of indigenous population, under the FRA 2006. The FRA 2006 has been a major step to undo the "historic injustice" done to the tribals and forest dwellers for generations. The right implementation of this Act will go a long way in ensuring inclusive development in the country.

The study has highlighted that the present development policies are definitely posing a threat to local communities in India. The government is creating more dependency of the people on government support' by depriving people off their lands and means of livelihood, rather than building self-sufficiency among the poor and landless.² It is ironical that the government on one hand is acquiring land, including agricultural land for industries and SEZs, and on the other hand making the provision of food and employment to the poor an obligation of the State. The tribals and the poor are deprived off their land and forests, which are their source of livelihood in the name of development. But these very people, who are supposed to be the beneficiaries of development, are today protesting against this process.

Thus the question arises: *Is rural development truly possible through mega-industrial projects?* Development is necessary but not at the cost of the poor. Only when it is inclusive and participatory, involving the poor and tribals, while protecting their land rights, culture and traditional beliefs, can there be genuine development. Amartya Sen defines development as the process of expansion of real freedom and capabilities that people enjoy, in contrast to the narrow views of development such as identifying development with growth of GDP, or rise in personal incomes, or with industrialization and technological advance (Sen, 2009).

Therefore, development strategies need to focus on human freedom. It is on this line that the study concludes that development strategies in India need to recognise the needs and uniqueness of vulnerable sections of the society. Therefore, there is a need to restructure development policies in building up the capabilities of these sections without threatening indigenous socio-cultural exchanges and livelihoods. An extractive capital centred development shall lead to greater social differentiations and thereby inequalities in the society. Land acquisition from the poor will push them further into poverty, particularly in a highly populated agrarian economy like India, where land performs the critical role of providing economic and social security. Such extractive development, as seen from the study, will have a devastating effect on the livelihoods and the health of the poor, thus violating their right to life. Kerala and other high HDI states have shown that heavy, capital intensive industries are not crucial for growth. A focus on basic needs like health and education and livelihoods of the poor is central to economic and social development. It is through this investment in social sectors along with land reforms which provided deeds to agricultural labourers and land for all that Kerala has successfully lowered poverty.

Finally development strategies in India, rather than trying to transform the village socio-economies, need to be more place-based and should seek to serve better the needs and desires of the people seeking to maintain and enhance their way of life. Thus, development should be "socially embedded" (Polanyi, 1944) rather than being an expanding profit generating market economy dominated by market relations. Thus, building up the capabilities of the poor rather than grabbing their lands and threatening their livelihoods can bring about equitable growth. Agriculture, the backbone of the Indian economy, needs to be strengthened so as to strengthen rural economy and prevent suicides of farmers. There are positive indicators in this direction both in the Central and State Budgets for 2016–17, where the agriculture outlay has been increased. A proper implementation of this will go a long way in expanding the capabilities of the poor and removing rural poverty.

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Note :

[1] For instance, the Government's Employment Generation Scheme (the Mahatama Gandhi Employment Generation Scheme) which is aimed to provide 100 days of employment to the poor (for details: refer to the Planning Commission of India – www.planningcommission.nic.in)

[2] One step in this direction is the present Government's emphasis on skill development through its Make-in-India programme. But this is a new policy and its impact is still to be felt.

> *We need to promote development that does not destroy our environment.*
>
> —*Wangari Maathai*

Diversification of Agriculture for Enhancing Income and Employment Opportunities in Uttarakhand[1]

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It has been well recognized that undertaking traditional form of farming operations is neither in a position to create additional employment opportunities for increasing labour force nor to sustain the livelihood of farming households due to increasing fragmentation of arable land and its decreasing quality and depletion of various natural resources supporting to agricultural productivity in the hilly areas of Uttarakhand. Carrying out large-scale diversification and modernization of economic system by way of initiating industrialization to overcome from such problems is also restricted by certain environmental and ecological constraints. In such situations, initiating agricultural diversification through minimizing the use of land under the traditional low value food crops and its subsequent shift into the production of various high value crops and market oriented non-food crops such as fruits, off-season vegetables, oilseeds and spices, thereby to maximize per hectare and per household income are favourably available in its different areas. Both per hectare productivity and the value of net income being originated from the production every high value crop especially most market-oriented crops such as fruits and off-season vegetables, has witnessed remarkably manifold higher as compared to opting the farming of various traditional crops. In fact the elasticity of providing gainful employment opportunities with fairly larger per worker productivity and earnings have been well recognized in opting to confine on farming of former categories of crops as compared to latter one. The examination of above highlighted arguments are based on the analysis of primary data collected among a sample of 974 farm households located in different geographical locations, i.e. high, middle and low hill areas of two most agriculturally diversified districts of Pauri and Nainital in the state.

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I. Introduction

Agriculture and its associated activities have been forming the economic base as well as the main source for employment and income generation in Uttarakhand for last several centuries. However, due to increasing fragmentation of arable land and its decreasing quality due to increasing scarcity of water for irrigation and depletion of various natural resources supporting agricultural productivity, the farming sector alone is neither in a position to create additional employment opportunities for increasing labourforce nor to sustain the livelihood of farming households, especially for marginal farmers (Mehta, 1997). Similarly, the emerging challenges of providing additional productive employment cannot be reduced through carrying out large scale diversification and modernization of economic system by way of initiating industrialization due to certain environmental and ecological constraints. In such situations, initiating diversification in farming system through shifting of available arable land into the production of various niche based high value crops rather than using it under the cultivation of traditional field crops could be a most important option for creating additional employment and improving the livelihood situation of farming households in the emerging absolutely marginalized farming system of the state (Papola, 1996).

Emerging problems to agriculture in hilly and mountain areas of the state are increasing fragmentation of holdings resulting in increasing numbers of marginal and small farmers. terraced fields, unprecedented decreasing pattern in arable land, partly due to increasing pace of urbanization and partly due to increasing natural disasters like landslides, soil erosion and depletion of natural resources and water scarcity for irrigation. As a

result of these factors, adoption of traditional farming system with using available land in the production of low value and traditional crops have created the problem of sustaining the livelihood of farming households, particularly of marginal farmers. Consequently the value of agricultural produce becomes very low as compared to the aggregate cost of production. Thus, obviously the average hill family gets around seven months, subsistence in terms of food from its holding (Madhav, 1981) and its contribution in the income of farming households accounted for nearly 32 percent (Mehta, 2003). These findings are further substantiated by Pokharyal (1993), who argues that despite their best efforts the hill farmers are not in a position to produce enough food grains to meet their domestic consumption requirements. Pokharyal further points out that 90.67 percent of the farmers do not use improved farm technology, which is the reason for the low yield.

II. The Options

In order to overcome the problem of low productivity of land, it shall be desirable to have a comprehensive land use planning based on the classification of land and its suitability for growing different food crops, vegetables, fruits and other non-food crops. Issues related to land use pattern and land management has, therefore, been cited a very important subject of policy concern for mountain areas (Bansksta, 1993). In this context the obvious objective of a land-based planning exercise is to allocate the available land for alternative uses which maximize per hectare returns. At the same time, efforts must also be made to identify specific farming options which will be environmentally sustainable (Pratap, 1999). Thus, the concept of appropriate land use planning and management should centre on the objective approach of a basic shift of available land from the production of low value food crops to those of high value crops in consonant with the environment and ecology of concerned geographical locations of the state. In fact, it should aim at: (i) a shift in pattern of the use of land already under cultivation; (ii) a greater emphasis on vegetables and horticulture; (iii) productive use of deforested land; and (iv) development of grass lands and pastures to support a more productive animal husbandry sector (Mehta, 1996).

III. The Present Paper

In light of the above arguments, the present paper has attempted at the contribution of farm sector in the income of farming households, the extent of changes emerging in cropping pattern, production and productivity, implications of diversification of agriculture in terms of deriving net returns and employment generation in using available land under high value crops and the future perspectives of initiating diversification across different geographical locations of the state. The paper is based on both secondary as well as primary data. The primary data was collected among a sample of 974 farm households located in different geographical locations, i.e., high, middle and low hill areas of two most agriculturally diversified districts of Pauri and Nainital in the state.

IV. Emerging changes in cropping pattern, production and productivity

The farmers continued to have been utilizing a highest proportion of arable land for growing traditional low value crops such as wheat, mandua, barley and paddy in the state. At the same time, the shift of land under the production of various high value crops, especially fruits, vegetables, species, etc. has also been simultaneously taking place in each of the geographical locations. The proportion of land being used for growing food crops has been negatively related with the size categories of farms. Rice and wheat are the most dominating food crops in almost all the areas but the area under both the crops have been narrowing down at the rate of 1.76 percent and 0.14 percent annually. The allocations of land under the production of fruits, vegetable and species have been increasing at the rate of 2 percent, 5 percent and 4 percent respectively. The high hill areas have possessed greater advantages over the middle and low hill areas in terms of growing various temperate, tropical and sub-tropical fruits. Therefore, the proportion of area as well as increasing pattern in area under different fruits have been noted many folds higher in former areas than in latter two locations. Fruits such as mango and litchi are mainly grown in low and middle hill areas. Potato seems to be the dominant crop among the various vegetables grown in different areas which share is accounted for over 63 percent in the total land put under the all vegetables.

The quantum of production of almost all the cereals has shown a declining trend. However, cropped area under all the cereals has been declining, especially in bottom categories of farm size categories in high and middle hill areas. However, the production of oilseeds, especially of soyabean and mustard, has been increasing at the rate of around 2 percent annually. Similarly, the production of different fruits, especially the dominant fruit crops such as apple and peaches, and vegetables has also been steadily increasing in the state. Further, it noted that despite a

considerable declining trend witnessed in the area under different food crops and certain non-food crops the productivity of major food crops, excepting rice and mandua and barley in middle hill areas, and non-food crops, excepting vegetables in middle hill areas, have been remarkably increasing. Per hectare productivity of all crops together has been increasing at the rate of 2.22 percent annually. But the overall per hectare productivity as well as growth in productivity rates of both food grains and high value crops constituted fairly much larger in favour of bottom categories of farm sizes as compared to medium and larger one. In this sense the farmers with tiny size of holdings, with below one hectare have been better optimizing the use of their available small sizes of land through deriving larger economic benefits as compared to relatively larger farm holders.

V. Contribution of Farm Income in Farming Households

Further the marginality situation of farm and farm households in different geographical locations has been well visualized while taking into account the per household income from agriculture sector, its contribution in the total income of farm households on one hand and the overall economic situation of the households as measured in terms of per capita and per household income available from different sources on the other. Per household income as generated from all sources together is estimated at Rs. 37.92 thousand which varied largely from Rs. 43.22 thousand in low hills to Rs.28.68 thousand in high hills. And the per capita income is accounted to Rs. 6.667, comprising Rs. 7.738 in low hills followed by Rs.7,728 in middle hills and Rs.4,801 in high hills. However, on an average, a farm household is in a position to generate the annual income of Rs. 7,921 from their available size of

farms. The corresponding figure of per household income being generated from farm sector accounted to Rs. 8,637 in low hill areas, Rs.8,028 in middle and Rs.7,116 in high hill areas. Also the contribution of farm sector in the total income of farm households is estimated to be merely 22.20 percent, though it stands relatively higher in high hill areas (24.84 percent) as compared to low (23.87 percent) and middle (18.56 percent) hill areas. Income earned through wage paid employment has the largest share of over 36 percent in the farm households. Even, its share is reported to be as larger as over 41 percent in middle hills and at lowest level of 28.48 percent in high hills. The share of income being originated from animal husbandry has also been witnessed significantly much higher (17.21 percent) as compared to income earned from the field crops (11.64 percent). In fact, its share is reported as higher as 25.06 percent for households in high hills as against 15 percent each in low and middle hills (Table 1).

VI. Implications of diversification of agriculture in creating income and employment

It was accepted that initiating agricultural diversification would prove as a cognitive approach for improving livelihood and creation of additional employment. At the same time it would also be a costly affair for mountain farmers, especially for tiny farm holders. As the per hectare input cost for undertaking the farming based on high value crops has been estimated two to six folds higher as compared to the traditional food crops. Input cost for procurement of plants seeds, fertilizers, hiring of labours and expendture involved in marketing of produced happened to be the major heads of costs which together accounted 75 percent in the aggregate cost of production. Per hectare aggregate input cost of production of food grains and different high

Table 1: Contribution of Income from Different Sources in Different Geographical Locations

Source of Income Generation	High Hills	Middle Hills	Low Hills	All Areas
Agriculture	531.695 (5.57)	1.028.765 (7.58)	2.182,322 (19.45)	374,282 (11.64)
Animal Husbandry	2,393.700 (25.06)	2,020.610 (14.89)	2,061,630 (14.20)	6,475,940 (17.21)
Horticulture	1.222,482 (12.80)	59.981 (0.44)	288,831 (2.00)	1,571,294 (4.18)
Business/Trade	467.800 (4.90)	558.500 (4.12)	482,000 (3.32)	1.508,300 (4.01)
Household Industry	419,690 (4.39)	443.000 (3.27)	305,500 (2.11)	1,168,190 (3.10)

Table contd...

Household Industry	419.690 (4.39)	443,000 (3.27)	305,500 (2.11)	1,168,190 (3.10)
Wage and Salary	2.720,380 (28.48)	5,565,650 (41.02)	5,269,100 (36.30)	13,555,130 (36.02)
Remittances and Pension	926,900 (9.70)	208.9024 (15.40)	2,569,100 (17.67)	5,580,724 (14.83)
Others*	250,750 (2.63)	372,074 (2.74)	369,800 (2.55)	992.624 (2.64)
All Sources	9,548.864 (100.00)	13,569.556 (100.00)	13,881,495 (100.00)	36,999,915 (100.00)
Per Household	28,675	43,215	42,451	37.988
Per Capita	4,802	7,727	7,738	6,680

*Other source of income: Professional, *jajmani* and transport activites.

Note: Figures in parentheses indicate the percentages of total household in respective farm size.

Table 2: Gross Income, Cost of Cultivation and Net Income Per Hectare of Major Crops *(Value in Rs.)*

Crops Gross	Income	Cost of Cultivation	Net Income	Output Input Ratio
Food grains	9,427	1,998	6,747	4.72
Oilseeds	17,621	3,488	14,133	5.05
Spices	93,595	36,127	57,469	2.59
Fruits	29,774	11,471	18,303	2.60
Vegetables	20,261	6.638	13,623	3.05
All Crops	15,492	4,568	10,924	3.39

value crops together varies between Rs.3,117 in low hill areas to Rs.6,095 in high hill areas (Table 2).

Among the various food grains it stands highest for sawan followed by wheat and paddy with a marginal differences prevailing across the size of farms. In cases of various high value crops, per hectare cost of production accounted highest for species followed by fruits and off-season vegetables. Also, the farmers have been bearing fairly high per hectare production cost for growing oilseeds as compared to both cereals and other food grains but around ten times less than per hectare cost of species. However, the per hectare cost of cultivation of food grains accounted 18 times less as compared to growing of species, seven times lower to fruits (Mehta, 2008).

The output–input ratios for various cereals are varying between the range of 3.64 and 1.78, though the respective ratio stands relatively much higher in case of pulses as compared to cereals. From the view point of maximizing the economic benefits in using cultivated land under the production of different cereals it may be pointed out through

considering the analysis presented in Table 3 that a highest levels of per hectare income can be derived in undergoing the production of wheat and then paddy followed by other local cereals. Input cost per hectare for undertaking the production of sawan has been reported to be fairly much larger at Rs. 2.80 thousand as compared to Rs. 2.58 thousand for wheat and Rs. 2.21 thousand for paddy while it come only Rs. 665 for madua and Rs. 744 for barley.

Among the various pulses, per hectare gross income varied lowest at Rs. 11.83 thousand for local variety pulses such as bhatt, gahat and rajma to highest at Rs. 22.79 thousand for peas and gram. In comparison to per hectare net income level being derived from the cultivation of pulses the per hectare cost structure seems to be at very lower order, ranging from Rs.1,691 at the maximum for peas and gram to lowest at Rs. 864 for local estimated as high as Rs. 21.10 thousand for peas and gram followed by Rs. 16.68 thousand for urd and Rs. 11.57 thousand for masoor and lowest at Rs. 10.96 thousand for local pulses such as bhatt, gahat and rajma.

Considering into account the output–input ratio, together of all cereals, spices, oilseeds, pulses and various non-food crops, including fruits, spices and vegetables, the growing of oilseeds has been recognized as the most economical activity as compared to remaining crops. But, the per hectare net amounts of returns in using land under the production of most of the oilseed crops have been revealed significantly to a much lower order than it depicted for various fruits, spices and pulses. Undertaking the production of oilseeds, such as lahi and soyabean, seems to be the most economical affairs in the state in the sense that the output-input ratio of concerned crops are in the order of 5.66 and 5.09 respectively as against of 4.99 for mustard and 4.73 for local oilseeds. Also, per hectare net returns have been estimated relatively highest at Rs. 15.01 thousand for soyabean as against other dominant oilseeds of the state, such as mustard (Rs. 12.55 thousand). In fact the net returns for local oilseeds stand relatively larger as compared to both lahi and mustard. However, it has to be noted that in spite of the visualized facts that growing of various oilseeds is becoming more economical for farmers as compared to growing various food grains and

Table 3: Gross Income, Cost of Cultivation and Net Income Per Hectare of Food grains

Crops	Gross Income	Cost of Cultivation	Net income	Output-Input Ratio
Paddy	7,388	2,210	5.178	3.34
Madua	1,998	665	1,333	3.00
Sawan	5,003	2,809	2.194	1.78
Wheat	9,402	2,583	6.819	3.64
Barley	2,411	744	1,667	3.24
Other Cereals	6.688	2,180	4,508	3.07
All Cereals	7.382	2,188	5,194	3.37
Urad	17,600	921	16.679	19.10
Masoor	12.404	839	11.565	14.78
Peas and Gram	22,786	1,691	21.095	13.47
Rajma and Bhatt/Gahat	11,827	864	10.963	13.69
Pulses	19,925	1.023	18.902	19.48
All Food grains	9.427	1,998	7.429	4.72

Table 4: Gross Income, Cost of Cultivation and Net Income Per Hectare of Oilseeds and Spices   *(Value in Rs.)*

Crops	Gross Income	Cost of Cultivation	Net Income	Output Input Ratio
Mustard	15.689	3.144	12,545	4.99
Lahi	15.857	2.804	13.053	5.66
Soybean	18.676	3.669	15.007	5.09
Others	17.754	3.752	14,002	4.73
All Oilseeds	17.621	3,488	14,133	5.05
Ginger	115,999	44.909	71,090	2.58
Chillies	46,954	13.027	33,927	3.60
Other Spices	55.485	13.599	41,886	4.08
All Spices	93,595	36.127	57,468	2.59

different high value crops growing the production of oilseeds cannot be carried out at mass scale level because all the oilseeds can be grown only under the mixed farming system along with or as inter-crop with various food crops, especially with madua during the kharif crops season (Table 4).

The output–input ratios of various spices are however noted significantly at a lower level as compared to remaining high value crops grown in the sample areas. But, both gross income as well as net returns per hectare for spices has been estimated remarkably very high as compared to other high value crops. The output–input ratio stands highest at 4.08 points for local spices to lowest at 2.58 points for ginger. In fact, the net return per hectare has been recorded as higher at Rs. 71.09 thousand for ginger followed by Rs. 41.89 thousand for local spices and lowest at Rs. 33.93 for chilly. Again the cultivation of various spices cannot be undertaken at a large-scale level in the sense that undertaking the cultivation of spices requires a very high productive soil, developed irrigation facilities and various infrastructural facilities. These facilities are inadequately available in different areas of the state. At present, the spices are mainly grown in valley areas and in irrigated lands of some pockets in high and middle hills.

Further, taking into account the output–input structure of various fruits the analysis revealed that the per hectare

input cost comprises lowest at Rs. 4.54 thousand for litchi to highest Rs.13.83 thousand for peach while the growing of mango and apple seems to the highly economical as compared to remaining fruits. This has emerged with the fact that both gross values of output and net returns per hectare for mango has been recorded as higher at Rs. 30.75 thousand and Rs. 22.42 thousand, respectively, and the corresponding value for apple stated to be Rs. 35.07 thousand and Rs. 21.71 thousand. Among the remaining fruits, the value of net returns per hectare are ranging highest Rs. 20.86 thousand for litchi, which is grown in middle and low hills, and lowest at Rs. 7.69 thousand for pear which is mainly fruits the net returns per hectare are also quite appreciable if we derived from the cultivation of various food-crops. The output–input ratio has been indicated highest at 5.60 points in favour of litchi followed by other fruits as papaya, guava, oranges, etc. (4.16 points), 3.69 points for mango, 2.62 points for apple and lowest at 1.87 points for plum followed by 2.20 points for plum (Table 5).

A look into the structure of net income per hectare being derived from the cultivation of various vegetables it provides gives an impression that growing of different vegetables, especially potato and onion, are quite profitable activity as compared to pulses and several other high value oilseeds such as mustard and lahi and fruits such as pear and plum in the state. A highest level of net returns per

Table 5: Gross Income, Cost of Cultivation and Net Income Per Hectare of Fruits (Value in Rs.)

Crops	Gross Income	Cost of Cultivation	Net Income	Output Input Ratio
Mango	30,751	8,329	22,422	3.69
Peach	33,620	13,852	19,788	2.43
Apple	35,072	13,367	21,705	2.62
Apricot	25,914	11,755	14,159	2.20
Pear	13,402	5,713	7,689	2.35
Plum	21,514	11,533	9,981	1.87
Litchi	25,404	4,539	20,865	5.60
Other Fruits	22,955	5,514	17,441	4.16
All Fruits	29,774	11,466	18,308	2.60

hectare have been visualized in response to onion (Rs.17.94 thousand) followed by Rs. 13.02 thousand for potato, Rs. 12.58 thousand for cabbage, Rs. 12.37 thousand for other vegetables which are grown during the rainy season and lowest at Rs. 11.46 for tomato which is grown largely in low hill areas. The input cost of potato has been reported

to be a very high level of Rs. 8,086 as compared to Rs. 4,382 for onion and Rs. 4,317 for cabbage and Rs. 3,616 for other vegetables. The consequences of a very high per unit cost of production as revealed in case of the cultivation of potato the output–input ration of concerned vegetable crop accounted only 2.61 points as against 5.09 points

for onion, 4.91 points for other vegetables grown during rainy season, 3.91 points for cabbage and 3.69 points for tomato.

More significant facts, which have been largely emerging, are that both potato and onion are the major off-season vegetable grown in almost all the areas of the state. Both area and production have been recognized consistently increasing for both the crops over the years (Table 6).

The analysis also depicts that despite a very high level of per hectare operating cost involved in the production of potato the net returns per hectare as being derived from growing of potato have been quite larger as

Table 6: Gross Income, Cost of Cultivation and Net Income Per Hectare of Vegetables *(Value in Rs.)*

Crops	Gross Income	Cost of Cultivation	Net Income	Output Input Ratio
Potato	21,102	8,086	13,016	2.61
Onion	22,321	4,382	17,939	5.09
Tomato	15,714	4,260	11,456	3.69
Cabbage	16,894	4,317	12,577	3.91
Other Vegetables	15,986	3,616	12,370	4.42
All Vegetables	20,261	6,638	13,623	3.05

compared to remaining vegetables grown in the sample areas. Over and above, it has been well proved that the more favourable advantages in the state are available in terms of growing various high value non-food crops with a certain locational differences prevailing in relation to location specific advantages available for using land under the cultivation of certain high value crops instead of growing traditional food crops as per hectare net returns as well as gross value of income of various high value crops have been estimated manifolds higher than the case of food grains.

In spite of the above revealed reality the proportion of area to gross cropped areas being used under the production of various traditional food grains is still many times higher as compared to what it is being used under the cultivation of various high value crops. One of the most important explanations in this context seems to be a very high production cost per hectare involved in opting for various high value crops as condition of marginal farmers might be hardly allowing them to opt for initiating shift in their traditional farming system towards high value market-oriented crops.

Since it has been well recognized that initiating agriculture diversification in the state through bringing additional cultivated land under the production of high value crops like fruits, vegetables, spices and oilseeds would

be a most important option in the emerging situation of very low level of returns being achieved through using available land under the production of traditional food crops as compared to various high value non-food crops. The study further proceed to assess the extent of differences are emerging in per hectare gross income, net returns and cost of production for various food and non-food crops among different geographical locations. Expectedly, such analysis would provide an insight into the appropriateness and viability situation in opting and for initiating the cultivation of high value crops in specific to various geographical locations in the process of undertaking agricultural diversification.

The gross incomes as well as net returns per hectare of land in the cultivation of foodgrain crops have been noted relatively at very low level as compared to various non-food crops in each of the geographical locations. The net returns per hectare for food grains accounted at highest level in low hill areas (Rs.8,730) followed by Rs.5,844 in middle hill areas and at lowest level of Rs.4,183 in high hill areas. Reversal in the situation prevailing in relation to the net returns per hectare being derived from the cultivation of both fruits and vegetables as the corresponding figures constitute highest for favour of high hill areas and lowest for low hill areas. In comparison to food grains, the per hectare net income being derived from the cultivation of

spices accounted as high as nine folds, followed by four folds for fruits, three folds for vegetables and 59 percent for oilseeds in high hill areas. However, the extent of differences in per hectare net income generation from growing food grains and non-food crops have been appearing relatively at low level in middle and low hill areas as compared to in high hill areas. In comparison to the cultivation of food grains crops the income being originated from the cultivation of fruits has been registered nearly three folds higher in both the areas and little over double in middle hills while almost two folds in favour of vegetables in each location. On the other, the cost of production in the cultivation of both fruits and vegetables has been reported significantly much larger in high hill areas in comparison to middle and low hill areas, it is mainly due to a very high transport and marketing cost involved in former area than in the latter areas. The cost of production per hectare for oilseeds stand highest at Rs. 3,973 in high hills followed by Rs. 3,774 in low hills and lowest at

Rs. 2,870 in middle hills. However, reversal is the situation in the cost of cultivation of spices in case of different areas. Thus, due to relatively higher level of per unit cost involved in the production of various food and non-food crops in very difficult and inaccessible areas of high hills the net returns for almost all the crops in high hill areas have been recognized relatively higher as compared to both middle and low hill areas. Otherwise the gross income per hectare originated from the production of all high value crops in high hill areas have been reported fairly at much larger level as compared in both middle and low hill areas. The higher level of advantages in favour of middle and low hill areas over the high hill areas have been reported in obtaining relatively higher per hectare gross income merely from the cultivation of various food grain crops (Table 7).

Among various fruits, per hectare cost of production of apple stands highest at Rs.13.36 thousand. Harvesting and packaging cost together have the major

Table 7: Per Hectare Value of Cost, Income and Output/Input Ratio of Different Crops across the Regions (in Rs.)

Areas/ Crops		Food Grains	Fruits	Vegetables	Oilseeds	Spices	All crops
High Hills	Gross income	5,816	30,252	20,736	11,088	55,550	16,004
	Cost of cultivation	1,633	12,567	7,886	3,973	19,910	6,095
	Net Income	4,183	17,685	12,850	7,115	35,640	9,909
	Output/Input Ratio	3.56	2.41	2.63	2.79	2.79	2.63
Middle Hills	Gross income	7,301	22,413	19,992	16,924	102,785	16,332
	Cost of cultivation	1,457	5,934	5,721	2,830	38,429	4,722
	Net Income	5,844	16,479	14,271	14,094	64,356	11,610
	Output/Input Ratio	5.01	3.78	3.49	5.98	2.67	3.67
Low Hills	Gross income	11,294	29294	19760	20307	48475	13,391
	Cost of cultivation	2,564	7178	5651	3774	8625	3,117
	Net Income	8,730	22116	14109	16533	39850	10,274
	Output/Input Ratio	4.41	4.08	3.50	5.38	5.62	4.30

share in total production cost of almost the fruits grown in different locations, which share is nearly half in the total cost. Similarly, in growing of various vegetables, per hectare cost accounted highest at Rs.8,086 for potato to lowest at Rs.1,417 for cabbage. However, growing of vegetables is recognized less costly as compared to growing of fruits.

At each category of farm sizes, the net income per hectare being derived from the cultivation of food grains are noted at a very low level as compared to various high

value crops. In comparison to food grains, per hectare net income being generated from the cultivation of species accounted as high as nine-folds, followed by four-folds to fruits, three-folds to vegetables and 59 percent to oilseeds in high hill areas but the respective difference are narrowing down if we proceed towards middle and low hill areas. Similarly due to the fact that the agro-climatic conditions in high hill areas is highly favourable for growing various fruits as compared to middle and low hill areas the value of net return of fruits in former areas are noted much higher

as compared to remaining areas. Such a situation is not the case for other high value crops as vegetables, species and oilseed. As the per hectare return from growing these crops have been following at around 25 to 40 percent in favour of middle and low hills as compared to high hills. This is largely due to much higher level of production cost involved in growing different crops in former areas than in latter areas. Otherwise the gross returns per hectare being originated from all the high value crops in high hill areas stand much higher as compared to remaining areas. The middle and low hill areas have been achieving relatively higher per hectare gross returns as compared to high hill areas in case of growing merely food grain crops.

Among the various fruits grown in different areas the highest income generation potentials have been recognized in undertaking the plantation of apple and peaches in high and middle hill areas and mango and litchi in low hill areas. Among the various vegetables, the cultivation of onion followed by potato seems to be a most profitable farming option as compared to growing other vegetables in each of the geographical locations. Also, growing of both potato and onion seems to be a more beneficial activity as compared to growing lahi and several other oilseeds and fruits such as pears and plums in the state. Further the pattern of per hectare income generation from growing different food and

non-food crops together is seen negatively related with the size classes of farms. And the tiny farm groups of households are deriving comparatively higher per hectare income as compared to upper and medium farm holders in growing of almost the high value crops, especially fruits and vegetables.

On an average a farm household is in a position to generate an annual income of around Rs.7,921 from undertaking the farming together of food and non-food crops, though it varies marginally among different geographical locations. Providing 68 percent arable land under the production of food grains has been contributing a share of only 44 percent while allocating remaining 32 percent arable land under various high value crops is contributing 56 percent share in the gross income of farm households. It proves that providing increasing initiatives towards bringing additional arable land from former crops to latter one, especially under fruits and off-season vegetables, could be the most important option for maximizing per household income in different areas especially in high and middle hill areas.

Initiating agricultural diversification would not only prove an important measure for enhancing the per hectare productivity but its contribution has also been proved in

Table 8: Average Area and Income Per Household in Using land under Different Options by Locations

(Area in hectares and income in Rs.)

Options	High Hills		Middle Hills		Low Hills		All Areas	
	Cropped Area	Income	Cropped Area	Income	Cropped Area	income	Cropped Area	Income
Food grains	0.36	1499	0.49	2862	0.69	5992	0.51	34,447
%	50.00	21.07	71.01	35.66	80.23	69.38	68.00	43.52
Fruits	0.21	3671	0.01	191	0.04	883	0.09	1613
%	29.17	51.59	1.45	2.38	4.65	10.23	12.00	20.37
Vegetables	0.14	1741	0.12	1648	0.07	1007	0.11	1465
%	19.44	24.47	17.39	20.53	8.14	11.66	14.67	18.49
Oil Seeds	0.01	97	0.03	414	0.04	682	0.03	396
%	1.39	1.37	4.35	5.15	4.65	7.89	4.00	4.99
Spices	0.01	107	0.05	2912	0.01	73	0.02	1000
%	1.39	1.50	7.25	36.28	1.16	0.85	2.67	12.63
All Crops	0.72	7116	0.69	8028	0.69	8637	0.75	7,921
%	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

creating additional and productive employment opportunities since the cultivation of various high value crops have proved more labour intensive as compared to traditional crops. The number of workers employed per hectare in growing of food grains accounted only 6 as against 16 and 23 workers in growing of fruits and vegetables, respectively. However, the potential of generating employment opportunities through undergoing the production of vegetables seems to be fairly larger in low hill areas followed by middle and high hill areas. But the per hectare worker employed in cultivation of fruits is much higher in high hills areas as compared to middle and low hill areas. Also growing of both fruits and vegetables require employing much higher per hectare women workers as compared to the cultivation of food grains in each of the geographical locations.

It revealed that using one hectare land under the production of food and non-food crops together have the potential to provide 310 man days employment; consisting

relatively much higher at 556 days under the production of vegetables followed by 475 days for fruits as against only 233 days in opting for food grains production. Across the different geographical locations, the generation of employment per hectare in undertaking the farming of food and non-food crops together is noted fairly higher in high hill areas followed by middle and low hill areas. In comparison to the cultivation of food grains, growing of both fruits and vegetables have been providing almost little over two times higher man days employment in each high and middle hill areas while 36 percent in the production of fruits and little over two folds in vegetables in low hill areas. However in each geographical location, per hectare man days employment for women have been recognized relatively higher as compared to men in undertaking the food grain production (Table 9).

The labour requirement for undertaking different farming operations both in growing of food and non-food crops is mostly being met out through employing the

Table 9: Crop-wise Per hectare Employment

Crops	Men	Women	Child	Total
Food grains	3	3	0	6
%	50.00	50.00	0.00	100.00
Fruits	10	5	1	16
%	62.50	31.25	6.25	100.00
Vegetables	12	9	1	22
%	54.55	40.91	4.55	100.00
All crops	5	4	1	10
%	50.00	40.00	10.00	100.00

available workforce with the farm households across the different geographical locations. Merely 10 percent of farm employment is provided by hired labours, which stands highest at 20.21 percent in plantation of fruits to around 9 percent in growing of vegetables and a little over 7 percent in food grains production. However, the share of hired workers to total workers employed in undertaking both

food grains and non-food grains productions is noted comparatively higher in low hill areas as compared to remaining areas (Table 10).

On an average, a worker engaged in cultivation is in a position to earn Rs.1,100 per annum, with a little level of variations existing across different areas. However, using one hectare lands under the production of food grains have

Table 10: Average Annual Earnings Per Workers under Different Options by Locations

Options/ Locations	High Hills	Middle Hills	Low Hills	All Areas
Food grains	538	1,082	1,676	1,152
Fruits	1,225	355	1,289	1,130
Vegetables	665	1,727	570	1,011
All Crops	812	1,295	1,316	1,100

been providing relatively higher per worker earnings as compared to growing of both fruits and vegetables. But per worker earning in growing of both fruits and vegetables accounted comparatively much higher than that of food crops in case of the middle and high hill areas while reverse is the situation emerging in low hill areas. Also the pattern of average earnings per worker in undertaking the farming of both traditional food grain crops and high value crops like fruits and vegetables are positively related with the size categories of farms. Under the existing circumstances, the emerging cropping pattern indicates a shift in the production of fruits in high hill areas, vegetables along with some fruits in middle hill areas and oilseeds and major food grains such as paddy and wheat in low hill areas would be the most alternative options for increasing the livelihood of farming households and providing productive employment to the rural labourforce in respective areas (Mehta, 2008).

VII. Conclusions

Initiating agricultural diversification through minimizing the use of land under the traditional low value food crops and its subsequent shift into the production of various high value crops and market oriented non-food crops such as fruits, off-season vegetables, oilseeds and spices, thereby to maximize per hectare and per household income are favourably available in its different areas. Both per hectare productivity and the value of net income being originated from the production every high value crops, especially most market oriented crops such as fruits and off-season vegetables have been witnessed remarkably many-folds higher as compared to opting the farming of various traditional crops. In fact, the elasticity of providing gainful employment opportunities with fairly larger per worker productivity and earnings have been well recognized in opting to confine on farming of former categories of crops as compared to latter one. However, the options and opportunities in favour of undergoing agricultural diversification have been recognized largely available in high hill areas followed by middle hill areas while the low hill areas have the options for using available arable land in growing of certain cereals, pulses and oilseeds rather than to concentrate in growing of fruits, vegetables and spices on a mass level. Various fruits which are being grown with achieving a very high level of per hectare productivity in high and middle hill areas cannot be grown elsewhere including in low hill areas of Uttarakhand.

In fact, the farming communities in different geographical locations are well aware about using their limited available arable land under the most beneficial options of cropping system which option can maximize the per hectare net income and use of labour. It is, therefore, the area under various traditional food grains, even in case of major food crops such as paddy and wheat which is consistently declining and its increasing shift under the production of various high value crops, especially fruits, off-season vegetables and spices across the different farm size continuum and in different areas of the state has been well demonstrated. However, even after knowing such a very high economic advantages that can be achieved through using available arable land under the production of various high value crops instead of using it under the production of traditional food grain crops a very high proportion of nearly half of farm households, especially in high and middle hill areas have been practicing to undertake the farming system dominated by latter categories of crops. It is mainly due to the involvement of relatively high cultivation cost and the inability of farmers to meet out such level of costs due to their poor economic conditions and inaccessibility situation arising in the availability of various inputs such as seeds and plants and technological know-how in opting for growing of certain high value crops, and the inadequately developed marketing network for selling of farm produces and lacking initiatives from the part of any government departments to motivate farmers for changing cropping system.

There is a need to initiate a concrete and comprehensive planning approach to motivate farming communities for harnessing natural advantages and niche-based opportunities by way of opting the utilization of available arable land under the production of various high value crops through minimizing land under the production of traditional food crops so as the livelihood situation of marginal farmers could be strengthened and the productive employment opportunities for additionally increasing labour force can be created to a certain level.

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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

Talent Development in Family-managed Businesses: A Cross-organizational studies on SMEs and large business units in India

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Family-managed organizations practice talent development through alternative experiential learning approaches like mentoring, cross-skilling and even by focusing on employee engagement. This study examines the trend in talent development practices in family-managed business units in India, based on information compiled from two family-managed small and medium-sized enterprises (SMEs) and two family-managed large business units. The study outlines the talent development practices in sample family-managed SMEs and then compares it with talent development practices of two large family-managed business units. Based on the literature support and the results of comparison, the study then suggests the need for emulating the best practices on talent development in family-managed SMEs, even when direct investments are not made.

Introduction

We have been struggling for the definition of talent for quite some years. One definition cannot answer this. Even for organizations, perception on talents differs. We have seen many employees who when they deliver 'exceeds expectation' level of performance become talent for the organization. But the same employees who were identified as talent for delivering 'exceeds expectation' level of performance in operations or protocol-bound jobs, when they fail in non-operational jobs in future, we put them out of our talent pool. This raises the question: can talent be such time and job specific? We cannot offer any definition of talent which can go unchallenged. Even then let us try. Talents are those enduring qualities and attribute of employees, which can ensure long-term sustainability and growth, both for the individual and for the organization (Bhattacharyya, 2015). This definition is more appropriate for family-managed business units in India, who are sustaining over a long period, despite globalization, competition and economic slowdown.

The next challenge for us is to define talent development. Our organizations are still not free from the 'bell-curve effect' of performance evaluation. Bell curve, also known as normal distribution method, is used in performance assessment by many organizations worldwide. By using the bell curve, organizations adjudge only some percentage of employees (usually 10 percent) as hyper-performers. These employees are the talent for the organizations, and they become eligible for increased compensation and benefits, accelerated promotions and opportunities to develop through sustained learning reinforcement. This obviously persuades our organizations to think for those top 10 percent, who perform at 'exceeds

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expectation' level as the precious talent. Exclusivity in developing these 10 percent both through planned and unplanned learning is our legitimate understanding of talent development. It is a process of guiding and developing such star employees by means of which organizations can continue to leverage their talents for long-term sustainability and growth. Family-managed organizations, particularly in India, however, cannot think of such talent development pursuit. For such organizations, talent development is an inclusive approach to guide and develop all cross-sections of employees, so that they can continue to perform best with their enduring qualities and attributes.

Objectives of this study are to understand talent development practices of family-managed SMEs in India, understand their specific differences with large family-managed organizations and suggest what could be the focus in large family-managed and non-familymanaged business organizations in incubating talent in-house. Non-family-managed business organizations' talent development practices have been grounded on literature support. For family-managed business organizations, in addition to the literature support, talent development practices have been actually studied in four sample organizations. The study also recommends the need for emulating the practices of talent development of family-managed organizations by other organizations, to make their talent development process more effective.

Literature Review

In the following paragraphs, the above conceptual discussions are being grounded with literature support.

Human capital concept per se is a transition from control to commitment approach in human resource management literature. Organizations invest in human capital to get incremental change in their business results. Often organizations use the term human capital management interchangeably with talent management (Bhattacharyya, 2013). Michaels et al. (2001) conceptualized talent as those attributes of leaders and managers which can drive performance and at the same time can help the organization in achieving business goals. Such talent attributes as observed by them are sharp strategic mind, leadership ability, emotional maturity, communications skills, the ability to attract and inspire other talented people, entrepreneurial instincts, fundamental skills and the ability to deliver results. This definition although highlights all qualities and attributes of talent however restricts itself to only managerial-level

employees. Ready et al. (2010), on the other hand, defined talent as those attributes which can ensure credible and consistent performance delivery. Organizations focus on talent development strategically, either with inclusive or exclusive approach, both for improved performance results and ROI. Haskins et al. (2010) suggested that talent development process should be business driven, future focused, integrated and capable of delivering measurable results. Based on their studies, Haskins et al. suggested four components of talent development process. These are:

- Understanding what drives business of the organization

- Ensuring employees develop those identified talents that drive business

- Making talent development as an ongoing and continuous learning process

- Measuring the results of talent development

Following the above process, organizations can achieve talent development. However, drawing lessons from the organizations, we observe while considering their talent development programmes, organizations broadly focus on the following issues:

- Nature of markets

- Global perspectives

- Competitive advantage

- Economic value creation and metrics

- Culture

- Leadership

Considering the above issues, organizations can draw plans for talent development, duly identifying specific skills, attributes and knowledge requirements of the employees. Such identified knowledge requirements on the one hand help in achieving the business goals of the organizations and at the same time help in detailing learning and development programmes for talent development.

Once again, we reiterate that skills, attributes and knowledge requirements are specific to organizations and their business plans. Also such requirements may vary within an organization with the shift in their business focus. Hence, once talent for the employees is developed by the organizations, it does not mean it will suffice the purpose

of the organizations for ever. Time to time employees' talents need to be revisited and calibrated and, accordingly, talent development activities need to be continued.

Detailed learning and development plan for employees to develop their talent can be both instruction-based and experience-based. Instruction-based methods include in-house training, or training through hiring of external training providers, and self-paced programmed instructions, such as e-training or computer based training (CBT). Experience-based methods include coaching, mentoring and assigning new job tasks/projects. Although we do not have any empirical evidence on the effectiveness of learning and development methods for talent development, it is said that experience-based approach to talent development works better. However, we cannot discredit the instruction-based approach to learning and development for talent development, particularly when employees are to be taken through new areas of skills, knowledge and attributes, pacing with the changing needs of the market, and business environment in general. Hence, a better approach to talent development should be more balanced rather than only instruction-based or experience-based. Thus, for talent development, one learning and development method complements the other. Both are critical and equally important for holistic talent development in organizations.

Based on the above discussions we can say that talent development is a multi-dimensional activity in an organization and requires careful planning. Also talent development represents an important component of the overall talent management process (Cappelli, 2008; Novations, 2009). While it is possible for organizations to pursue a strategy that focuses on talent acquisition from the external labour market, such a strategy is unlikely to be successful in the long term. It is well established that organizations can gain significant advantages from internal talent development approach. But to make internal talent development programme successful, organizations need to acquire and develop industry and firm-specific knowledge and skills (Lepak and Snell, 1999). This requires organizations to make significant investments in talent development activities, so that internal talent development capabilities of the organizations can be built and organizations can make its effective use. Talent development activities in the organization has to be undertaken in such a way that it can ensure that there are zero talent attrition, more

planned succession and simultaneous brand building of the organization (Gandz, 2006).

Methodology

This research is grounded in talent development phenomenology of sample organizations, and essentially an experiential approach. In family-managed organizations, research on managerial decision making (in our case, here it is talent development) is more amenable to holistic experiencing, rather than measurements with quantitative approaches. Moreover family-managed organizations do not take function specific decisions (Carson, 1993; Gartner et al., 1992), rather their decision making process is more holistic (Gilmore and Carson, 1996). This was also evident in the research of Grant et al., 2001. Holistic decision-making process can be better understood by a researcher through experiential research. From this perspective, this study can be categorized as experiential. Again experiential research, being a pure form of research without any pre-judgmental influence, methodologically it can also be categorized under model theoretic research (Bhattacharyya, 2013a; Putnam, 1982). In management research embracing the model-theoretic approach we deviate from metaphysical realism (MR) which restricts our thought process with the constraints of mind-dependent thoughts for existing models and the law.

Taking into consideration the above background, this study, therefore, is a departure from the existing known methodologies of management research. Although experiential in nature, the study could make the author's understanding and analysis more meaningful through available literature support. The study is also supported by visits, discussions, observations of practices and published information of all the sample organizations. Unlike other qualitative research, the study did not capture the views of the owners, co-owners, managerial employees and workers, with a structured questionnaire, rather internalized their decisions and practices on talent development through observations and vicarious experiencing, to document the unique practices, critically evaluate the same, and then coming out with suggestive approach for better results. Talent development practices in non-family-managed business organizations, as already mentioned earlier, have been grounded on secondary information and literature support only.

Talent Development in India

In India talent development or incubating talent within the organizations have all along been the practices of

organizations like Tata, HUL, ITC, Aditya Vikram Birla Group, etc. Similar focus on talent development for developing the talent pipeline to ensure continuity of talent supply within the organization is also evident from the public sector enterprises like SAIL, ONGC, BHEL, NTPC, etc. Some Indian organizations instead of investing in talent development follow the practice of lateral hire for meeting their time to time–talent requirements. However, this approach is not cost effective, and also devoid of focus on long-term sustainability of the organization.

Sourcing talent through recruitment on real time basis has now changed to focus on incubating talent in-house for building the talent pipeline. As part of the talent development programme, many organizations take their new hires through robust on-boarding, including cross-functional induction. For example, HUL has their world-class leadership development programme.

Building talent pipeline rehiring former executives have again become institutionalized practices for some Indian companies. Infosys, Tatas, HUL and ITC are known for such practices. For Infosys, this is 'Green Channel Hiring'. With such new initiatives, and renewed focus on developing in-house talent, future talent pipeline for Indian companies are expected to look bright.

Indian companies are now reviewing their talent development strategies to avoid the future leadership crisis. Incubating in-house talent through systematic talent development initiative is now considered more pragmatic approach to build the talent pipeline, particularly to develop the future ready human resources.

Talent Development in Family-managed business organizations in India

In India, family-managed businesses share as high as 95 percent of total businesses, and nearly 80 percent of such family-managed business in India dominate Indian economy. Large numbers of family-managed businesses in India are SMEs. Around 26 million of SMEs in India employ 60 million people and contributes to 45 percent of manufacturing output. Over 40 percent of India's exports are made by this sector. Today SMEs in India contribute to 8 percent of country's GDP (*Business Standard*, 2015). Many SMEs today are listed in stock exchanges and their profitability has increased over the years. Among other factors, SMEs growth and sustenance in India today are traced to their entrepreneurial zeal, innovation and the pursuit for talent development.

However, with globalization, family-managed businesses, including SMEs, in India are now facing the challenge of sustainability. To survive in competition, these organizations now focus on change to upgrade their technology, processes, quality and pacing with the changing needs and expectations of customers. Lack of managerial talent and expertise, along with resource crunch, often stand against the growth and sustainability of such organizations. However, many such organizations today have successfully ingrained talent development strategies in their managerial practices, more in the form of mentoring, avoiding expensive investment in training and development. Mentoring programmes in family-managed business units are so designed that it provides flexibility to employees to get the advantage of cross-skilling. A culture of open communication helps their talent development process to be more effective and result oriented. In SMEs, owners are directly involved in mentoring programmes and talent development which is becoming more and more need-based. Such advantages however are restricted to family-managed SMEs, rather than family-managed large organizations, which are corporatized and owners' direct interaction in such organizations being limited to some key employees, who are at the top. In India, we have the golden example of Wipro which could achieve excellent business results, in 2005, when the chairman of the company played simultaneously the role of CEO as well. With the chairman's involvement in operations, employees get shadow-mentored, as they get the opportunity to emulate the best practices of the top boss of the organizations.

In India, family-managed businesses are characteristically different from their Western counterparts. Most of these business houses believe in long-term sustainability. Hence, talent development has become the most important strategic issue for these organizations to sustain and grow. Although we do not have literature support on talent development processes in family-managed businesses, family human capital has been acknowledged as potential source of competitive advantages for the organizations. Such human capital become the crucial resource for family-managed businesses, as investors repose their confidence investing in such organizations based on this (Dawson, 2011). From traditional constructs of knowledge, skills and abilities as human capital in family-managed businesses, Hoy and Sharma (2009) have also included

intellectual and psychological dimensions like commitment, emotions, integrity, compassion and forgiveness. The extended form of human capital concept today is encapsulated in talent, the enduring quality and attributes of employees that give sustainable competitive advantages to the organizations.

Talent Development in SMEs

Globally it is acknowledged that SMEs cannot compete for talent with large business organizations. The CIPD study (2014) observed that SMEs are more focused to develop people using the services of external practioners for coaching. A cross-country study on 'Training and Skills Development in SMEs' by OECD (2010–11) indicated that SMEs use both formal and informal training for developing their employees. Interestingly, this study could observe that SMEs have a general propensity to train employees who are high or medium skilled and in the age group of 25–49.

Family-managed business organizations in India, particularly those which are categorized under SMEs, also have their unique talent development practices. For family-managed businesses, talent development need not always be expensive investment in training and development. Being mostly owners-driven, in such organizations, owners activate the talent development process through direct mentoring. The uniqueness in such talent development processes, particularly in family-managed SMEs are holistic and inclusive approach to talent development. Employees in such organizations get more space for their development, and they prefer their self growth with organizational growth. Such reversal syndrome, i.e., pacing self growth with organizational growth, in family-managed organizations, institutionalizes the talent driven culture and contributes to long-term sustainability of family-managed organizations in India.

For the purpose of this study two SMEs have been selected purely based on convenience. These two organizations do not have any acclaimed talent development programmes, but they value their employees and believe in their development. Organization A is a distillery, engaged in production of rectified spirit from industrial molasses. Rectified spirit is used as a core raw material for country liquor and for formulation of homeopathic medicine. Organization B is a tool maker and known for its specialty tools in domestic and global markets. Both the organizations are categorized as SMEs because of their size, capital investment and manpower

strength. Even though characteristically they are different (in terms of their product portfolio and nature of operation), these two SMEs have always enjoyed the captive market privileges till the beginning of 2008.

Both the SMEs could successfully address their critical problems through in-house talent. In both the organizations talent development process is inclusive, and cross-skilling is extensively practised for cross-functional utilization of employees' talent. Owners in both the organizations have directly engaged in mentoring employees, facilitating experiential learning and development of talents. Owners' participation in talent development could also help in building relationship with employees, leading to their retention. Also these two SMEs instead of insularity, made their communication process transparent, and employees in such organizations could pace their self growth with organizational growth. As a result these two organizations could institutionalize talent driven culture for their long term sustainability and growth.

For SME A

The company employs highly talented engineers, scientists and other technically qualified persons to gain efficiency and effectiveness of processing. Even though the company was running very efficiently for more than a decade, of late it has started experiencing problems due to non-availability of raw materials at competitive price. To cope with such problems, the company now has converted to multi-feed distilling. The human resources of the company are outstanding both in terms of their performance and competence, and are continuously engaged in innovation and various research and development activities. The company believes in systematic training for their employees, and invests on such pursuits as an ongoing initiative. Outstanding research and development facilities provide opportunities to make effective use of talents, which could help the company to come out with various innovative process developments, including value addition to wastages, resource recycling, gainful waste utilization, etc.

For organization A the problem was to search for alternative raw materials, and process improvement for better yield to sustain in price competitive market. Human resource development practices in organization A primarily centres on capability building of workers through sustained training interventions. Apart from conducting training programmes in the operation site, employees were also sent to renowned technical institutes for continuous update

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on knowledge and skill. The company's focus on training is understood by the extent of their commitment to developing human resources. The nature of operation of the company, by default, requires engagement of highly talented technical people with a research bent. From the company's record it is evident that people work with them on an average of 16.5 years, which indicate high rate of retention. In order to sustain their competitive strength, the company invests in manpower development, primarily hiring the services of professionals and consultants, as their in-house training facilities are yet to develop.

For SME B

Workers in organization B for their obvious engagement in developing and designing specialty tools have developed their talent pool over the years. Their ingenuity and skill are recognized, as they could come out with innovative machine and hand tools for specific uses by India's defence sector. In many cases, organization B could get financial support from the defence ministry in the form of tooling cost, for dedicated development of innovative tools for specific use. Such tools being manufactured for specific use by the defence sector could not be made available for use in private sector. Such embedded creative instincts of workers could immensely contribute in talent development practices.

For organization B the problem was more attributable to scaling down their product portfolio, from specialty tools to standard saleable tools to cater to the mass market after their captive institutional buyers have stopped buying the tools from them for availability of tools with the new generation technology. Organization B had the captive market privilege to cater to the tooling requirement of India's defence sector. However, subsequent to India's economic liberalization programme, the defence sector in India has undergone a change in technology (imported) and is now sourcing tools directly from technology vendors. Often sourcing tools directly from vendors become a part of technology transfer agreement. This has caused for their shift in product portfolio, i.e., introducing standard saleable tools to cater to the mass market, and adoption of customer-centric marketing business process. Here again talent development practices could help the company to achieve success. However, talent development practices in this organization are more reflected through their inclusive approach on human resources. Transitioning from customized machine tools (including specialty tools) to standard hand tools was a successful journey for this organization; despite this fact it has more de-skilling effect on the employees who are specialized in innovating tool design and development. Here the result was possible for cross-skilling the workers, who were taken to markets to understand the customers' rhythm and translate it to tool design, incorporating customers' perceived critical to quality factors (CTQs).

Talent Development in Large Family-managed Businesses

In India, we have several large family-managed century old organizations. These organizations are sustaining and growing over a period of time. With globalization, large family-managed businesses in India are now facing the challenge of sustainability, like family-managed SMEs. To survive in competition, these organizations now focus on change to upgrade their technology, processes, quality, pacing with the changing needs and expectations of customers. At the same time these organizations are now following sustainable HRM practices to remain viable. Talent development is one of their basic tools for achieving business results. For the purpose of assessing talent development activities, two large family-managed century old organizations have been studied.

The first family-managed business entity is having a business turnover of Rs. 22,314 crores (US$4 billion approximately). The company was started in 1900 and at present they have an employee strength of 32,000. The other century old family-managed organization in India started in the year 1884 with sales revenue of Rs. 7,073 crores (US$1.2 billion), and current headcount of 6,382. One thing common in both the cases are their diversified business portfolio, and impressive track record of growth. Last five years performance track records for both the companies, despite global recessionary trends, speak of their long-term business sustainability.

Talent development in family-managed business unit-1

Talent development activities of the first business unit can be traced to their culture of employee development and strong pay equity, even valuing meritocracy. With talent development initiative, the company also embraced sustainable human resource practices like rewarding stretch, effort and risk taking, encouraging inter-functional and organizational perspective, providing thrust to sustainable processes, giving impetus to innovation and learning, etc. In a recent technological change process, the company has to take re-skilling initiative to redeploy their maintenance employees, ensuring skill

interchangeability. The first thing the company did was the development of Master Jobs Matrix, and comparing the same with the available competency matrix to identify 'cross-over' tasks for the redundant manpower, outside their conventional discipline or job family. With inter-disciplinary cross-training, the company could successfully reduce the competency gap, realigning the knowledge and skills of the existing manpower, and gradually could arrange for their successful redeployment, including in new maintenance jobs. Such sustainable and strategic multi-skilling efforts could result in increasing in-house maintenance engineers to the extent of 30 percent both for the routine and specialist tasks.

The company assigns weight on continuous developing of their human resources, encouraging every employee to learn, experiment and develop new ideas. Total Quality Management (TQM) practices, with business leadership, truly reflects on employees' value accretion. This satisfies the important prerequisite of sustainable talent development practices, i.e., reproducibility of human resources. With respect, opportunity to learn and contribute to the originations, the company today gets the benefit of employees' innovativeness and creativity. With diversity inclusive structured talent development processes, the company today embraced competency-based human resource management practices, which among others also contribute to HRM sustainability.

Analysis indicates, for this family-managed business unit, sustainable talent development practices are; people orientation, work–life balance, opportunity to grow, etc. Negative issues are typical hierarchical structure, less opportunity to grow, uncompetitive compensation structure, less focus on diversity issues, etc. Despite being highly talent focused, and systematic investment in employees' development, from the employees' point of view, this organization could not truly achieve a talent driven organizational culture. The gap in talent development initiative is evident from the less inclusive approach of this organization, i.e., for it's too much focus on developing managerial talents for future leadership role.

Talent Development in family-managed unit-2

This company is a leading Indian consumer goods company with diverse interests in health care, personal care, and foods. The century old company's concern for talent development practices is evident from their vision statement, i.e., dedicated to the health and well-being of every household. The company is more value-driven. As their strategic intent the company professes to be an employer of choice, at racing, developing, and retaining quality personnel. Their major initiative for talent development is institutionalizing their EMPOWER programme (Employee Orientation on Web for Engagement and Reference). This e-learning programme enables all employees of the company to get accustomed to culture and this also strengthens the practices of transparency and open communication.

Through EMPOWER, the company is trying to build a sense of belonging among its employees. This new web-based module is aimed at bringing about an atmosphere conducive to its organizational culture in today's growing and competitive age. The company recognizes the growing importance of its human asset to sustain itself in this competitive race and, therefore, strives to revamp its human resource perspective right from the organization's lowest level.

For their obvious focus on talent development, the company provides career development opportunities to employees in alignment with their organizational development. Some of the important talent development activities are work–life balance, good training programmes, learning organization culture, benefits and perquisites, teamwork culture, and the legacy of more than a century. With people development as the core value, the company takes special care for its employees and recognizes and rewards their good performance. With special skill development programmes, the company ensures their employees are abreast of market needs. Sustainable talent development practices are also evident from company's concern for talent attraction, partnering with B-Schools, in-house talent development through career development initiatives (like project-based assignments with a mandate on execution), mentoring, etc.

In this organization also talent development initiative is less inclusive as it limits its focus only on identified top performers working at the managerial level. Thus, operational and middle-level managerial employees often feel neglected, as they are deprived from career development opportunities.

Discussions

Family-managed businesses in India for their in-built entrepreneurial culture could sustain even after global economic slowdown and competition from domestic and global organizations. Their long-term commitment, agility and relationship orientation could make them winners. As

they attach their family values with the business, they comply with ethical business norms in all their organizational practices, which is even evident from their talent development pursuits.

With distinctive cultures, entrepreneurial zeal, and innovativeness, family-managed organizations develop their capabilities to survive competiting with other type of organizations. This is even true for a SME, for whom resource constraint is the major issue. Such capabilities in the form of organizational talent, even though initially limited to the promoters and co-promoters of the family-managed organizations, gradually it cascades to other employees. Characteristically in family-managed businesses, promoters and co-promoters, apart from the strategic issues, also get involved in operational activities, resulting strong relationships with all members of the organizations. Such relational bond when reinforced by mentoring, talent development process becomes more effective. Moreover, for family-managed business units, all non-members of family who work with them are privileged with equal treatment, resulting all employees get opportunity to develop. Another great advantage of the family-managed business units is scope of extensive cross-skilling for employees. For structural flexibility, vertical job movements in family-managed business units are high. Such cross-skilling also gradually develops the talent for the employees, who can time to time pace with the changes in the businesses.

In our case, all the sample organizations are now managed by professionals who are non-family members, and these organizations could make successful transition from one generation to another. To incubate talent in-house these companies from the beginning had the familial bondage with the employees. The owners and the co-owners have the embedded sense of responsibility to engage the employees with a life-time commitment, more in the form of institutional employment. To sustain with the employees for the life-time; automatically reposed the responsibility of developing them, so that organizations continue to grow. Although in all the sample organizations, training is used as an ongoing employee development tool, real talent development, in all the cases, could be possible with mentoring, shadow-mentoring and cross-skilling which are facilitated by culture of inclusivity, relational and familial bondage.

Reviewing the characteristics of talent development practices of both SMEs (two) and family-managed large business units (two), we do not find any major

characteristics differences, apart from the investment issue. SMEs obviously cannot afford investment on talent development, but they do practice talent development by pro-active human resource management practices. First, the inclusive approach to human resource management practices makes them different from other organizations. Secondly, their employees develop talent within the organization for supportive mentoring. This may not be an institutionalized approach, but when the owners themselves help the people to learn through the process of hand holding, employees develop their talents by default. Another characteristic feature of talent development process in SMEs is tremendous scope of cross-skilling. Employees are not differentiated in talent development, rather all are encouraged. In both the SMEs we have also seen the characteristic differences in the nature of talent. While for SME-A, talent is more institutionalized, for SME-B talent is more acquired through practice. In SME-A collegiality even extends beyond the organization, resulting support from the universities/research institutes to their ex-students, who are now employees of the organization. In case of SME-B, tool design and development, being a highly specialized job, owner's handholding could play the major role in talent development. Inclusive approach in managing the human resources in both the SMEs also could help the employees to relate them with the organizations, as reflected from their high rate of employee retention.

Analyzing the talent development trend in two large family-managed century old large business organizations, we find use of more institutionalized approaches. These two organizations also practice inclusive human resource development and partnering with employees. Less attrition, family bondage and strong sense of identity, with institutionalized approaches in developing talent, could make their talent development process successful one. Major point of difference in these two organizations with SMEs is their focus on developing talent for managerial employees. In SMEs, all cross-sections of employees get the scope of their talent development; in large family-managed organizations, the scope is limited to managerial employees. Another subtle point of difference between these two types of organizations is that in SMEs talent development process is more holistic with the increase of cross-skilling while in two family-managed organizations, focus is more on firm specific talent development. Thus, SMEs in true sense contribute to social capital development, while other organizations not.

Thus, talent development processes in family-managed business units in India are characteristically different from the talent development processes of other organizations in following respects.

Firstly, in both the SMEs and other family-managed business units we could see more inclusive approach to talent development, as all cross-sections of employees are covered under talent development programmes. However, inclusiveness is more evident in family-managed SMEs than in large family-managed business units. Secondly, in both the cases owners of the business units take direct interest in talent development. In SMEs degree of owners' involvement is very high, while in large family-managed business units, degree of owners' involvement is low, obviously for corporatization and decentralization of activities. However, owners' participation in talent development processes, in both the cases, for family-managed business units can be attributed to the fact that owners are simultaneously involved in strategic and operational activities of the organizations. Thirdly, family-managed business units, particularly SMEs, instead of investing on expensive learning and development programmes, make effective use of mentoring for developing in-house talents. Mentoring is constant guidance on one-to-one basis in understanding the criticalities of the jobs, and then gradually reaches to the level of expected performance. Usually organizations only invest in mentoring for those identified talents, who will continue with them on long-term basis. In family-managed business units, inclusive approach to talent development increases the retention, which obviously justifies use of mentoring as an alternative approach to talent development. Fifthly, talent development processes in family- managed units in general being more inclusive; it is also ethical, as all cross-sections of employees are covered under the scope of talent development. Ethical talent development approach in family-managed business units is also evident as in both the type of organizations; talent development was not just restricted to firm specific development, rather development of the social capital. Finally, in family-managed business units, employees feel more identified, and talent development gradually becomes their self development, which helps the organizations to sustain and grow. Characteristically also scholars like Gilmore and Carson (1996) could identify decision-making process of family-managed organizations is more holistic. Obviously such reflection was also observed in their talent development pursuit.

Limitations of the Study

This study is based on experiential research supported by visits, discussions, observations of practices and published information of all the sample organizations. Unlike other qualitative research, the study did not capture the views of the owners, co-owners, managerial employees, and workers, with a structured questionnaire. This is not however a methodological constraint, rather, is a necessity to carry out a practice-based study of this nature. Hence, what is being practised by the sample organizations have been documented in this study to make it more meaningful. This conforms to Putnam's model-theoretic approach (1983) to management research, which has been argued by the author as an effective tool for management research (Bhattacharyya, 2013a).

Although through literature support, the study initially thought of legitimizing the primary hypothesis that talent development practices in family-managed businesses are characteristically different, for literal absence of any research data, the study has to debate on the unique talent development practices in family-managed SMEs and large organizations, which perhaps give them the competitive strength to sustain and grow over a long period. All the sample family-managed organizations have successfully completed transition from one generation to another, and hence their practices are time-tested.

The study could identify the research gap in talent development practices in family-managed organizations, including SMEs, and could come out with observations that talent development practices in family-managed organizations are characteristically different from other organizations. It is expected the study will evoke response for future research on talent development in family-managed organizations.

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> *Bring diversity back to agriculture. That's what made it work in the first place.*
>
> —David R. Brower

Gender Responsive Climate Change Strategies for Sustainable Development

N. B. CHAUHAN AND VINAYA KUMAR, H. M

Attention to gender and changing climate has increased progressively over the last decade. Much of the recent literature is focusing on the nature of women's work, which is being used to justify placing women at the centre of climate change policy. However, in difference with the representation of the woman in earlier literature, policies typically portray her as vulnerable, weak, poor and socially isolated. Debatably, this is a reflection of the politics of gender slightly than the reality of the men and women who often experience and deal with changes of various kinds. The Intergovernmental Panel on Climate Change (IPCC) acknowledges that climatic risk affects men and women differently on a number of levels, including politically, communally, economically and in terms of exposure to risk and risk perception. However, there is a deficiency in research on gender differences in vulnerability to and impacts of climate change, especially health-related impacts. Equity and social justice can be achieved by recognizing the differences in vulnerability and strengths of women and men and the diverse factors that contribute to vulnerability. Identifying these differences is an essential and important component of any forthcoming attempts to address the gender issues in a changing climate.

1. Introduction

Gender impacts of changing climate have been identified as an issue necessitates better attention by the Commission on the Status of Women (CSW). Women's and men's vulnerability to the impact of intense climatic events is determined not only by biology but also by differences in their cultural, social roles and responsibilities (Easterling, 2000; Wisner, 2004). Although intensity may vary, these roles and responsibilities exist in all societies. Changing climate does not affect everyone in the same way. Men and women are affected with different intensity. Their responses to the impacts of changing climate also differ, particularly, when it comes to safeguarding their food security, livelihoods and other social issues. Even though women are significant food producers and contributors, they have limited access to and control of resources, on the one side. On the other side, because of their central role in agriculture, women are great agents of social change. In reality, the FAO State of Food and Agriculture 2010–11 calculate approximately 100 million citizens could be lifted out of poverty if women had the same access and control of resources as men (FAO, 2011). Therefore, responses to changing climate in agriculture and allied sectors must be gender-specific. Initiatives need to ensure that women are included in changing climate mitigation and adaptation activities and strategies designed to ensure sustainable development.

Much of the research into farming systems has looked at soil, water, nutrients, seeds and land management approaches and technologies that make up the assortment of climate-smart agriculture options. Very little emphasis has been placed on understanding the different adaptive strategies between men and women for ensuring better livelihoods in the face of changing climate/ weather. If changing climate research and development

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interventions are to be targeted to women and men, we need to understand both women's and men's adaptation and mitigation strategies. Knowing gender differences will allow policymakers, development practitioners, allied sectors and researchers to see how marginalized groups, such as impecunious men and women, could gain fair access and use information resources that would allow them to make better decisions on the management of climate induced risk (Marja et al., 2012). It is well documented that climate disaster affects women more than men. The vicious circle is that the more women are affected harmfully by changing climate, the worse the inequalities get and the worse the impact becomes. This unpleasant circle has a devastating effect on economic and social growth and can definitely delay achievement of the Millennium Development Goals (Panitchpakdi, 2008).

The *Human Development Report 2007–2008* confirms that the historic disadvantages of women, with limited access to resources, restricted rights, negligible accountability and no voice in decision making, make them extremely vulnerable to a changing climate. Given that there is a wide range of unpredictability in the nature of this susceptibility, it is not enough to make generalizations, but climate risks may increase present gender shortcoming (UNDP, 2007).

II. Climate/weather change is not gender-neutral

Women in developing countries like India are particularly vulnerable to changing climate because they are directly dependent on nearby available natural resources for their livelihood. Especially in India women experience inadequate access to resources and decision-making processes, with limited mobility in rural areas. It is thus important to identify gender-sensitive sustainable strategies that respond to climate induced crisis for women. A number of factors account for the discrepancy between men's and women's differentiated exposure and vulnerability to climate induced crisis.

1. Gender-centred differences in time use, access to credit, assets and treatment by markets and formal institutions limit women's opportunities. As a result, there is a global gender gap in profits and productivity- women make between 35 and 80 percent of what men earn annually. A World Bank survey in 141 countries showed that nearly 103 countries persist in imposing legal differences on the basis of gender that may hamper women's economic opportunities (World Bank, 2011). Although women make up nearly

50 percent of the overall farming labour force, percentages may vary by region and country. The cumulative effects of poverty and social, psychological, cultural, economic and political barriers are that women will often be disadvantaged in coping with the adverse climatic impacts.

2. Compared to men, women face massive challenges in accessing all levels of policy issues and decision-making process. This renders them less able to influence policies, programmes, decisions and implementation that impact their lives.

3. Socio-cultural norms can limit women from acquiring the information and necessary skills to escape or avoid disaster. Social influences render women disproportionately vulnerable to hazards and related negative effects of climate change (Rohr, 2010).

4. Lack of sex-disaggregated data in all sectors (e.g., livelihoods, crisis preparedness, protection of the environment, health, social and well-being) often leads to an underestimation of women's roles and assistance. This situation can then cause gender-blind climate change policies and programming, which does not take into account the gender discriminated roles of both women and men (i.e., their constraints, distinct needs and priorities). As such, such activities, programming and policies can have the unintended effect of increasing gender-based vulnerability (Senay, 2013).

III. Facts about gender-based vulnerability to changing climate

1. Women are not well represented in a managerial process, which constrains their ability to meaningfully participate in decisions on mitigation and adaptation strategies.

2. Globally, only 16–17 percent of the cabinet and 18–19 percent of parliament members are women; among 11 Pacific Island developing economies that were studied, some had no women members in parliament at all.

3. A global gender gap in income and productivity persists across all forms of economic activity; women make between 35 percent and 80–85 percent of male annual income. Restricting job opportunities for women has been costing the region roughly $44 billion a year.

4. A research by the Organization for Economic Cooperation and Development (OECD) classify has women's access to land as 'limited' in a number of countries within the region of Asia-Pacific.

5. For those developing countries, for which data were available, only between 10 and 20 percent of all landholders are women.

6. Burning biomass fuel indoors leads to 2 million deaths per year (mainly women).

7. In 2007, the expected number of women/girl children who were 'missing'—the number of excess female deaths was 484,000 in Asia (excluding central Asia). Globally, 3.9 million women / girl go 'missing' every year.

8. During the past decade in the Asia-Pacific region, a yearly average of more than 200 million people was affected and nearly 70,000 people were killed by a natural crisis (90 percent and 65 percent respectively, of global total for natural disasters). Women and children make up the greater part of deaths resulting from water-related disasters.

(Source: OECD, Gender, Institutions and Development Database, 2012.)

IV. Factors influencing risks for women in changing climate

1. **Physical location**: Poor women are likely to be physically located in places vulnerable to climate induced risks and in poorly built environments. For example, in a rural area, they maybe marginal and small agricultural farmers living on hillsides and river embankments which are prone to soil erosion, flooding, drought and therefore, are at risk of losing their source of livelihood.

2. **Social aspects:** Social vulnerability is associated with the level of well-being of individuals, family, communities and societies. It involves features related to access to essential human rights, education and literacy levels, good governance, organizational systems, values and norms. Due to gender discrimination, many women are less advantaged and, as a result, they are more vulnerable and, therefore, more likely to be exposed to climate induced crisis (GGCA, 2009) For example, women are more prone to dietary deficiencies because they have unique nutritional needs (especially when they are pregnant/breast feeding); in South and South-East Asia, 50–60 percent of women of reproductive age

are underweight and 80 percent of pregnant women have iron deficiency (FAO, 2001).

3. **Economic factors:** In rural area women are more vulnerable to poverty; they have lower revenue than men and are more likely to be economically reliant and have limited access to natural, finance and credit, as well as having a partial likelihood of control over productive resources (Mehta, 2007). In Nepal and Thailand, for example, below 10 percent of women farmers own land (FAO 2007). Furthermore, women are over-represented in the informal market, agricultural and allied sectors, which are underpaid and are most susceptible to natural risks (Mehta, 2007).

4. **Education and information:** As regards literacy levels, women and girl children experience many obstacles that limit their opportunities to obtain schooling; of the 876 million people in the world who are uneducated, two-thirds are women and three-fifths of the 115 million girl children do not go to school (Lara, 2004). It has also been noticed that after a crisis or during stressful times many girls are forced to drop out of school to help with responsibilities in the house or to save money (Davis et al., 2005). Access to literacy, information and communication play a critical role in determining the effectiveness of early warning systems which are critical in reducing the impact of droughts, floods and other crisis situations. Women have lower literacy levels and, therefore, are less likely to respond to written early warning instructions and announcements; poor education leads to less involvement in decision making and less representation in crisis response organizations and training, hence, lowering their capability to respond to disasters.

5. **Political will:** Lack of political will to adapt to gender and climate change and limited access to political power and representation for marginalized groups such as women's exacerbates their vulnerability to climatic risks.

V. Principles when including the gender perspective in reconstruction and recovery—changing climate

It is important to note that the differences in women's and men's social positions not only create specifically gendered vulnerabilities and risks but also generate gender-centred capacities. The definite capacities that

women have developed in different social, political and cultural settings can be very important during all the phases of crisis management and also for climate change mitigation and adaptation efforts (GGCA, 2009).

1. Think big: equal opportunity and the principles of risk reduction must guide all hazards mitigation aspects, responses to disasters and restoration. The window of opportunity is quick to close.

2. Know the fact-based data: gender analysis is not an option but it is very important to direct help and plan an equitable recovery.

3. Work with women in base association: in communities the women's organizations have knowledge, information, experiences, networks and resources that are vital to increasing resilience when faced with a crisis?

4. Work with and build the capability of existing women's groups.

5. Resist stereotype: base all initiatives on knowledge of the exact contexts and differences of each economic situation, culture as well as political and sexual differences and not on false generalizations.

6. Use a human basic rights approach: participatory and democratic initiatives are of more help to women and girls. Both women and men have a right to the conditions they need to get pleasure from their fundamental human basic rights, as well as simply to survive.

7. Respect and build women's capability. Avoid overburdening women who already have a very heavy workload and many household tasks.

(*Source:* Gender and Disasters Network, 2005.)

By excluding the voice of women from climate change decision-making and adaptation processes, the public is excluding the voices of half the world's population, contravening the values concerning their social, political and cultural rights and, at the same time, depriving themselves of a significant number of skills, capacities and experiences. Women do not normally become involved with decision-making process, but the information they provide benefit the entire society. Hence, while designing policies and programmes enough care should be taken to provide equal opportunities for both men and women in order to ensure sustainable development.

VI. Gender-specific elements for sustainable development

A report by Food and Agriculture (2011) states: 'If women had the same access to resources as men, they could boost yields on their farms by 20–30 percent' (FAO, 2011). Figure 1 shows that resources must be made equally accessible to both women and men for successfully adapting to and mitigating climate change for sustainable development. The framework provides an understanding in the interconnectedness between access to and control over assets and decision making and also adaptation to and mitigation of changing climate. How can gender be taken into consideration in the fight against climate change? There is still partial understanding and few research results concerning the intersection of climate change, gender and sustainable agricultural development. To plan enhanced policies and improve finance structures for changing climate adaptation and mitigation and agricultural and allied investments, we need to know how to involve all stakeholders in participatory approaches, provide gender-specific and socially sensitive information to policy makers and planners dealing with research and development in the challenging context of changing climate. Research and development have shown that results are further successful when gender is taken into consideration in the implementation of development actions. Changing climate has a strong impact on agricultural production systems. Agricultural development and food production will be severely shortened unless the crisis posed by climate change is addressed (FAO, 2010).

Figure 1: Elements related to gender-centred climate change for sustainable development—A Framework

Knowing the diversity within the communities can better help us target our support to people. Gender is one essential dimension of this diversity. It shapes women's and men's roles and opportunities, responsibility and consequently determines their access to and processes needed for dealing with climate change (Figure 1). Precise climate information and the ability to interpret it allow farmers to plan and make enhanced decisions on how to adapt to climate change for ensuring sustainable development.

VII. Conclusion

The contribution of women in climate change initiatives must be ensured and the role of women's groups and institutional networks should be strengthened. Currently, women are underrepresented in access to resources and decision-making process on environmental governance. They should be uniformly represented in the decision-making process to allow them to contribute their valuable and unique perspectives and expertise on management of climate change. Women can make substantive assistance through their knowledge and experience on a subject related to the management of natural resources. Adaptation strategies need to take into account women's and men's comparative and diverse capacities, power, social resilience, vulnerabilities and resources because gender roles, relations and norms can either enable or constrain adaptive capacities. Deal with the social and gender dimensions of climate change which poses numerous challenges that are not insurmountable. It necessitates gender mainstreaming in climate change response activities, sustainable development, a clear focus on adaptation and mitigation, a strong assurance of resources and empowerment of individuals to construct their own resilience.

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The village is a cell of the national body and the cell-life must be healthy and developed for the national body to be healthy and developed.

—Sri Aurobindo

A Study of Corporate Social Responsibility of Banks

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The current study, the analysis of the level of expectation and its influences on corporate social responsibility (CSR) of banks in Virudhunagar district, is based on both primary and secondary data. The primary data has been collected from 386 customers in the study area to know the attitude of customers about the CSR of banks. The secondary data required for the study are collected from government reports, journals, books, bank records and websites. The collected data has been analysed by using appropriate statistical tools such as Percentage Analysis, Factor Analysis and Discriminant Analysis with the help of SPSS.

Introduction

The field of Corporate Social Responsibility (CSR) has been exponentially well documented in the last decade. Nevertheless, there remains protected debate about the legitimacy and value of corporate response to CSR concerns. There are different views for the role of the firm in society and a disagreement is to wealth maximization which is the sole goal of a corporation. The definition of corporate social responsibility is not abstruse. According to business responsibility (BSR), CSR is defined as "achieving commercial success in ways that honor ethical values and respect people, communities and the natural environment". CSR is viewed then as a comprehensive set of policies, practices and programmes that are integrated into business operations, supply chains and decision-making process throughout the company and usually include issues related to business ethics, community investment, environmental concerns, governance, human rights in the market place as well as work place.

In our social structure, we have many stakeholders, amongst them are companies or corporate houses. These corporate houses are meaningfully contributing from their fund which impact their internal stakeholders and also openhandedly support societal initiatives. In India, companies like TATA and Birla are practicing the CSR for decades, long before CSR became popular. There are many instances where the corporate have played a dominant role in addressing issues of education, health, environment and livelihoods through their CSR interventions across the country (Berad, 2011, 28–30).

There are different views on the relationship between CSR and banks: by operating with a CSR perspective, proponents believe that banks are capable of making more long-term profit and increasing long-term success, while

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the opponents argue that CSR would only distract firms from the economic role of businesses, namely profit generation. Both the proponents as well as the opponents present a list of sound rational reasons which defend their viewpoints. Despite the ongoing debate whether or not social responsibilities should be the concern of corporate decision makers, it cannot be denied that CSR has been increasingly growing in today's world (Green and Peloza, 2011, 48–56).

CSR is an important management tool today. It has emerged as a significant theme in the global business community and has become a mainstream activity. Innovation affects economic growth, cultural policy and the creative industries in the modern world. Contemporary organisations need to innovate to survive and be successful. Innovation is a process that involves the entire value chain and uses clear performance indicators to steer decisionmaking in the right strategic direction. CSR can be a way of doing business that has significant impact on society and it will be necessary to build CSR into a movement. So public and private organisations will need to come together to set standards, share best practices, jointly promote CSR and pull resources.

There is a demanding growth for corporate disclosure from stakeholders, including customers, suppliers, employees, communities, investors and activist organisations. But there is a lack of interest in the local community in participating and contributing to CSR activities of companies. This is largely attributable to the fact that there is little knowledge about CSR within the local communities. There is no serious efforts which have been made to spread awareness about CSR and install confidence in the local communities about such initiatives. Therefore, there is a need to evaluate and create awareness about CSR amongst the general public to make CSR initiatives more effective.

Statement of the Problem

The banking system in India is considered to be significantly different from that of other nations, because of the country's unique geographic, social and economic characteristics. Liberalisation and deregulation of the financial sector, coupled with rapid technological advancement and improved communication systems, have contributed to the integration process. As a result, banks are now facing a very high and intense competition.

The advantage of CRS for banks includes increased profits, enhancing customer loyalty, trust, enhancing the brand attitude and skirmishing negative publicity which are all well documented. In light of these known optimistic effects, CSR strategies have been embraced by the international banking community.

The extensive adoption of CSR by the global banking community suggests that the priority has once again returned to the banking sector, that is, the banking population may be perceived by the general public to be socially responsible in all sense. In the current scenario where banks are increasing the amount of funds allotted towards CSR activities due to levels of retail customer discontent, it is important to study the opinion of customers about CSR of banks. Hence, this study makes an attempt to study CRS of banks.

Review of Literature

Research begins research by reading. It is important for the researcher to be familiar with both previous theories as well as researches published so far in the field of investigation or study. In order to assure its familiarity, the following efforts were made to present the earlier studies and research works done relating to the present study.

The article entitled "The Social Responsibility of Business is to increase its Profits" (Friedman,1970, 1–21) has discussed that CSR increase the profit of the business. Through his study Friedman declared that CSR of the company or corporation should increase the profit of the business. But the ideas of Friedman's are not widely accepted in society and even in the business world itself.

The article titled "Corporate Social Responsibility: Evolution of a Definitional Construct" (Carroll,1999, 68–95) analyses the evolution of definitions about CSR. He finds out that corporate social responsiveness, CSR, public policies, business ethics and stakeholder theory and management are considered as important factors for creating theories and definitions of CSR.

The article entitled "Measuring Corporate Citizenship in Two Countries: The Case of the United States and France" (Maignan and Ferrell, 2000, 283–97) analyses the indicators of CSR. They distinguish the indicators in three categories: expert evaluations, single and multiple issue indicators and survey of managers. All the indicators are represented in the Pollution Index which is the key to evaluating the multiple aspects of CSR.

The dissertation titled "A Review of the Business Case for Corporate Social Responsibility in the UK Financial Services Sector" (Almona, 2005, 382–89) has analysed the business case for CSR and identifies the key issues that derive CSR by viewing the business model.

The review article titled "Mainstreaming Corporate Social Responsibility: Developing Markets for Virtue" (Conninghom and Drumwright, 2007,130) makes the following observations. CSR is understood to be the way in which firms integrate social, environmental and economy concerns of their values, culture, decision making, strategy and operations with transparent accountability whereby they establish better practices within the firm which also should create wealth and improve society at large.

The proceeding titled "CSR Communication of the Large Banks" (Asvanyi, 2009) has discussed the type of CSR practices and its communication techniques. These types of companies sponsor under its CSR those institutions and corporations which do their CSR activities committed by direction, objectives and as per the theme of the company.

The article titled "A Expression of Green Marketing Developing the Conception of Corporate Social Responsibility" (Bonyte, Brazioniene and Adeiviene, 2010, 550–60) has analysed the attitude of customers regarding environmental protection, ecology, social responsibility and their consumption habits. The article titled "Corporate Social Responsibility and Employee Engagement in Jordan" (Ali Abbas Albdour and Ithlas Ibrahim Altarawaneh, 2012) investigates the impact of the interface CSR practices on employee engagement, specifically CSR practices, namely, training and education, human rights, health and safety, work–life balance and workplace diversity. Through their study the authors find that CSR practices are not highly adopted within the banking sector of Jordon. They conclude that the impact of internal CSR practices on organisational engagement was greater as compared with job engagement. This implies that internal CSR practices could predict employees' organisational engagement (OE) stronger than their job engagement (JE).

The article entitled "Social Responsibility and Business Ethics for Multinational Corporations: An overview" (Raheem, 2013) has analysed the responsibilities of corporations and how CSR is profitable to business. In his article, Raheem has suggested that responsibility is mainly driven by economic incentives (it is good for business) rather than by ethical considerations (it is the right thing to do).

The research article entitled "Ethics and Governance: Code of Corporate Social Responsibility" (Selvakumar, 2013) has explained the ethical principles, ethical propositions and ethics of corporate governance. Selvakumar also explains the codes of ethics, such as selflessness, integrity, accountability, openness, honesty and leadership. He suggests that CSR is operating a business in a manner which meets or exceeds the ethical, legal, commercial and public expectations that a society has formed about the business.

The reviews collected under CSR have been based on various journals and books. They offer a multilevel and multidisciplinary theoretical framework that synthesises and integrates the literature at the institutional, organisational and individual levels of analysis. The authors' review reveals important knowledge related to the adoption of different theoretical orientations by researchers studying CSR at different levels of analysis, the need to understand underlying mechanisms linking CSR with outcomes, the need for research at micro levels of analysis (i.e., individuals and teams), and the need for methodological approaches that will help address these substantive knowledge. But all the above research studies have failed to analyse the attitude of customers towards banking. In order to fulfill the research gap, this present study has been undertaken.

Scope of the Study

The study mainly planned to analyse the future expectations of customers towards CSR of banks in Virudhunagar District.

Objectives of the Study

The following are the objectives of the study:

- To analyse the opinion of customers about the future expectation of banks' CSR activities.

- To examine the comparative analysis of expectation of customers towards CSR of banks.

- To offer suitable suggestions on the basis of findings of the study.

Methodology

The data required for the study were collected during the year 2012–13. This study is based on both primary and secondary data. Primary data have been collected from sample customers in the study area to know the attitude

of customers about the CSR of banks. The secondary data required for the study are collected from government reports, journals, books, bank records and websites.

Sampling Method

Banking customers are large in number and it is not feasible to collect data from all banking customers from the study area. Therefore it is decided to apply sampling technique to study the current problem. The www.surveysystem.com is used to identify the sample size. According to this website, 386 is identified as an appropriate sample size.

For the purpose of this study, Multi-stage Sampling Technique has been applied. In order to select the sample banks stratified random sampling method has been used and the population is divided into eight taluks, such as Aruppukkottai, Kariapatti, Rajapalayam, Sattur, Sivakasi, Srivilliputur, Tiruchuli and Virudhunagar. Then the purposive sampling technique has been used to identify the sampling customers, proportionate to the population, from the taluks. Table 1 shows the taluk-wise distribution of sample customers.

Table 1: Taluk-wise Distribution of Sample Customers

Sl.No.	Taluks	Population (No.)	Percent to Total	Sample Size (No.)
1	Aruppukattai	248,186	12.77	49
2	Sivakasi	427,072	21.98	85
3	Srivilliputtur	292,895	15.07	58
4	Sattur	186,659	8.68	34
5	Kariapatti	105,329	5.42	21
6	Rajapalayam	347,318	17.87	69
7	Tiruchuli	103,068	5.30	20
8	Virudhunagar	250,782	12.91	50
	Total		100	386

Source: Primary data

Data Analysis

The collected data has been analysed by using appropriate statistical tools, such as Percentage Analysis, Factor Analysis and Discriminant Analysis with the help of SPSS.

Results and Discussion

Grouping of Expectation of Customers towards the CSR Activities of Banks-

Application of Factor Analysis

The researcher has analysed with the expectation of customers towards the CSR activities of banks in Virudhunagar district. The view of customers on the services of the banks may vary from person to person. The level of expectation of the customers is meant to indicate the extent to which CSR activities have been done by the banks. During the survey, the respondents are asked to opine about the CSR activities of banks. The level of expectation is determined by the score values calculated for 43 statements which are related to the activities done by the banks by adopting scaling technique, namely liker's five point scale. The reliability of the scale is tested with the help of Cronbach's Alpha test by using SPSS. Table 2 shows the details of opinion of the respondents about their expectations towards CSR activities of banks in Virudhunagar district.

Table 2 discloses that majority of the customers agree with all the statements influencing the expectation of customers towards the CSR activities of banks, since the percentage is high for "Agree" and "Strongly Agree" scales when compared to "Disagree" and "Strongly Disagree" scales.

Table 2: Opinion about the Future Expectations of Customers about the CSR of Banks

Sl. No	Variables	SA (%)	A (%)	NO (%)	DA (%)	SDA (%)	Total
1	Give more types of loans to all customers	139 (36.01)	216 (55.96)	16 (4.15)	9 (2.33)	6 (1.55)	386 (100.00)
2	Follow minimum procedure for account opening	102 (26.42)	243 (62.95)	34 (8.81)	5 (1.30)	2 (0.52)	386 (100.00)
3	Charge minimum cost for services	118 (30.57)	199 (51.55)	52 (13.47)	13 (3.37)	4 (1.04)	386 (100.00)
4	Establish more ATM centres in rural areas	114 (29.53)	208 (53.89)	40 (10.36)	20 (5.18)	4 (1.04)	386 (100.00)
5	Create awareness about No Frill Accounts	119 (30.83)	168 (43.52)	70 (18.14)	18 (4.66)	11 (2.85)	386 (100.00)
6	Implement KYC norms effectively	110 (28.50)	170 (44.04)	70 (18.14)	28 (7.25)	8 (2.07)	386 (100.00)
7	Conduct awareness programmes about banking, e-banking	119 (30.84)	179 (46.37)	72 (18.65)	14 (11.40)	2 (0.52)	386 (100.00)
8	Charge minimum interest against loans	103 (26.68)	181 (46.89)	68 (17.62)	20 (5.18)	14 (3.63)	386 (100.00)
9	Give high interest against investments	125 (32.38)	172 (44.56)	57 (14.77)	26 (6.74)	6 (1.55)	386 (100.00)
10	Maintain friendly relationship with customers	139 (36.01)	155 (40.16)	51 (13.21)	24 (6.22)	17 (4.40)	386 (100.00)
11	Create good infrastructure	133 (34.46)	181 (46.89)	53 (13.73)	15 (3.89)	4 (1.03)	386 (100.00)
12	Maintain secrecy of the customers details	134 (34.72)	172 (44.56)	51 (13.21)	12 (3.11)	17 (4.40)	386 (100.00)
13	Provide adequate safety measures	127 (32.90)	188 (48.71)	57 (14.77)	10 (2.59)	4 (1.03)	386 (100.00)
14	Create awareness about financial literacy to customers	151 (39.12)	175 (45.34)	38 (9.84)	14 (3.63)	8 (2.07)	386 (100.00)
15	Provide high quality services	132 (34.20)	167 (43.26)	65 (16.85)	18 (4.66)	4 (1.03)	386 (100.00)
16	Adopt recent technologies in timely manner	132 (34.20)	168 (43.52)	68 (17.62)	12 (3.11)	6 (1.55)	386 (100.00)
17	Resolves customer complaints in a timely manner	136 (35.23)	149 (38.60)	66 (17.10)	26 (6.74)	9 (2.33)	386 (100.00)
18	Provide funds to environment preservation	135 (34.97)	176 (45.60)	53 (13.73)	16 (4.15)	6 (1.55)	386 (100.00)
19	Involve reduction of air pollutant	14 (37.56)	156 (40.42)	51 (13.21)	23 (5.96)	11 (2.85)	386 (100.00)
20	Provide more agriculture loans	131 (33.94)	159 (41.19)	66 (17.10)	27 (6.99)	3 (0.78)	386 (100.00)
21	Strictly follow e-waste reduction technology	142 (36.79)	159 (41.19)	63 (16.32)	18 (4.67)	4 (1.03)	386 (100.00)
22	Encourage plantation	138 (35.75)	161 (41.71)	56 (14.51)	19 (4.92)	12 (3.11)	386 (100.00)
23	Encourage green products and environment	142 (36.79)	157 (40.67)	53 (13.73)	26 (6.74)	8 (2.07)	386 (100.00)
24	Follow paper-less work	104 (26.94)	175 (45.34)	75 (19.43)	20 (5.18)	12 (3.11)	386 (100.00)

25	Donate funds to charity	83 (21.50)	144 (37.3)	89 (23.06)	50 (12.95)	20 (5.18)	386 (100.00)
26	Actively involved in local community development	72 (18.65)	131 (33.94)	106 (27.46)	48 (12.44)	29 (7.51)	386 (100.00)
27	Provide funds to develop town to which it locates	96 (24.87)	142 (36.79)	87 (22.54)	38 (9.84)	23 (5.96)	386 (100.00)
28	Provide more scholarship to meritorious students	139 (36.01)	160 (41.45)	63 (16.32)	18 (4.66)	6 (1.56)	386 (100.00)
29	Provide special schemes to minority students	121 (31.35)	186 (48.19)	53 (13.73)	15 (3.89)	11 (2.85)	386 (100.00)
30	Provide education loans to rural students	117 (30.31)	181 (46.89)	70 (18.13)	16 (4.15)	2 (0.52)	386 (100.00)
31	Provide more to state and central welfare funds	117 (30.31)	194 (50.26)	53 (13.73)	14 (3.63)	8 (2.07)	386 (100.00)
32	Provide special loans to differently abled citizens	124 (32.12)	183 (47.41)	50 (12.95)	16 (4.15)	13 (3.37)	386 (100.00)
33	Help women education and and development	110) (28.50)	192 (49.74)	58 (15.03)	20 (5.18)	6 (1.55)	386 386(100.00)
34	Conduct blood and eye donation camps frequently	124) (32.12)	165 (42.75)	51 (13.21)	32 (8.29)	14 (3.63)	386 (100.00)
35	Provide funds to healthcare issues	125 (32.39)	189 (48.96)	50 (12.95)	16 (4.15)	6 (1.55)	386 (100.00)
36	Provide more loans to young entrepreneurs	120 (31.09)	187 (48.44)	58 (15.03)	11 (2.85)	10 (2.59)	386 (100.00)
37	Conduct regular AIDS awareness campaigns	130 (33.67)	166 (43.01)	56 (14.51)	25 (6.48)	9 (2.33)	386 (100.00)
38	Provide accessible facilities to disabled customers	128 (33.16)	165 (42.75)	63 (16.32)	21 (5.44)	9 (2.33)	386 (100.00)
39	Conduct awareness programmes against child labour	105 (27.20)	186 (48.19)	55 (14.25)	21 (5.44)	19 (4.92)	386 (100.00)
40	Provide more funds to rural development	81 (20.98)	208 (53.89)	74 (19.17)	10 (2.59)	13 (3.37)	386 (100.00)
41	Improve community relationship	101 (26.16)	184 (47.67)	65 (16.84)	25 (6.48)	11 (2.85)	386 (100.00)
42	Improve customer loyalty	118 (30.57)	184 (47.67)	60 (15.54)	16 (4.15)	8 (2.07)	386 (100.00)
43	Give something back to the community	141 (36.53)	196 (50.78)	29 (7.51)	14 (3.63)	6 (1.55)	386 (100.00)

Source: Primary data

Application of Cronbach's Alpha Test for the Opinions of Customers about the Future Expectations of Banks CSR Activities

Cronbach's Alpha Test is used to test whether the Likert's scale used to analyse the opinion of customers about the future expectations of banks CSR activities is reliable or not. Table 3 shows the results of Cronbach's Alpha Test.

The Cronbach's Alpha value of .920 infers that the scale used to analyse the opinion of customer about the future expectations of banks CSR activities is considered highly reliable.

Table 3: Cronbach's Alpha Test for the Opinions of Customers about the Future Expectations of Banks' CSR Activities

Cronbach's Alpha	Number of Items
.920	43

Source: Computed data

In the present study, the principal component factor analysis is used to identify the opinion of customers about the future expectations of banks CSR activities.

The principal component factor analysis method has been applied to the inter-correlation matrix of 43 dimension of the opinion scale and the results were rotated using Kaiser Varimax Criteria. The data validity for factor analysis has been examined with the help of Kaiser–Meyer–Oklin (KMO) measures of sampling adequacy and Bartlett test of sphericity. The KMO measure of .788 zero level of significance of Chi-Square statistics the validity of data for factor analysis. The factor analysis results in six factors, Eigen value, communalities and percentage of variance explained are discussed the following tables.

Total Variance Accounted by the Extracted Factors

The percentage of variance explained by each of the factor can be computed using the Eigen values. As there are 43 variables, the total variance equal 43. The variance explained by each of the factors can be computed as

percentage of variance

$$\text{explained by factor 1} = \frac{\text{Eigen values 1}}{\text{sum total of the eigen values}} \times = 100$$

The results of the above computations as obtained from SPSS and the outputs are presented in Table 4.

Table 4: Percentage of Variance

Components	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.604	24.660	24.660	4.754	11.056	11.056
2	2.485	5.778	30.438	3.789	8.811	19.866
3	2.025	4.710	35.148	3.284	7.638	27.504
4	1.886	4.386	39.534	3.033	7.053	34.558
5	1.723	4.007	43.541	2.940	6.838	41.396
6	1.651	3.840	47.381	2.573	5.985	47.381

Source: Computed data

Communality: Explanation of Original Variable Variance

Communality is donated by h_2. It indicates how much of each variable is accounted for the underlying factors taken together. In other words, it is a measure of the percentage of variables variation that is explained by the factors. As a result of the communality explains that relatively high communality shows that not much of the variable is left over after whatever the factors represent is taken into consideration. The communality for each variable is computed as given in Table 5.

In Table 5 it is clear that the high communality variable is .723, which means 72.3 percent of the variance or information content of the variable provide special loans to differently disabled citizens (X_{32}) is explained by the six factors. Similarly, the communalities for the other variables could be computed.

Results and Interpretation

The rotated factor matrix for the variable relating to the opinion of customers about their future expectations of

banks CSR activities are given in Table 6. This table gives the following received by the factors under F_1, F_2, F_3, F_4, F_5, and F_6.

Table 6 reveals that the rotated factor loadings for the 43 statements (variables) of factors are the future expectations of customers from the bank as CSR practices. It is clear from the table that all the 43 statements have been extracted into six factors namely F_1, F_2, F_3, F_4, F_5, and F_6. The factors with identified new names which are important for the future expectation of customers are discussed in the following.

Factor I—Service Responsibility

The primary objective of the bank is to provide quality services. Service responsibility includes consumerism, product quality, packaging and advertising. Banks and retail corporations are most involved in product and service contribution to their customers, whereas diversified financial services helps to retain the customers as well as attract new customers. Table 7 displays the factor variables with their factor loadings.

Table 5: Communalities

SI. No.	Variables	Extraction
1	Give high interest against investment	.540
2	Charge minimum interest against loans	.432
3	Provide high quality services	.505
4	Adopt recent technologies in timely manner	.583
5	Encourage green products and environment	.477
6	Follow paperless work	.423
7	Create awareness about No Frill Accounts	.364
8	Encourage plantation	.585
9	Create awareness about financial literacy to customers	.616
10	Resolve customers complaint at timely manner	.476
11	Conduct awareness programmes about e-banking	.479
12	Provide special loans to differently disabled citizens	.593
13	Provide more funds to state and central	.570
14	Helps to women education and development	.282
15	Conduct blood and eye donation camps frequently	.526
16	Provide funds to healthcare issues	.488
17	Improve customer loyalty	.561
18	Provide loans to young entrepreneurs	.399
19	Provide education loans to rural students	.585
20	Involve reduction of air pollutant	.453
21	Provide more agriculture loans	.416
22	Implement KYC norms effectively	.401
23	Strictly follow e-waste reduction technology	.400
24	Provide accessible facility to disabled customers	.429
25	Give something back to community	.336
26	Provide funds to environment prevention	.409
27	The bank actively involved local community development	.431
28	Improve community relationship	.391
29	Provide funds to develop town which it operates	.440
30	Create awareness programme against child labour	.347
31	Donate funds to charity	.462
32	Provide funds to rural development	.723
33	Conduct AIDS awareness campaigns	.468
34	Maintain secrecy of the customers details	.489
35	Create good infrastructure	.430
36	Provide more scholarship to meritorious students	.489
37	Provide special schemes to minority students	.482
38	Provide adequate safety measures	.492
39	Maintain friendly relationship with customers	.485
40	Give more types of loans to all customers	.441
41	Establish more ATM centres in rural areas	.563
42	Follow minimum procedure for account opening	.433
43	Charge minimum cost for services	.482

Extraction Method: Principal Component Method

Table 6: Rotated Component Matrix

Sl. No.	Particulars	Rotated factor loading					
		F_1	F_2	F_3	F_4	F_5	F_6
1	Give high interest against investment	**.740**	.122	-.007	.037	.022	.228
2	Charge minimum interest against loans	**.731**	.018	.151	.049	-.002	.158
3	Provide high quality services	**.594**	.360	.079	.188	.024	.021
4	Adopt recent technologies in timely manner	**.568**	.264	.104	.249	.113	-.101
5	Encourage green products and environment	**.548**	.087	.169	.172	.184	-.014
6	Follow paperless work	**.538**	-.094	.266	.080	.222	.067
7	Create awareness about No Frill Accounts	**.462**	.191	.188	-.031	.009	.438
8	Encourage plantation	**.429**	.395	.163	-.116	.085	.119
9	Create awareness about financial literacy to customers	**.424**	.096	.197	-.075	.204	.082
10	Resolve customers complaint at timely manner	**.403**	.380	.103	-.019	.333	.364
11	Conduct awareness programmes about e-banking	**.391**	.000	.379	.069	.109	.438
12	Provide special loans to differently disabled citizens	-.009	**.796**	-.008	-.001	.111	.227
13	Provide more funds to state and central	.062	**.616**	.121	.090	-.005	.236
14	Helps to women education and development	.224	**.560**	-.050	-.065	.286	.129
15	Conduct blood and eye donation camps frequently	.069	**.515**	-.337	.228	.217	-.081
16	Provide funds to healthcare issues	.167	**.481**	.194	.212	.291	-.056
17	Improve customer loyalty	.132	**.467**	.357	.203	.014	-.170
18	Provide loans to young entrepreneurs	.335	**.443**	.274	.281	.153	-.051
19	Provide education loans to rural students	.104	**.353**	.440	.214	-.302	.127
20	Involve reduction of air pollutant	.056	.091	**.733**	.067	.147	.102
21	Provide more agriculture loans	.269	.112	**.586**	.062	.129	.061
22	Implement KYC norms effectively	.303	.084	**.480**	-.081	.210	.207
23	Strictly follow e-waste reduction technology	.348	.164	**.468**	-.056	.196	.089
24	Provide accessible facility to disabled customers	.304	.122	**.444**	.422	.045	.085
25	Give something back to community	.104	.353	**.440**	.214	-.302	.127
26	Provide funds to environment prevention	.187	.272	**.406**	-.096	-.103	.325
27	The bank actively involved local community development	-.023	-.017	.020	**.634**	-.047	.062
28	Improve community relationship	.363	.125	.151	**.616**	.113	-.013
29	Provide funds to develop town which it operates	-.116	-.018	-.145	**.597**	.154	.040
30	Create awareness programme against child labour	-.004	.216	.315	**.538**	.153	.161
31	Donate funds to charity	.191	.062	-.155	**.495**	-.094	.134
32	Provide funds to rural development	.282	.308	.131	**.469**	.104	.136
34	Conduct AIDS awareness campaigns	.159	.107	.216	-.072	**.682**	.199
35	Maintain secrecy of the customers details	.245	.204	-.022	-.014	**.591**	.165
36	Create good infrastructure	.000	.065	.081	.240	**.560**	.096
37	Provide more scholarship to meritorious students	.178	.111	.201	.240	**.512**	-.189
38	Provide special schemes to minority students	-.011	.153	.471	-.197	**.500**	.189
39	Provide adequate safety measures	.384	.258	.024	.138	**.482**	.096
40	Maintain friendly relationship with customers	-.145	-.111	.011	.207	.225	**.642**
41	Give more types of loans to all customers	.224	.088	.202	.273	-.056	**.638**
42	Establish more ATM centres in rural areas	.146	.128	.129	.007	.105	**.605**
43	Follow minimum procedure for account opening	.284	.271	.122	.135	.175	**.536**
% of Variance		11.056	8.811	7.638	7.053	6.838	5.985
Eigen Value		4.754	3.789	3.284	3.033	2.940	2.573

Source: Computed data

Table 7: Factor I: Service Responsibility

Sl. No.	Variables	Factor loadings	Eigen value	Percentage of variance
1	Give high interest against investment	.740		
2	Charge minimum interest against loans	.731		
3	Provide high quality services	.594		
4	Adopt recent technologies in timely manner	.568		
5	Encourage green products and environment	.548	4.754	11.056
6	Follow paperless work	.538		
7	Create awareness about No Frill Accounts	.462		
8	Encourage plantation	.429		
9	Create awareness about financial literacy to customers	.424		
10	Resolve customer complaints in a timely manner	.403		
11	Conduct awareness programmes about banking, e-banking	.391		

Source: Computed data

Give high interest against investment (0.740), charge minimum interest against loans (0.731), provide high quality services (0.594), adopt recent technologies in timely manner (0.568), encourage green products and environment (0.548), follow paperless work (0.538), create awareness about no frill accounts (0.462), encourage plantation (0.429), create awareness about financial literacy to customers (0.424), resolve customer complaints in a timely manner (0.403), conduct awareness programmes about banking, e-banking (0.391) are the items with high loadings on factor I. The above items refer to the service aspects. Hence, factor I is characterised as "service responsibility". The Eigen value for factor I is 4.754 and the percentage of variance is 11.056.

Factor II—Stakeholder Responsibility

Banks have number of stakeholders, like account holders, debtors, employees, general public, local community and so on. Banks have to satisfy this divergent number of stakeholders and build a credible relationship through CSR reporting. This improves communication with the community and other stakeholders and it creates better results in competitive advantage. Employees are one of the backbones of banks and they contribute more for the development of banks in all respect. Banks are dealing with all employees equally and should treat them with justice. It is better if they maintain a policy on the fair treatment of employees. CSR may ensure better and safe working environment, elimination of corruption, focusing

of human rights and environmental sustainability which are now recognised as essential factors for the sustainable development of societies. Table 8 shows the variables contributing to Factor II.

In the second factor, provide special loans to differently disabled citizens (0.796), provide more to state and central welfare funds (0.616), help women education and development (0.560), conduct blood and eye donation camp frequently (0.515), provide funds healthcare issues (0.481), improve customer loyalty (0.467), provide more loans to young entrepreneurs (0.443) and provide education loans to rural students (0.353) have the highest significant positive loadings. As the above items relate to stakeholders, factor II is named as "stakeholders responsibility". The Eigen value for factor II is 3.789 and the percentage of variance is 8.811.

Factor III—Environment Responsibility

Environment responsibility includes activities directed towards preventing environmental pollution, for example, water, air or noise pollution or disposal of wastage. In this criterion, the least type of issues has been found and should be prevented or protected by the banks where it locates. Banks or financial service organisations ensure that there is no scope of polluting the environment. Table 9 illustrates the variables contributing to factor III.

Improve reduction on air pollution (0.733), provide more agriculture loans (0.586), implement KYC norms

Table 8: Factor II: Stakeholder Responsibility

Sl. No.	Variables	Factor loadings	Eigen value	Percentage of variance
1	Provide special loans to differently disabled citizens	.796		
2	Provide more to state and central welfare funds	.616		
3	Helps to women education and development	.560		
4	Conduct blood and eye donation camps frequently	.515	3.789	8.811
5	Provide funds to healthcare issues	.481		
6	Improve customer loyalty	.467		
7	Provide more loans to young entrepreneurs	.443		
8	Provide education loans to rural students	.353		

Source: Computed Data

Table 9: Factor III: Environment Responsibility

Sl. No.	Variables	Factor loadings	Eigen value	Percentage of variance
1	Improve reduction on air pollution	.733		
2	Provide more agriculture loans	.586		
3	Implement KYC norms effectively	.480		
4	Strictly follow e-waste reduction technology	.468	3.284	7.638
5	Provide accessible facility to disabled customers	.444		
6	Give something back to community	.440		
7	Provide funds to environmental preservation	.406		

Source: Computed Data

Table 10: Factor IV: Community Responsibility

Sl. No.	Variables	Factor loadings	Eigen value	Percentage of variance
1	The bank actively involve local community development	.634		
2	Improve community relationship	.616		
3	The bank provide funds to develop town to which it locates	.597		
4	Conduct awareness programme against child labour	.538	3.033	7.053
5	The bank donates funds to charity	.495		
6	Provide funds to rural development	.469		
7	Conduct AIDS, awareness campaign	.413		

Source: Computed Data

effectively (0.480), strictly follow e-waste reduction technology (0.468), provide accessible facility to disabled customers (0.444), give something back to community (0.440) and provide funds to environmental preservation (0.406) have the highest significant positive loadings. As the above items relate to environment, factor III is named as "environment responsibility". The Eigen value for factor III is 3.284 and the percentage of variance is 7.638.

Factor IV—Community Responsibility

Community responsibilities are socially oriented activities that are primarily of benefit to the general public like financial aid to the poor and disable people, some donation to charity-like health, hospital, social awareness program etc. Table 10 displays the factor variables with their factor loadings.

In the fourth factor, the bank actively involves the local community for development (0.634), improves community relationship (0.616), provides funds to develop

the town in which it is located (0.597), conducts awareness programmes against child labour (0.538), donates funds to charity (0.495), provides funds to rural development (0.469) and conducts AIDS awareness campaigns (0.413). As the above items relate to community development, factor IV is named as "Community Responsibility". The Eigen value for factor IV is 3.033 and the percentage of variance is 7.053.

Factor V—Customers Responsibility

Banks can be of many types and sizes, from large financial services companies with a national or even an international presence to local community banks, savings and loans, credit unions, and Internet banks that exist solely online. Most offer a diverse range of products and services such as consumer checking and savings accounts and loans along with similar services designed especially for businesses. Banks offer their customers many different ways to access their services: face-to-face service to its

Figure 1. Displays the Influencing Factors of CSR of Banks.

customers, telephone banking, online banking, mobile banking, ATM services, payment of bills, account alerts, SMS banking and branches with 100% centralised banking solution. Table 11 displays the factor variables with their factor loadings.

Maintain secrecy of customers details (0.682), create good infrastructure (0.591), provide more scholarship to

meritorious students (0.560), provide special schemes to minority students (0.512), provide adequate safety measures (0.500), maintain friendly relationship with customers (0.482) are the items with high loadings on factor V. Factor V is characterised as "Customers Responsibility". The Eigen value for factor V is 2.940 and the percentage of variance is 6.838.

Table 11: Factor V: Customer Responsibility

Sl. No.	Variables	Factor loadings	Eigen value	Percentage of variance
1	Maintain secrecy of the customers details	.682	2.940	6.838
2.	Create good infrastructure	.591		
3	Provide more scholarship to meritorious students	.560		
4	Provide special schemes to minority students	.512		
5	Provide adequate safety measures	.500		
6	Maintain friendly relationship with customers	.482		

Source: Computed Data

Factor VI—Product Responsibility

Banks not only provide a safe place to store cash, they also offer accounts and products that allow you to pay your bills and, at the same time, earn interest and help your money grow. Banks offer a number of varied products under deposits and advances to suit the needs of all types of customers. Having a bank account allows you to keep your money safe from loss, theft or fire; earn interest and grow your savings; deposit your paycheck directly; pay bills easily and inexpensively; track your spending and manage your finances; establish credit and mortgage loans, car loans and loans on other products. Table 12 displays the factor variables with their factor loadings.

Table 12: Factor VI: Product Responsibility

Sl. No.	Variables	Factor loadings	Eigen value	Percentage of variance
1	Give more types of loans to all customers	.642	2.573	5.985
2	Establish more ATM centres in rural areas	.638		
3	Follow minimum procedure for account opening	.605		
4	Charge minimum cost for services	.536		

Source: Computed data

In the sixth factor, give more types of loans to all customers (0.642), establish more ATM centers in rural areas (0.638), follow minimum procedure for account opening (0.605) and charge minimum cost for services (0.536) have the highest significant positive loadings. As the above items relate to banking services, factor VI is named as "**Product responsibility**". The Eigen value for factor VI is 2.573 and the percentage of variance is 5.985. Table 13 shows the variables with the highest factor loadings for the future expectations of customers towards CSR activities of banks.

Identifying the discriminating variable of expectations towards CSR—Application of Discriminant Analysis

The researcher analyses to find out which independent variables are relatively better in discriminating between groups. For this purpose, the discriminant analysis is applied. Discriminant analysis is used to predict group membership. The technique is used to classify individuals/objects into one of the alternative groups on the basis of a set of predictor variables. The dependent variable in the discriminant analysis is categorical and on a nominal scale, whereas the independent or predictor variables are either interval or ratio scale in nature.

The mathematical form of the discriminant analysis model is $Y = b_0 + b_1 X_1 + b_2 X_2 + \dots + b_k X_k$

Where,

Y = Dependent variable

b_x = Coefficients of independent variables

X_s = Predictor or independent variables.

Table 13: Variables with the Highest Factor Loadings for the Future Expectations of Customers towards CSR Activities of Banks

Factor	Name of newly extracted dimensions (factor)	Selected statement (variables)	Factor loadings
F_1	Service responsibility	Give high interest against investments	0.740
F_2	Stakeholders responsibility	Provide special loans to differently abled citizens	0.796
F_3	Environment responsibility	Involve reduction of air pollution	0.733
F_4	Community responsibility	The bank actively involved local community development	0.634
F_5	Customers responsibility	Maintain secrecy of the customers details	0.682
F_6	Product responsibility	Give more types of loans to all customers	0.642

Source: Computed data

The method of estimating b_s is based on the principle that the ratio of between group sums of squares to within group sum of squares be maximized.

Classification of Groups

The factors influencing the levels of expectations of the customers towards the CSR activities of banks are analysed by 43 statements. From the 43 statements, 24 statements are identified as high loading factors having more than .5 of loadings score. These 24 statements are taken in the discriminant analysis and are classified into two groups, namely low level of expectation and high level of expectation groups on the basis of scores given by the respondents about the 24 statements. The total score for each respondent is computed and then the mean value for the total score is found out. On the basis of mean values, the level of expectation of customers is categorized into two groups, namely high level of expectation and low level of expectation groups.

Group Statistics

In order to predict group membership in discriminant analysis, first an attempt is made to examine whether there is any significant difference between groups on each of the independent variables using group means and ANOVA results data. A basic idea of variables that may be important can be obtained by inspecting the group means and standard deviation. Table 14 shows the details of mean and standard deviation for each variable for each group and for the entire sample.

Table 14 shows that the differences in mean values indicates that there is a significant difference between low and high level of expectation groups of customers on each of the independent variables.

Test of Equality of Group Means

Test of equality of group means compares the mean values for each group for each variable to know for which of the variables a significant differences have exist between the mean of two groups. Table 15 presents the results of the univariate ANOVA's carried out for each independent variable.

Table 15 makes it clear that out of 24 variables, nine variables, namely (i) adopt recent technologies in timely manner, (ii) provide high quality services, (iii) conduct blood and eye donation camp frequently, (iv) charge minimum interest against loans, (v) provide more agriculture loans, (vi) encourage green products and environment, (vii) conduct awareness programmes against child labour, (viii) create good infrastructure and (ix) involve reduction of air pollutant are significantly differed between of low expectation and high expectation groups of customers towards CSR activities of banks by producing very high value of F's.

Box's M Test

Box's M test is a test for the equality of the group covariance matrices. It tests the null hypothesis that the covariance matrices do not differ between groups formed by the dependent. When tested by Box's M; a non-significant M is expected to show similarity and lack of significant differences. Table 16 shows the results of Box's M test.

Table 16 reveals that Box's M is 1.762 with F 7.927 which is significant at $P < 0.05$.

Eigen Values

Table of Eigen values provide information on each of the discriminant functions produced. The maximum number

Table 14: Group Statistics

Sl. No.	Proportion of Customers	Level of Expectation					
		Low	High	Total	Low	High	Total
		Mean			Standard Deviation		
1	Give more types of loans to all customers	2.44	1.65	2.00	1.02	0.68	0.93
2	Follow minimum procedure for account opening	2.33	1.54	1.89	0.93	0.58	0.85
3	Charge minimum cost for services	2.44	1.62	1.97	1.17	0.65	1.00
4	Establish more ATM centres in rural areas	2.24	1.64	1.90	0.95	0.56	0.81
5	Charge minimum interest against loans	2.66	1.69	2.11	1.07	0.64	0.98
6	Give high interest against investment	2.44	1.65	2.00	1.02	0.68	0.93
7	Create good infrastructure	2.34	1.55	1.90	0.93	0.58	0.85
8	Maintain secrecy of the customers details	2.44	1.62	1.97	1.17	0.65	1.00
9	Provide adequate safety measures	2.24	1.64	1.90	0.95	0.56	0.81
10	Provide high quality services	2.44	1.56	1.95	0.96	0.58	0.88
11	Adopt recent technologies in timely manner	2.43	1.56	1.94	0.98	0.55	0.88
12	Involve reduction of air pollutant	2.47	1.55	1.95	1.15	0.60	0.99
13	Provide more agriculture loans	2.50	1.59	1.99	0.99	0.63	0.92
14	Encourage green products and environment	2.49	1.56	1.96	1.12	0.59	0.98
15	Follow paperless work	2.61	1.75	2.12	1.02	0.73	0.96
16	The bank actively involved local community development	2.74	2.41	2.55	1.12	1.15	1.15
17	Improve community relationship	2.83	2.33	2.35	1.12	1.14	1.13
18	Provide more scholarship to meritorious students	2.23	1.71	1.93	1.08	0.68	0.91
19	Provide special schemes to minority students	2.40	1.66	1.98	1.11	0.58	0.93
20	Provide more funds to state and central	2.35	1.67	1.96	1.08	0.52	0.88
21	Provide special loans to differently abled citizens	2.46	1.62	1.99	1.17	0.52	0.96
22	Help women education and development	2.38	1.72	2.01	1.04	0.60	0.88
23	Conduct blood, eye donation camp frequently	2.67	1.63	2.08	1.21	0.60	1.05
24	Create awareness programme against child labour	2.66	1.69	2.12	1.21	0.56	1.02

Source: Computed data

Table 15: Test of Equality of Group Means

Sl. No.	Variables	Wilks Lambda	F	Df1	Df2	Sig
1	Give more types of loans to all customers	.824	81.500	1	381	.000
2	Follow minimum procedure for account opening	.786	103.570	1	381	.000
3	Charge minimum cost for services	.788	102.346	1	381	.000
4	Establish more ATM centres in rural areas	.764	117.897	1	381	.000
5	Charge minimum interest against loans	.760	120.185	1	381	.000
6	Give high interest against investment	.824	81.500	1	381	.000
7	Create good infrastructure	.786	103.570	1	381	.000
8	Maintain secrecy of the customers details	.834	75.887	1	381	.000
9	Provide adequate safety measures	.866	58.979	1	381	.000
10	Provide high quality services	.758	121.636	1	381	.000
11	Adopt recent technologies in timely manner	.758	121.938	1	381	.000
12	Involve reduction of air pollutant	.788	102.346	1	381	.000
13	Provide more agriculture loans	.764	117.897	1	381	.000
14	Encourage green products and environment	.780	107.600	1	381	.000
15	Follow paperless work	.808	90.793	1	381	.000
16	The bank actively involved local community development	.980	6.675	1	381	.000
17	Improve community relationship	1.000	.182	1	381	.000
18	Provide more scholarship to meritorious students	.921	32.841	1	381	.000
19	Provide special schemes to minority students	.845	69.907	1	381	.000
20	Provide more funds to state and central	.853	65.757	1	381	.000
21	Provide special loans to differently abled citizens	.816	86.174	1	381	.000
22	Help women education and development	.865	59.380	1	381	.000
23	Conduct blood, eye donation camp frequently	.759	120.845	1	381	.000
24	Create awareness programme against child labour	1.781	107.007	1	381	.000

Source: Computed data

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Table 16: Test Results

Box's	M	1.762
F	Approx	7.927
	df1	210
	df2	3.904
	sig	.000

Texts null hypothesis of equal population covariance matrices.

Source: Computed data

of discriminant function produced is the number of groups minus one. Here, there are two groups, namely, high level of expectation and low level of expectation, so only one function is displayed. It indicates the simple correlation coefficient between the discriminant score and their corresponding group membership (low expectation, high expectation). Table 17 provides the multivariable aspects of the model given under the canonical discriminant function.

Table 17: Eigen Values

Function	Eigen value	% of variance	Cumulative variance	Canonical correlation
1	2.957[a]	100.0	100.0	.864

a. First 1 canonical discriminant functions were used in the analysis.

Source: Computed Data

Table 17 reveals that a canonical correlation of 0.864 suggests the model explains (0.864 x 0.864) 74.65% of the variation in the grouping variable, that is, 74.65% of the variance in the discriminating model between a prospective high expectation and low expectation due to the changes in the twenty factors, namely adopt recent technologies in timely manner, provide high quality services, create good infrastructure and so on.

Wilks Lambda

Wilks Lambda indicates the significance of the discriminant function. Table 18 shows the results of Wilks Lambda.

Table 18: Wilk's Lambda

Test of function (s)	Wilks Lambda	Chi-square	Df	Sig
1	.253	510.304	20	.000

Source: Computed data

Table 18 indicates that the value of Wilks Lambda is 0.253 and with 20 degrees of freedom a *p* value of 0.000. Since the *p* value is less than 0.05 and Wilks Lambda is

between 0 and one, it is inferred that the discriminant function is significant.

Standardised Canonical Discriminant Function Coefficients

The standardised canonical discriminant function coefficient is exactly the same way as a regression coefficient. Each coefficient reflects the relative contribution of each of the predictor variable on the discriminant function. A small value of the discriminant coefficient means that the impact of a unit change in a predictor variable is small in the discriminant function score. Table 19 shows the details of standardised canonical discriminant function coefficient.

Table 19 reveals that "provide loans to differently disabled citizens" is the strongest predictor (0.510 points) which is followed by "charge minimum interest against loans" (0.448 points), "conduct awareness programmes against child labour" (0.428 points), "create good infrastructure" (0.354 points), "adopt recent technologies in timely manner" (0.289 points) and the bank actively involve local community development (0.267 points) are the major differences between high expectation and low expectation groups of customers. These six variables with large coefficient stand out as those that strongly predict allocation to the low or high expectation groups. All other 14 variables are less important as predictors.

Structure Matrix

Structure matrix table provides another way of indicating the relative importance of the predictors. Structural coefficients are obtained by computing the correlation between the discriminant score and each of the independent variables. Structure matrix correlations are considered more accurate than the standardized canonical discriminant function coefficients. It shows the correlations of each variable with each discriminate function. Table 20 shows the structure matrix.

Table 20 reveals that give more types of loans to all customers (.331), follow minimum procedure for account opening (.331), charge minimum cost for services (.330), establish more ATM centres in rural areas (.329), charge minimum interest against loans (0.329 points), give high interest against investment (0.329 points), create good infrastructure (0.328 points), maintain secrecy of the customers (0.327 points), provide adequate safety measures (0.323 points), provide high quality services (0.309 points) and adopt recent technologies in timely manner (0.308 points) are the most important variables in

Table 19: Standardised Canonical Discriminant Function Coefficients

Sl. No.	Variables	Functions
		1
1	Give more types of loans to all customers	.356
2	Follow minimum procedure for account opening	.183
3	Charge minimum cost for services	.298
4	Establish more ATM centres in rural areas	.433
5	Charge minimum interest against loans	.448
6	Give high interest against investment	.027
7	Create good infrastructure	.354
8	Maintain secrecy of the customers details	.083
9	Provide adequate safety measures	.123
10	Provide high quality services	.034
11	Adopt recent technologies in timely manner	.289
12	Involve reduction of air pollutant	.160
13	Provide more agriculture loans	.150
14	Encourage green products and environment	.144
15	Follow paperless work	.255
16	The bank actively involved local community development	.267
17	Improve community relationship	.262
18	Provide more scholarship to meritorious students	.090
19	Provide special schemes to minority students	.133
20	Provide more funds to state and central	-.031
21	Provide special loans to differently abled citizens	.510
22	Help women education and development	-.141
23	Conduct blood, eye donation camp frequently	.211
24	Create awareness programme against child labour	.428

Source: Computed data

Table 20: Structure Matrix

Sl. No.	Variables	Functions
		1
1	Give more types of loans to all customers	.331
2	Follow minimum procedure for account opening	.331
3	Charge minimum cost for services	.330
4	Establish more ATM centres in rural areas	.329
5	Charge minimum interest against loans	.329
6	Give high interest against investment	.329
7	Create good infrastructure	.328
8	Maintain secrecy of the customers details	.327
9	Provide adequate safety measures	.323
10	Provide high quality services	.309
11	Adopt recent technologies in timely manner	.308
12	Involve reduction of air pollutant	.303
13	Provide more agriculture loans	.301
14	Encourage green products and environment	.284
15	Follow paperless work	.277
16	The bank actively involved local community development	.269
17	Improve community relationship	.260
18	Provide more scholarship to meritorious students	.249
19	Provide special schemes to minority students	.242
20	Provide more funds to state and central	.230
21	Provide special loans to differently abled citizens	.229
22	Help women education and development	.171
23	Conduct blood, eye donation camp frequently	.083
24	Create awareness programme against child labour	.013

Pooled within groups correlations between discriminating variables and standardized canonical discriminant functions variables ordered by absolute size of correlation within function.

Source: Computed data

Table 21: Canonical Discriminant Function Coefficients

Sl. No.	Variables	Functions 1
1	Give more types of loans to all customers	.479
2	Follow minimum procedure for account opening	.291
3	Charge minimum cost for services	.261
4	Establish more ATM centres in rural areas	.544
5	Charge minimum interest against loans	.521
6	Give high interest against investment	.031
7	Create good infrastructure	.469
8	Maintain secrecy of the customers details	.091
9	Provide adequate safety measures	.161
10	Provide high quality services	.044
11	Adopt recent technologies in timely manner	.375
12	Involve reduction of air pollutant	.181
13	Provide more agriculture loans	.185
14	Encourage green products and environment	.166
15	Follow paperless work	.292
16	The bank actively involved local community development	.233
17	Improve community relationship	-.231
18	Provide more scholarship to meritorious students	.102
19	Provide special schemes to minority students	.155
20	Provide more funds to state and central	-.038
21	Provide special loans to differently abled citizens	.587
22	Help women education and development	-.171
23	Conduct blood, eye donation camp frequently	.229
24	Create awareness programme against child labour	.473
	Constant	-7.822

Unstandardised coefficients

Source: Computed Data

discriminating between low expectation and high expectation of customers towards CSR activities of banks. All other variables are less important variables in discriminating between low expectation and high expectation group of customers.

Canonical Discriminant Function Coefficients

The basic principle in the estimation of a disc.minant function is that the variance between the groups relative to the variance within the group should be maximised. These unstandardised coefficients (b) are used to create the discriminant function (equation). It operates just like a regression equation. The discriminant function coefficient b or standardised form beta both indicate the partial contribution of each variable to the discriminate function controlling all other variables in the equation. Table 21 shows the canonical discriminant function coefficients.

From Table 21 the discriminant function can be formulated as below.

D = (.479 x give more types of loans to all customers) + (.291 x follow minimum procedure for account opening) + (.261 x charge minimum cost for services) + (.544 x establish more ATM centres in rural areas) + (0.521 x charge minimum interest) + (0.031 x give high interest) + (0.469 x good infrastructure) + (0.091 x maintain secrecy) + (0.161 x provide safety measures) + (0.044 x high quality services) + (0.375 x adopt recent technologies) + (0.181 x reduction of air pollutant) + (0.185 x provide agricultural loan) + (0.166 x encourage green products) + (0.292 x paperless work) + (0.233 x involve local community development) + (-0.231 x provide funds to develop town) + (0.102 x provide more scholarship) + (0.155 x special schemes to minority students) + (-0.038 x provide to state and central welfare funds) + (0.587 x loans to differently abled citizens) + (-0.171 x helps to women education) + (0.229 x conduct blood and eye donation camp) + (0.473 x conduct awareness programmes against child labour) − 7.822.

Functions at Group Centroids

A further way to interpreting discriminant analysis results is to describe each group in terms of its profile, using the group means of predictor variables. These group means are called centroids. Table 22 displays the results of functions at group centroids.

Table 22 makes it clear that high expectation group of customers have a mean of 1.508 while low expectation group of customers produce a mean of 1.951. Cases with

Table 22: Functions at Group Centroids

Expectation of groups	Function
	1
Low expectation	1.951
High expectation	-1.508

Unstandardised canonical discriminant functions evaluated at group means.

Source: Computed data

scores near to a centroid are predicted as belonging to that group.

Classification Results

The classification, also called a confusion table, is simply a table in which the rows are the observed categories of the dependent and the columns are the predicted categories. When the predictor is perfect, all cases will be lie on the diagonal. The percentage of cases on the diagonal is the percentage of correct classifications. The cross validated set of data is a more honest presentation of the power of the discriminant function than that provided by the original classification and often produces a poorer outcome. Table 23 shows the classification results.

Table 23 reveals that 96.6 percent of the respondents are classified correctly into low and high expectation groups. High expectations are classified with more accuracy (99.1%) than low expectation group (93.4%).

Findings of the Study

The following are the findings of the study:

• To find out the future expectations of customers towards CSR of banks, the factor analysis has been applied.

  The results of the factor analyses reveal that the factors are grouped under the following headings.

  1. Service responsibility

  2. Stakeholders responsibility

  3. Environment responsibility

  4. Community responsibility

  5. Customers responsibility

  6. Product responsibility

• Provide special loans to differently disabled citizens (.796), give high interest against investment (.740), involve reduction of air pollutant (.733), charge

Table 23: Classification Results

Expectation of customers		Predicted group	membership	Total
		Low	High	
Original count	Low	156	13	169
	High	3	214	217
%	Low	93.4	6.6	100.0
	High	.9	99.1	100.0

a.96.6% of original grouped cases correctly classified.

minimum interest against loans (.731) are identified as the high loading factors on the basis of the opinion of the customers about future expectations of banks towards CSR.

- In order to predict group membership discriminant analysis has been applied. It reveals that charge minimum interest against loans (0.329 points), give high interest against investment (0.329 points), create good infrastructure (0.328 points), maintain secrecy of the customers (0.327 points), provide adequate safety measures (0.323 points), provide high quality services (0.309 points) and adopt recent technologies in timely manner (0.308 points) are the most important variables in discriminating between low expectation and high expectation of customers towards CSR activities of banks.

Suggestions of the Study

Provide special loans to differently disabled citizens, give high interest against investment, involve reduction of air pollutant, charge minimum interest against loans are identified as the high loading factors on the basis of the opinion of the customers about future expectations of banks towards CSR. In future the banks may take into account the above expectations of the customers and implement these as early as possible.

The study also reveals that charge minimum interest against loans, give high interest against investment, create good infrastructure, maintain secrecy of the customers, provide adequate safety measures, provide high quality services and adopt recent technologies in timely manner are the most important variables in discriminating between low expectation and high expectation of customers towards CSR activities of banks. As a result, banks should provide high quality services, ensure safety and security, adopt recent technologies in timely manner and also concentrate on community and environmental aspects.

Banks should be investing in the development of human resources which include training, seminars, workshops, credit facilities, employment generation, libraries, employee family welfare, good-working environment, internship programmes, etc.

Banks should go ahead and report its CSR issues in various manners, such as annual reports, newspaper, websites or press conferences. The role of the government is to establish globally accepted reporting guidelines on CSR reporting.

Banks should concentrate on product and service contribution area, including consumerism, product quality, packaging and advertising.

Banks should contribute to community development, including socially oriented activities that are primarily of benefit to the general public, such as financial aid to the poor and disable people, donation to charities, such as health, hospital and social awareness programmes.

Banks must be involved in the prevention and protection of physical resources and environmental contribution, including activities directed towards preventing environmental pollution such as water, air, or noise pollution or disposal of wastages. Banks should ensure that there is no scope of polluting the environment by the banks. Most customers are not aware about the CSR activities of banks and the benefits towards stakeholders, such as customers, employees, general public, environment, local community development, agriculture, economically weaker section and economic development. Banks must create awareness about CSR activities and its benefits through conduct awareness programmes, seminars, conferences and encourage stakeholders for their active participation.

Conclusion

CSR has become necessary for organisational health and wealth. It plays a role of supporter and facilitator in the journey that enterprises undertake to reach the peak along

with highest ethical standards. CSR will help banks in their endeavour in serving the cause of the society. It will also help banks in evolving into a suitable mechanism for implementing the CSR programmes and keep a close watch on their effects. The government is the principal shareholder and promoter of CSR and corporate governance standards and practices of every country in the world. Good CSR practices are essential for sustainable business. It generates long-term value to all its shareholders and other stakeholders. Even private organisation is only constructing the profit motive. So the private sector is voluntarily initiating the CSR.

The banks under this study have recognised their responsibility towards the society and are making their contribution in the field of employment generation, education, health care, farmer training, women welfare and women empowerment. We suggest that banks should disclose the amount spent on CSR activities in their annual reports. Along with financial reporting, non-financial reporting should become amendatory for the banks for social, economic and environmental betterment of the society.

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"There are no miracles in agricultural production."

—Norman Borlaug

Barriers and Drivers in Energy Efficiency in India: A SAP-LAP Analysis

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Recent global developments towards climate change have ignited a lot of interest in field of energy efficiency and conservation in India. The government is also developing and implementing many innovative programmes as a policy measure to promote energy efficiency and energy conservation in different sectors of Indian economy. In this study, we provide the brief review the energy saving potential in India. We focus our thought to analyze the energy policy of India using SAP-LAP analysis and identify the barriers and drivers in the field of energy efficiency and conservation promotion. We further review the different energy efficiency and conservation programmes and briefly highlight the performance of each programme. We also emphasize the limitations, challenges and issues in promoting and implementing those programmes. This paper aims to ignite interest among policymakers, researchers, energy service companies, appliance manufacturers and other pertinent stakeholders. The learnings gained from this study may be used by the policymakers in designing and implementing effective energy policy measure to remove the obstacles in the way of investment in energy efficient technologies.

1. Introduction

India supports around 17.5 percent of the world population but has only 2.4 percent of the world surface area. According to NATCOM 2007, India is the sixth largest emitter in world emitted 1728 million tonnes of CO_2. However, on a per capita basis, India is one of the lowest emitters of GHG emissions. The average annual per capita energy consumption in India in 2011 was only 0.6 tonnes of oil equivalent (toe) whereas the global average is 1.88 tonnes(UNFCCC, 2015). The electricity consumption per capita in India was 917kWh (Planning Commission, 2014A).

National Mission on Enhanced Energy Efficiency (NMEEE) is one of the eight missions under National Action Plan on Climate Change (NAPCC) with the objective of promoting innovative policy and regulatory regimes, financing mechanisms and business models which not only create but also sustain markets for energy efficiency to reduce the energy consumption resulting into less GHG emission.

It has been seen that inspite of a policy framework for promoting energy efficiency and energy conservation, sometimes the desired results have not been achieved. This is because of several barriers or obstacles in effective implementation of policy measures. The objective of the present paper is to examine the nature of the barriers and drivers for energy efficiency and carry out a SAP-LAP analysis of energy efficiency policy framework of India. The classification of barriers and drivers in different categories will facilitate the government to guide its energy policies accordingly.

Sushil (2000) has recommended the use of SAP-LAP framework for developing models of managerial inquiry. It involves three basic entities in any management

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context, viz., situation, actor and process. An interplay of situation, actor and process (SAP) leads to learning, action and performance (LAP). This paper uses the SAP-LAP analysis as a tool to identify the barriers and drivers in the field of energy efficiency. Learnings from this analysis would also identify the actions required to improve the performance of the energy policy framework.

The paper has been organized in eight sections. Section 1 has introduction and background of the paper. Section 2 reviews the energy scenario in India and tries to quantify the energy saving potential in country through several studies carried out in the sector. Section 3 lists the barriers and drivers found during literature survey. Section 4 describes the significance of SAP-LAP analysis in analyzing energy policy framework. Section 5 summarizes the research methodology adopted in this paper. Section 6 is devoted to identify the barriers using SAP-LAP analysis of the energy policy framework. Section 7 presents the classification of drivers thrusting the energy efficiency in India. Section 8 presents the conclusion of this paper.

2. Review of Energy Scenario in India

GHG emissions of a country depend on several factors such as population, level of income and life style of people, economic pattern, industrialization, urbanization, construction, type of transport infrastructure, etc. Based on recent estimates by IEA (2008), the world's primary energy needs will grow by about 45 percent from 2006 to 2030, requiring some US$26 trillion investment in an enhanced system capacities. About 87 percent of this growth is expected to occur in developing countries. Unfortunately, fossil fuels are expected to remain as the dominant source of primary energy, accounting for about 80 percent of this projected increase. China and India, which together account for about half of this increased demand, will continue to rely heavily on coal to fuel their growth (IEA, 2008). Table 1 shows the macro indicators depicting the future energy needs with the growth of Indian economy.

Table 1: Macro Indicators of Indian economy Related to Energy use

Indicator	India in 2014	India in 2030
Population (billion)	1.2	1.5
Urban population (million)	377 (2011)	609
GDP at 2011–12 prices (in trillion)	INR 106.44 (USD 1.69)	INR 397.35 (USD 6.31)
Per capita GDP in USD (nominal)	1,408	4,205
Electricity demand (TWh)	776(2012)	2,499

Source : UNFCC (2015) "India's Intended Nationally Determined Contribution: Working Towards Climate Justice"

2.1 Energy Efficiency Potential in India

Studies indicate that increased energy efficiency can bridge the gap between growing demand and reduced energy supply without compromising the quality of service or output (Reddy, 2003). India clearly has a vast potential of energy savings and energy conservation through improved energy efficiency. Though several studies have been conducted in the last few years to estimate the energy saving potential in the country, however, the studies are not comparable because of their different objectives, assumptions, indicators and data sources. Findings of these studies are summarized below.

2.1.1 National Productivity Council (NPC) Study

NPC carried out this study in 2009 in energy consuming sectors in India. The study findings were based on the energy consumption data of 2007–08. The sectors covered under this study were industries including Small and Medium Enterprises (SMEs), agriculture pumping, municipalities, domestic households and commercial buildings and establishments. Energy consumption and energy saving potential estimated in this study is summarized in Table 2.

An electricity saving potential of 75.38 billion units possible through implementation of energy efficiency measures is estimated in the report. It is even higher than the overall energy deficit of 73.1 billion unit reported in 2007–08.

2.1.2 The then Planning Commission's low carbon study

The then Planning Commission (2011) brought out two scenarios namely "determined effort" and "aggressive effort" while estimating energy saving potential in all sectors (domestic, commercial, agricultural and industrial). The study suggests requirement of 1970 and 2020 billion kWh

Table 2 : Estimate Energy Consumption and Saving Potential in Few Selected Sectors

Sector	Consumption (billion kWh)	Energy saving potential (billion kWh)	% energy saving potential (billion kWh)
Agriculture pumping	92.33	27.79	30
Domestic	120.92	24.16	20
Industry (including SMEs)	265.38	18.57	7
Municipalities	12.45	2.88	23
Commercial buildings/Establishments with connected load more than 500 kW	9.92	1.98	20
Total	501	75.38	15

Source: NPC (2010) "State-wise Electricity Consumption and Conservation Potential in India".

Table 3: Energy Saving Estimates for Different sectors for the Year 2020 under Two Scenarios

Sector	Determined effort efficiency improvement (billion kWh)	Aggressive effort for energy efficiency improvement (billion kWh)
Appliances	80	147
Agriculture	5	10
Industry	20	60
Total savings	105	217

Source: Planning Commission (2011)

of net generation of power in year 2020 to meet the 8 percent GDP growth in India. As per the estimations, there is a saving potential of 105 billion kWh and 217 billion kWh in two scenarios respectively. Table 3 depicts the energy saving potential estimates in 2020 for different sectors under two scenarios.

2.1.3 ADB Study

ADB (2005) study analyzed the available data of electricity use for four sectors, industrial (generic and process),

commercial and municipal. The study found that there is a good potential of energy savings through energy saving measures and estimated a total investment potential of USD 3.5 billion to harness this energy saving potential. USD 3 billion of this investment was needed only for industrial sector. Table 4 shows the investment potential of electricity efficiency in India. ADB (2013) estimated a yearly investment of USD 4.5 billion through 2020 to realize the energy conservation targets.

Table 4: Electricity Saving Potential in India

Sector	Investment potential (USD million)
Industrial – Generic energy efficiency measures	1050
Industrial – Process energy efficiency measures	1975
Commercial	165
Municipal	325

Source: ADB (2005)

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Table 5: Barriers against Energy Efficiency Found in Literature

Reddy And Amulya (1991)	USAID (1991)	Weber (1997)	Sorrell (2000)	Reddy (2002)	Vine et al. (2003)
(i) Consumer-related (ii) Equipment manufacturer-related (iii) Utility-related (iv) Financial institution-related and (v) Government-related	(i) Pay back gap (ii) Lack of information (iii) Limited access to capital (iv) Lack of institutional estimates (v) Market structure (vi) Aversion to downtime and innovation, (vii) Standardized inventories and (viii) Purchase decision criterion	(i) Institutional barriers: barriers caused by political institutions, i.e., state government, local authorities (ii) Market barriers: obstacles conditioned by the market (iii) Organizational barriers: barriers within organizations, especially within firms and (iv) Behavioral barriers: barriers within individuals	(i) Neo-classical (ii) Behavioral and (iii) Organizational	(i) Financial-economic (ii) Technical (iii) Awareness and information (iv) Institutional-organizational (v) Regulatory and (vi) Personnel and behavioral barriers	(i) Lack of information about energy use (ii) Lack of access to information about financing investments in general and energy efficiency technologies in particular and (iii) Low importance given to energy efficiency in decision-making
ADB (2005)	**Reddy (2007)**	**Bhattacharya and Cropper (2010)**	**Limaye et al. (2012)**	**ADB (2013)**	**USAID (2013)**
(i) Subsidy (ii) Lack of top management commitment (iii) Use of outdated technologies	(i) Insufficient profitability (ii) Insufficient feasibility (iii) Combination of two (iv) Lack of financial support (v) Lack of policy support (vi) Promote inefficient use of energy	(i) Energy pricing policy of government (ii) Lack of information (iii) Split incentives between builders and tenants in case of buildings	(i) Availability of Funds (ii) Information, Awareness, and Communication (iii) Project Development and Transaction Costs (iv) Risk perceptions (v) Limited capacity	(i) Subsidies (ii) High transaction costs (iii) Limited information (iv) Limited professionals (v) Unavailability of finance (vi) Small size of energy efficiency measure (vii) Small projected savings	(i) Policy barriers (ii) Institutional barriers (iii) Barriers related to end users and project developers (iv) Financial barrier (v) Voluntary nature of policy measures (vi) Limited capacity of institutions (vii) High cost of energy efficient products (viii) Limited technical knowledge (ix) Lack of internal funds (x) Split incentives between ESCOs and Owners (xi) High transaction cost due to small project size (xii) Communication gap between financers and project developers

2.1.4 World Bank Study

Taylor et. al. (2008) conducted a study for World Bank to estimate the financial investment in the area of energy efficiency in Brazil, India and China. The study found that China, India and Brazil represented three of the top ten energy consuming countries of the world. India consumed 1103 Mtoe of energy in 2004. According to the report, there is an energy saving potential of 50 billion kWh in Indian economy with an investment potential of approximately US$ 2.27 billion.

It is seen from above mentioned studies that there is a significant potential of energy savings in India. A few studies suggest that this saving potential even exceeds the total energy deficit. However, it has been observed that organizations have not taken up the energy efficiency measures in the same proportion. The investment in energy efficiency projects has not been very encouraging even after the government interventions. In this view, it becomes imperative to study and analyze the barriers and drivers restricting the diffusion of energy efficiency technologies. The barriers identified during literature review have been listed in next section.

3. BARRIERS OF ENERGY EFFICIENCY

It has been shown in past that despite the vast potential of energy saving, and a growing importance being put by state and national governments on energy efficiency, the investment in energy efficiency technologies has not been very encouraging. This has been on account of reasons classified as technical, institutional and financial barriers in the literature (Reddy and Amulya, 1991; Weber, 1997; Ghosh et al., 2002; Vine et al., 2003; Beck and Martinot, 2004; Reddy and Assenza, 2007; Chandrasekhar and Kandpal, 2007; Taylor et al., 2008; USAID, 1991, 2006, 2013; ADB, 2005, 2013; Bhattacharya and Cropper, 2010; Planning Commission, 2011, 2014; Limaye et al., 2012). The above studies identify barriers from different perspectives. The barriers found in the literature have been listed in Table 5.

Successful promotion and implementation of energy efficient technologies depends on investment flow in the area of energy efficiency. The funding in energy efficiency projects should come from government, private and multilateral agencies.However, investment in energy efficient technologies is not possible until the issues related to the penetration of energy efficient technologies are addressed (Reddy and

Amulya, 1991; Hollander and Schneider, 1996; Sorrell et. al., 2000).After listing the barriers and drivers found in the literature, significance of SAP-LAP framework is discussed in next section.

4. SIGNIFICANCE OF SAP-LAP FRAMEWORK IN ANALYZING BARRIERS AND DRIVERS

Sushil (2000) recommended use of SAP-LAP framework for developing models of managerial inquiry. SAP-LAP paradigm shown in Figure 1 is basis of flexible systems management (Sushil, 1997). It involves three basic entities in any management context, viz., situation, actor and process. A situation is to be dealt with by an actor or a set of actors via a process or a set of processes. An interplay of situation, actor and process (SAP) leads to learning, action and performance (LAP).
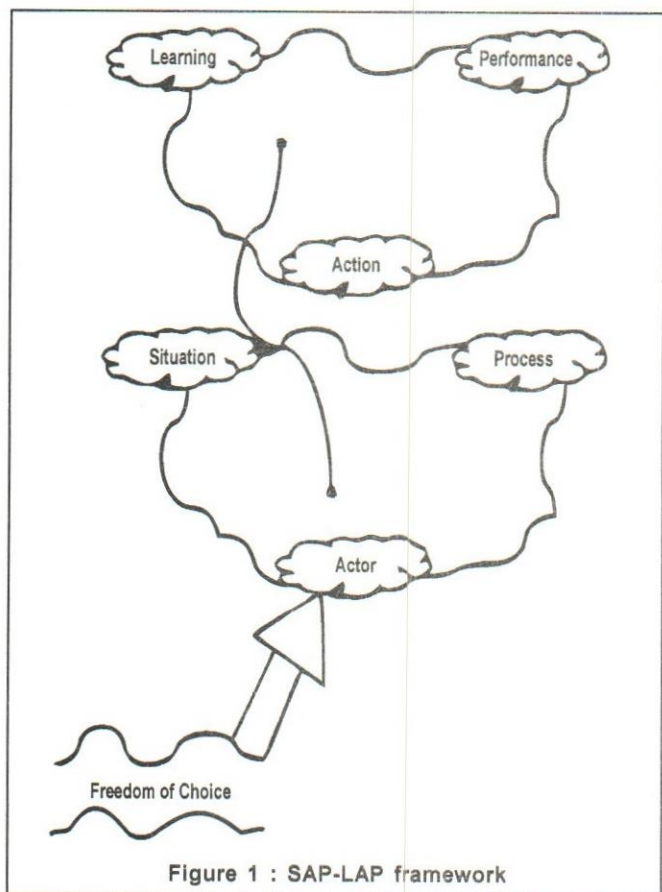

Figure 1 : SAP-LAP framework

Source : Sushil (1997)

In any managerial inquiry, the learning is gained about the situation, actor and process. The learning would direct the actions to be taken for the impending situation which will result into improved performance of the system.

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Sushil has used this model to analyze the performance of many auto industries such as Mahindra & Mahindra and Hero MotoCorp. Soni and Choudhary (2013) developed a SAP-LAP model of internal supply-chain management. Kumar et al. (2012) applied SAP-LAP to analyze the learning issues of supply chain management in SMEs. Though SAP-LAP model has been used in many contexts, however, its application has not been observed in analysis of energy policy framework. In this context, this model is relevant to analyze the barriers and drivers in the area of energy efficiency.

5. RESEARCH METHODOLOGY

This paper uses the SAP-LAP methodology as a tool for general problem solving. In the first step of SAP-LAP framework, a semi-structured questionnaire was developed to enquire the situations, actors and processes. The concerned project managers and coordinators were interviewed using the developed questionnaire. Primary data was collected from the interviews. Secondary data was collected through published sources such as reports, papers and from the websites. SAP elements "situations", "actors" and "processes" were identified from the primary data.

The second step of research methodology was LAP synthesis. Similar to SAP, LAP synthesis also has three components "learning", "action" and "performance". LAP is carried out for situations, actors and processes leading to LAP synthesis. Key learning issues are identified from SAP analysis. This leads to key suggested actions to improve the situations, actors and processes respectively. Finally,

Figure 2: Steps of research methodology
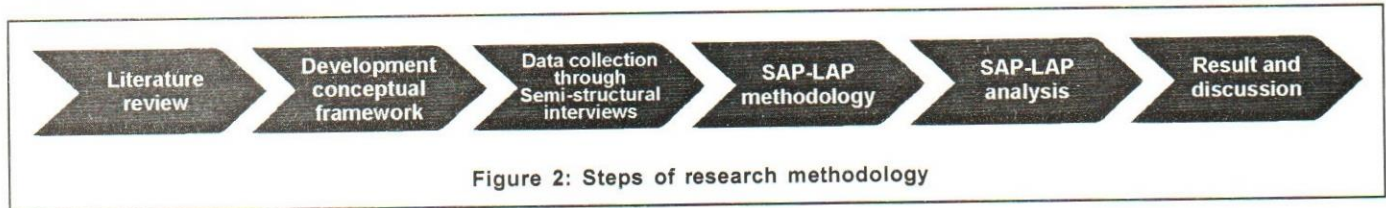
the impacts of these actions on the performance of the situations, actors and processes are explored (Sushil, 2000). Figure 2 shows the steps of used research methodology.

6. SAP-LAP ANALYSIS

In this section, we analyze the barriers found in implementation of energy efficient technologies in the country during the interview. Following few barriers in the form of situations were selected for their detailed SAP-LAP analysis.

Situation 1: Absence of awareness about the energy efficient opportunities

It has been found that many end customers including the large organizations are not aware about their energy saving potential. They also do not know the available energy efficiency opportunities to realize this energy saving potential. Lack of information sometimes raises the cost of project implementation inversely affecting the profitability and feasibility of any project.

Situation 2: Access to and utilization of energy efficient technologies

Though the users have access to reliable information about cost effectiveness and technical performance of energy efficiency technologies due to energy policies of the government, however, end customers do not have access to technologies because of lack of knowledge and expertise in this area. Though aware about the equipment and technologies available, they do not utilize those technologies due to various reasons such as unavailable case studies, performance of new technology, reliability of technology and lack of funds.

Situation 3: Lack of funds and capital for energy efficiency technologies

Energy efficient technologies require funds and capital for effective implementation. However, reduced profitability and feasibility due to lack of information instill less confidence to the investor for committing the funds for energy efficiency project. The organizations give least priority to energy conservation projects in comparison to other projects such as capacity expansion.

Situation 4: Low credibility of service provider

Energy efficient technologies may be implemented in two ways in any organization. In the first case, the technology is implemented directly by the technology supplier on direct investment by user organization. In the second case, Energy Service Companies (ESCOs) finance energy efficient technology and savings are shared between the ESCOs and user organizations.

ESCOs and technology suppliers are known as service providers. Sometimes, savings realized after the project implementation are not in unison with those guaranteed in the beginning.

Situation 5: Lack of coordination among government and the private sectors

The government formulates the policies to promote energy efficiency and energy conservation. The policies also ensure minimum supply of energy on an affordable price to all concerned. It seems in spite of policy formulation, enforcement of policy has been a concern in Indian energy sector. It has been found that there has been a lack of coordination among government and private sectors.

Situation 6: Limited institutional and industrial capacity

The government through its policies creates institutional

A SAP-LAP analysis of above situations is presented in Figure 3

Actors
- Lack of expertise in energy efficiency
- Government interventions
- Lack of interest of stakeholders
- Inadequate database
- Lack of energy service providers
- Commitment and leadership of banks and financial institutions

Situations
- Absence of awareness about the energy efficient opportunities
- Access to and utilization of energy efficient technologies
- Lack of funds and capital for energy efficiency technologies
- Low credibility of service providers
- Lack of coordination among government and the private sectors
- Limited institutional and industrial capacity.

Processes
- Documentation of activities related to energy efficiency/renewable energy/sustainablity
- Policy documentation and implementation
- Strengthening of research institutes in energy areas
- Development of energy service companies
- Identification of training needs and capacity building

SAP-LAP Interplay

Learnings
- Knowledge sharing and replication
- Increased energy cost or production cost
- Learning knowledge sharing and replicatioon
- Barriers in both supply and demand to be removed
- Sustained government interventions are important in policy, regulation and demonstration of energy efficiency benefits
- Summary of case studies of bank activities
- Customer approach for customized solutions

Actions
- Review the energy efficiency landscape in India
- Develop case studies and study material on Indian experience in energy efficiency implementation
- Develop innovative financing mechanis
- Define the government role in building energy efficiency
- Develop database
- Capacity building
- Review the energy efficiency market in India
- Survey of banks, financial institutions

Performances
- Reduced energy consumption
- Less cost of production
- Increased availability of funds/finance for energy efficiency projects
- Access to institutional expertise/knowledge pool
- Reduced GHG emission
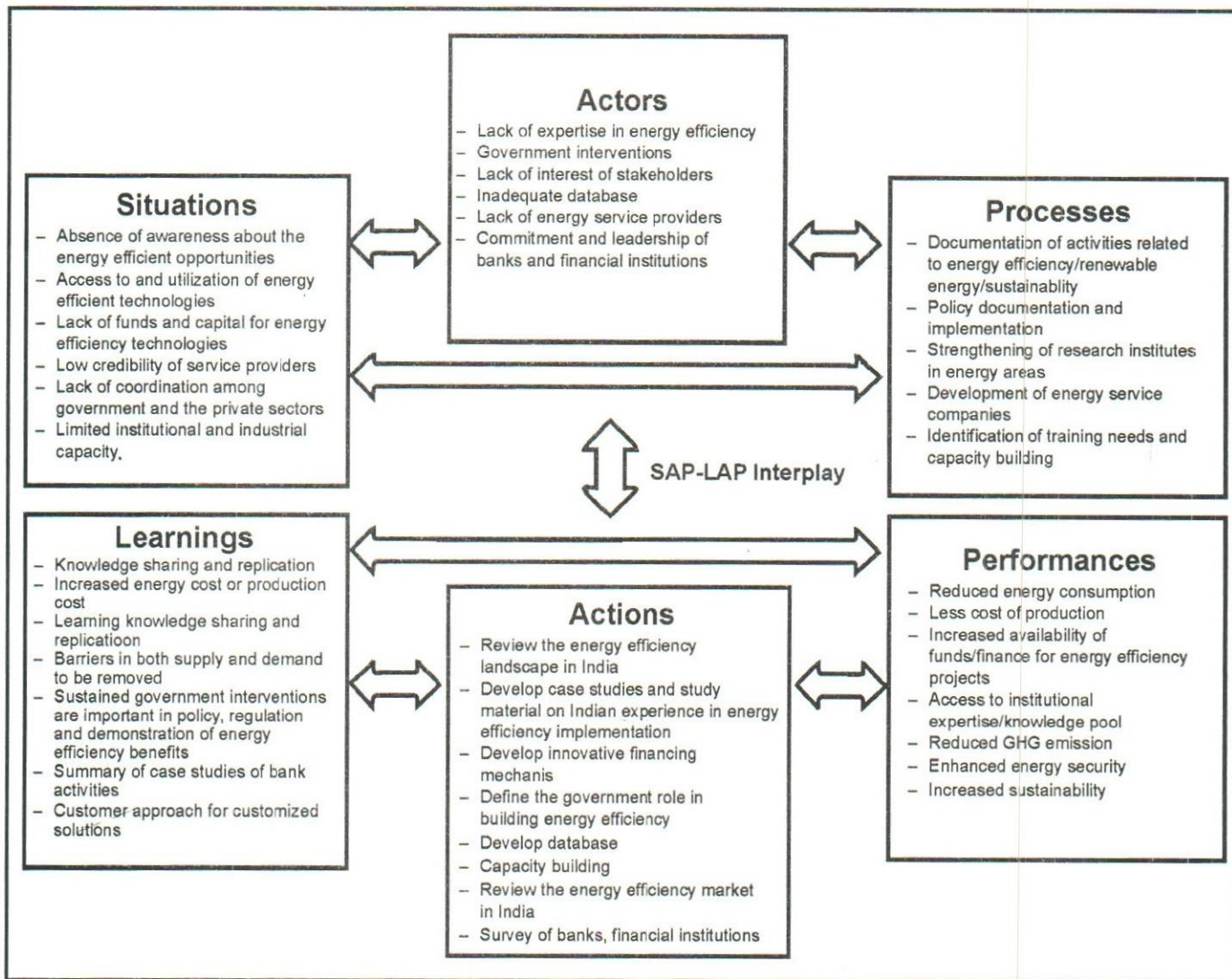- Enhanced energy security
- Increased sustainability

Figure 3: SAP-LAP of energy efficiency policy framework in India

and industrial capacity. Certified Energy Managers and Certified Energy Auditors are being trained to make them available for industry. However, in spite of all efforts, there is still a deficiency of knowledge, skills and institutional expertise in energy field.

Actors

The barriers listed as situations above are based on the views expressed during semi-structured interviews. The reasons or actors behind these barriers identified during

the discussion are discussed below.

Expertise in the field of energy efficiency in India is limited. Though, energy consumption has increased in last few decades at a rapid pace, however, capacity building in energy efficiency has not been on the desired pace. Government interventions are not adequate towards capacity building to develop enough expertise in the area. Government policy framework has not been sufficient to bring all the stakeholders such as industries, commercial customers, technology suppliers and financial institutions together. Though the government is formulating policies, still action is required at many fronts.

The stakeholders such as industries and customers, due to lack of interest do not implement energy efficient technologies. Other stakeholders such as banks and financial institutions are also less committed towards the cause of energy efficiency. Banks do not consider the energy projects reliable and creditworthy.

The number of energy service providers is low in India and the concept has not been very popular in the country. Moreover, case studies of energy conservation and energy efficiency implemented by the energy service providers are limited. The total energy consumption and specific energy consumption are not available for all the sectors of economy. An inadequate database of such information has been one of the major actors in formulating proper policies for different sectors.

Having discussed the situations and actors in the above paragraphs, the process is explained in the following sub-section.

Process

As a part of SAP-LAP methodology, it becomes imperative to understand the process undertaken by various stakeholders in forming the policies of promoting energy efficiency, making the technology and skill set available in the country and regulating and guiding the energy usage. These steps are described in the present section.

There are many departments and ministries which deal with different type of energy sources. Earlier, there were many policy frameworks of different government departments which were used to regulate energy market. However, Energy Conservation Act covering all types of energy sources was enacted by Parliament in 2001. Consequent to EC Act 2001, Bureau of Energy Efficiency was constituted which is now solely responsible to form energy efficiency policies in India. Policy frameworks related to energy usage have been formed under the broad guidelines framed in Energy Conservation Act 2001. Apart from BEE, Ministry of New and Renewable Energy still promotes and regulates the renewable energy market including solar power, wind power and biomass resources in country.

The policy frameworks are related to conventional energy sources, renewable energy sources and environment and sustainable issues. BEE in association with State Designated Agencies, its counterpart in States implements and enforces Energy Conservation Act in different States and Union Territories in India.

The policy framework also consists of a process of developing energy service companies. The contracts are made between energy service companies and user organizations. ESCOs conduct energy audits and implement solutions on shared savings basis.

The user organizations identify the training needs for their personnel to make them expert in energy usage technologies. There are also provisions of strengthening of the institutes carrying out research and development activities in energy areas in EC Act 2001. The government is taking initiatives to strengthen the capacity building institutes to cater the growing need for training of Energy Auditors and Energy Managers.

Having discussed the processes as a part of SAP analysis, LAP synthesis is worked out to know the learnings from the analysis, actions required to improve and assessment of performance improvement.

Learning

Based on SAP analysis and the findings of the semi-structured interview held with the project managers and coordinators, the learning of SAP-LAP analysis are discussed below.

It is learnt that the organizations remain skeptical about the efficacy of energy efficiency technologies. The best way to convince organizations about the energy efficiency is knowledge sharing with them. The case studies of the organization, where new technologies have been successfully implemented should be prepared and shared with other organizations and training institutes. The knowledge sharing in this way will motivate the people to use the energy efficient technologies.

It is seen that the organizations give the least priority to energy conservation measures. The management

willingly implements the capacity expansion projects or other financially attractive projects instead of energy conservation projects. In their opinion, energy efficiency projects are not financially feasible projects. This type of misconceptions may be removed by demonstrating the successful case studies.

Production cost consists of energy cost as one of its major component. The subsidy given by the government reduces the actual energy cost and consequently the production cost does not reflect actual cost of production. Since the cost of production does not have actual cost of energy, the user organizations give least importance in implementing the energy conservation projects. High production cost consequent of high energy cost makes the product unviable in the market and the competitiveness of an organization becomes questionable. The cost component of energy may be reduced through energy efficiency and energy conservation projects. Further, if the price of energy sources increases during course of time, the management becomes willing in energy efficiency projects.

The central government forms policies and implement them through the state governments. The policies comprise of the guidelines, rules and regulations regarding for energy consumption, promotion of energy efficient products, capacity building and creating awareness, providing finance to the stakeholders. Both supply and demand of the energy efficient technologies and products need to be sustained by removing the barriers.

It has been seen that banks and financial institutions are least interested in financing the energy efficiency and conservation projects. They cannot ascertain the quality and reliability of such projects. The banks are also not certain of the return on their investment. It is required that case studies of bank financing of the energy projects should be propagated. Apart from that, it is also felt banks should get an assurance in the form of risk management for the loans disbursed by them towards energy efficiency projects.

Action

Based on the lessons learnt from the experience, following actions are required or have been taken by the government of India towards the enactment of energy policies.

Energy consumption varies across different sectors such as industry, service sectors and domestic consumers in India. It is necessary to map the energy intensity across the different categories of energy consumers in a sector. This landscaping or mapping of energy intensity would help in formulate the distinct policy for promotion of energy efficiency in a particular sector based on its energy usage.

Government is facilitating promotion by playing an active role in the field of energy efficiency. Several databases comprising of information on consumers' size, energy consumption data and technologies being used by the consumers are being prepared by the concerned government agencies. These databases are used for long term energy planning and policy formation.

The Bureau of Energy Efficiency has constituted separate energy efficiency programmes such as Perform Achieve and Trade (PAT) for industries, Standard and Labeling (S&L) Programme for domestic and industrial appliances, Bachat Lamp Yojna as a DSM initiative to manage power demand, SME Programme for Small and Medium Industries, Agri DSM for agriculture consumers, painting competition for creating awareness among young school children and National Certification Examination Programme to create expert pool in the country. Energy Service Companies are also being developed by bringing the different stakeholders such as technology providers, customers and financers bringing together.

Based on the learning of implementing the energy efficiency and energy conservation measures in the different sectors, case studies are being developed and the benefits of these programmes are being demonstrated through these case studies. Such case studies are available on several media viz. the internet (www.energymanagertraining.com), newsletters, magazines and journals.

Surveys have been carried out to assess the needs of consumers, energy service companies, technology providers, banks and financial institutions. As an outcome of the surveys, innovative financing mechanisms have been developed to cover the financial risks of the stakeholders. The technology providers are being encouraged to develop cheap indigenously available energy efficient products. The consumers are being motivated to use the available technologies and products by creating awareness. The loans to ESCOs and the consumers to implement the energy efficiency projects should be made available by the banks and financial institutions.

Performance

The performance of energy conservation programmes of India as a part of SAP-LAP analysis is discussed in this section. Several demand and supply side programmes to improve energy efficiency and to reduce energy consumption were launched by the government. As a result of these programmes energy consumption has reduced in the country in last few years. For an example, it was targeted to reduce 6.686 million tonnes in first cycle of market based trading scheme "Perform Achieve and Trade" (PAT) cycle. The scheme aims to improve energy efficiency in industries by trading in energy efficiency certificates in eight energy-intensive sectors.

As a first step of PAT, baseline audit studies were conducted in 2012 and the designated consumers were given with individual targets based on performance in baseline studies to reduce their energy consumption. The industries implemented several energy efficiency measures to achieve the targets. M&V audits as a part of PAT cycle to verify the energy savings are still being carried out in several designated consumer industries. It is assumed from the preliminary results of M&V studies that targets given to most of the industries will be achieved by designated consumers. This reduction in energy consumption will also reduce 24 million tons of CO_2.

BEE initiated the 'Standards and Labeling' programme for equipment and appliances in 2006 to provide the consumer an informed choice about the energy saving and thereby the cost saving potential of the relevant marketed product. The scheme is currently invoked for 21 equipment and appliances. The scheme is mandatory for four of the products since January 7, 2010 and is in voluntary stage for 17 other products. The most recent additions to the list of labeled products are variable capacity AC's and LED lamps. The market is transforming towards star products due to increased awareness of the benefits among customers in India by S&L programme.

As a learning of the SAP-LAP analysis, BEE has initiated a capacity building programme for distribution companies (DISCOMs) in power sector. The objective of the programme is capacity building of DISCOMs for carrying out load management programme, energy conservation programme, load growth programme, development of demand side management (DSM) action plan and implementation of DSM activities in their respective areas.

BEE is also developing and supporting State Designated Agencies (SDAs). There are 34 SDAs in country. Out of 34 SDAs, 15 are Renewable Energy Development Agencies, 9 are Power Department of State Governments, 6 are Electrical Inspectorate offices, 3 are Distribution Companies and 1 is "stand-alone" SDA. The major roles and responsibilities of SDAs are to coordinate, regulate and enforce the various provisions of the Act at the State level. The government supports the SDA by providing financial assistance to strengthen their institutional capacities and capabilities. Central government also makes contribution to State Energy Conservation Fund (SECF) constituted by SDAs.

BEE took up various policy and regulatory initiatives to enhance energy efficiency of building sector namely Energy Conservation Building Code (ECBC), support for energy assessment & retrofitting process and voluntary star rating programme for commercial buildings. BEE proposed ambitious targets for the 12th plan period, i.e. 75 percent of all new starts of commercial buildings are ECBC compliant by the end of the 12th plan period and 20 percent of the existing commercial buildings reduce their energy consumption through retrofits.

The Energy Conservation Building Code (ECBC) was developed by the Govt. of India for new commercial buildings on 27th May 2007. ECBC sets minimum energy standards for commercial buildings having a connected load of 100kW or contract demand of 120 KVA and above. The code developed by Central Government may be modified by the state governments to suit local or regional needs and notify them. Presently, the code is in voluntary phase of implementation.

Since the farmers did not have access to new energy efficient technologies, BEE initiated Agriculture Demand Side Management (Ag-DSM) scheme during XI plan in eleven DISCOMs of selected eight states (Maharashtra, Haryana, Punjab, Rajasthan, Gujarat, Andhra Pradesh, Madhya Pradesh and Karnataka). These states are agriculturally intensive and account for more than 70 percent of electricity consumption in this sector. The objective of the program is to create appropriate framework for market based interventions in the agriculture pumping sector and carried out pump set efficiency upgradation projects through Public Private Partnership (PPP) mode.

Restructured Accelerated Power Development and Reforms Programme (R-APDRP) strengthens the distribution companies to improve their distribution and

sub-transmission infrastructure. The focus of the programme is to establish reliable and automated systems for sustained collection of accurate baseline data and demonstrate actual performance in terms of sustained loss reduction. As per the study conducted by NPC (2015) to assess the impact of RAPDRP Programme, Aggregate Technical and Commercial (AT&C) losses have reduced in five states viz. Uttar Pradesh, Gujarat, West Bengal, Sikkim and Tripura as compared to their baseline set during 2010 to 2012.

Apart from above mentioned programmes, government has started several other projects to promote energy efficiency and energy conservation. Other programmes such as Bachat Lamp Yojna (BLY), Municipality DSM (Mu-DSM), Energy Conservation Awards for industries and commercial buildings, painting competition for children and promotion of renewable energy yielded the same results of reduced energy consumption. Energy Conservation Awards have created competition among industries and commercial building to use the energy efficient technologies. Similarly painting competition inculcates the feeling of resource conservation and environment improvement among young school children.

To address the barrier of financing the energy projects, government has come up with many innovative solutions. One of such programmes Venture Capital Fund for Energy Efficiency (VCFEE) provides equity capital for energy efficiency projects. The Fund provides equity support to specific energy efficiency projects, limited to a maximum of 15 percent of total equity required, through Special Purpose Vehicles or Rs. 2 crores, whichever is less, though the support is provided to only government buildings and municipalities. Earlier, commercial banks were less interested in financing energy efficiency projects because of risk involved and low credibility. Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE) is a risk sharing mechanism to provide commercial banks with a partial coverage of risk involved in extending loans for energy efficiency projects. Initially the support was provided to only government buildings and municipalities; however, in the twelfth plan it has been extended to cover SMEs and industries too.

BEE has started National Certification Programme for Certified Energy Managers and Energy Auditors to make expertise available in country in the field of energy efficiency. It has also been noted that there are more than 10,000 certified energy managers and energy auditors in country. These energy managers and energy auditors help industries to identify the opportunities available for them, evaluate the energy efficient technologies through cost benefit analysis. There are also more than 100 BEE accredited energy auditors and empanelled accredited energy auditor agencies in the country.

To address the barrier of limited knowledge available to Small and Medium Enterprises (SME) sector, BEE has initiated the energy efficiency interventions in selected 25 SMEs clusters during the XI plan. A study was conducted to assess energy use and technology gap at unit level, development of the cluster specific energy efficiency manuals, preparation of Detailed Project Reports (DPRs) on energy efficient technologies and capacity building and knowledge enhancement of man-force involved in SMEs.

Energy consumption in industries, transportation, agriculture and households is one of the many reasons of GHG emission. If the energy consumption is not efficient then GHG emission is also higher. As a result of various energy efficiency and energy conservation programmes of government of India, GHG emission is expected to come down. Energy saving targets of 6.686 million toe under PAT cycle 1 alone will reduce the GHG emission by 24 million tons of CO_2. Reduced energy consumption will lead to reduced demand and consequently to reduced import energy bill. Reduction in fossil fuel energy use due to energy efficient technologies and replacement by renewable energy sources not only strengthen the energy security of India but will also be a sustainable solution for energy needs.

7. DRIVERS OF ENERGY EFFICIENCY AND ENERGY CONSERVATION

In addition to the barriers in implementing energy efficiency, one should also understand the motivations or forces that direct the organizations and consumers to adopt the energy efficient measures. Using the normal group techniques (NGT) and based on the feedback taken from various experts from field, academicians and stakeholders, the cluster of drivers are tabulated in Table 6.

A high degree of advertising by the technology manufacturer can play a vital role in decision making of the consumer. At the same time, the information campaign run by the national and state governments will also help energy efficient products penetrate the market. The awareness thus created by various stakeholders will drive the energy efficiency further.

Awareness, advertising and marketing will not be sufficient to increase the penetration of energy efficiency measures if they bear a very high cost. For an example, Compact Fluorescent Lamps (CFLs) were very expensive when they appeared in the market, however, the competition between manufacturers made the option affordable. A decrease in price of the product led to an increase in the sale of the energy efficient technology.

Recently, energy prices have come to almost a third of its peak. When the energy prices are high and the government is paying most of its foreign reserve for paying energy bill, energy efficiency becomes more important. Energy bills of the consumers and organizations also increase with increase of the energy price. The products and services become costlier with increase in the energy price and competitiveness in the market increases to reduce the cost of product and service. Energy efficiency is the easiest way to reduce the product cost and increase the profit. Hence, increased energy price is also a driver for energy efficiency.

Non-energy benefits also play an important role in energy efficiency. These benefits take place at several levels including individual consumer level, national level and global levels. For consumer organizations, non-energy benefits are improved environment, comfort, health and safety for its employees, high productivity, improved process and direct and indirect economical benefits such as downsizing or elimination of equipment.

Table 6: Clusters of drivers for energy efficiency

Sl. No.	Cluster	Drivers
1	Institutional and Organizational	Strengthening of research institutes, Development of energy services companies, Development of institutional expertise in energy efficiency, Case studies in energy efficiency.
2	Regulatory	Policy formulation, Energy Conservation Act implementation, Enhanced energy security for the country, Information and awareness.
3	Technical	Technology transfer, Development of indigenous energy efficient technologies, Cluster approach for customized energy efficient solutions, Decrease in technology price.
4	Financial and economical	Development of financial mechanisms, New financial products and appraisal tools, Cluster approach for SMEs, Profit margin for companies.
5	Social	Reduced cost of product, High productivity, Improved competitiveness, GHG emission, Environment and sustainability.

Reduced energy imports and conservation of limited resources result into enhanced energy security for a nation. Avoided costs of power generation and usage can be used for social alleviation such as poverty reduction and job creation. Environmental regulations are important drivers for energy efficiency. Environmental regulations in form of tradable instruments motivate the consumer organizations to improve their manufacturing process to reduce the energy consumption. This will also result in less GHG emission, reduced global warming and maintaining a sustainable environment.

8. CONCLUSIONS

This paper attempts to study the barriers and drivers that affect energy efficiency in India using a SAP-LAP methodology. The paper starts with estimating the energy saving potential in India based on several studies carried out for this purpose. The barriers after thorough literature survey were listed and few situations were selected for detailed analysis. SAP-LAP methodology was used to analyze the energy policy framework and implemented programmes.

The actors and processes for each situation were identified using the data collected through semi-structured interview. Learnings and actions were decided from the experiences of the project managers to improve the performance of the policy system. The drivers were classified in five clusters viz. institutional and organizational, regulatory, technical, financial, economical and social. Such classification would help to develop the response measures to remove or mitigate the barrier. This would also facilitate devising of appropriate supporting mechanisms at policy, institutional, social, economical and financial, regulatory and information levels.

It was found in the literature that similar barriers were also faced by many developed countries where energy efficiency is considered an important aspect. The countries learnt from the barriers and devised the solutions to convert these barriers into the drivers. The positive outcome of these programmes led to other countries to design their energy efficiency projects imitating the success of the developed countries. However, the programmes were designed addressing the local conditions of each country.

The Government of India also considered the policy frameworks of many developed countries including but not limited to the United States of America and Germany during designing of its own energy policy. The initiatives such as S&L, ECBC, DSM and PAT have been implemented in other countries successfully. The energy efficiency and energy conservation projects are customized based on the inputs from various stakeholders such as industries, associations, technology providers and equipment manufacturers while implementing in India. It has been seen that there are only four products in the mandatory phase of S&L in India, whereas, many more products have entered the mandatory category in developed countries. The mandatory nature of such products shows successful market transformation as an outcome of this project.

Multilateral bodies such as UNFCCC have also helped devise several mechanisms to overcome many barriers. CDM as a virtue of Kyoto Protocol has paved the path of investment by developed countries in the field of energy efficiency projects. Bachat Lamp Yojna Programme is one of the several such initiatives which found the investors under CDM mechanism.

The governments of different countries are trying hard to improve the environmental conditions by cutting down the GHG emissions. The easiest way to do so has been the reduction in energy consumption by energy efficiency. Though there are always some obstacles present in the system, however effective policy planning and implementation leads to removal of the barriers. Alternatively, the risk mitigating tools and techniques are also used to reduce the risk of the barriers on the projects. Several such risk mitigating programmes to remove barriers in the financial and economical cluster for stakeholders have already been initiated by the Government.

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