How the Commercialisation of Agriculture and Government Policy has led to Ground Water scarcity in Rural Maharashtra

– A Qualitative Evaluation of the underlying factors

A Research Paper presented by

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(SB2066)

In partial fulfilment of the requirements for obtaining the degree of

MASTER OF ARTS IN DEVELOPMENT STUDIES

Major

Governance, Policy and Political Economy

(GPPE)

Specialization

Public Policy and Management (PPM)

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The Hague, The Netherlands

November 2014

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Acknowledgements

I would like to express by special appreciation and thanks to my Supervisor Dr Rachel Kurian for encouraging my thinking and streamlining my thoughts. Her advice on every occasion has been priceless.

I would like to thank Dr Joop De Wit for guiding me during the initial phase of the writing and as a convener of GPPE, he was always been pillar of strength for all of us.

I sincere thanks Dr Venkat for his valuable guidance towards the most crucial time of the paper and his encouragement throughout. Also I would like to thank Dr Sunil Thanka for all the inputs he gave for my work which immensely helped me.

I would like to thank Shri Vikas Kharge , my official mentor for all the guidance and support.

I would like to thank my friend Shri Dinesh Mahur . This Reasearch paper wouldn't have been possible without his help, encouragement and timely critic when it was most needed . I would also like to thank Shri Pradeep Purushotam and Shri Narayanan Srinivasan for their support.

Special thanks to my family, specially my parents, their prayers have what has sustained me this far. Words cannot express support of my son and husband who let me perceive my dreams and helped me remain focused.

I want to thank all of them whose names I have not been able to mention, I acknowledge their contribution without which this work would not be complete.

Nandini B Ghanekar
Mumbai, India
11th November 2014

Abstract

"Water is at the center of economic and social development; it is vital to maintain health, grow food, manage the environment, and create jobs. Despite water's importance, over 783 million people in the world are still without access to improved water sources, and even more are without access to consistently safe drinking water" (World Bank). In this context, this report undertakes a qualitative evaluation of the different ways in which commercialization of sugarcane agriculture, backed by uneven political patronage, has stimulated ground water depletion. This explores into how have the politics of sugarcane cultivation promoted the depletion of ground water supply in rural village. The research subsequently identifies the implications of these problems for the local villages and how the principles of good governance can help in resolving some of these issues. The researcher will primarily be dealing the research question from policy perspective of the sugar industry and sustainable ground water management. For analyzing role of the Government of Maharashtra in management of sustainable ground water resources, the researcher will be looking into different government policies for sugar factories, cooperatives and farmers; also to some extent the Ground Water Regulatory Act 1993.

The report finds that the water depletion is an incidence of the 'capture' theory where the regulatory framework has been used to indiscriminately use power for vested interests. In the backdrop of sugarcane production, the groundwater market in Maharashtra is typically oligopolistic and monopolistic. The large investments in this sector are either privately owned or politically motivated. In most states in India, the hydrological features and water table suffers from an uneven spatial distribution. Only a few water sellers consume the market space both, unethically and inappropriately. Particularly in the sugarcane belt the ground water usage and the agricultural produce are governed by political means. Evidently, the monopolistic environment has led to a situation which is a serious threat to the ground water availability.

Abbreviations

- Groundwater Survey and Development Agency (GSDA)
- Integrated Management Information System (IMIS)
- World Wide Fund for Nature (WWF)
- Indian Council of Agricultural Research (ICAR).
- Sugarcane Breeding Institute (SBI)
- International Crop Research Institute for Semi-Arid Tropics (ICRISAT)
- Ministry of Drinking Water and Sanitation (MDWS)
- Integrated Management Information System (IMIS)
- Below Poverty Line (BPL)
- Public Distribution System (PDS).
- Gross Cropped Area (GCA)
- South Asia Network on Dams, Raviers and People (SANDRP)

- Commission for Agricultural Costs and Prices (CACP)

- Flood Method of Irrigation(FMI)

- Sustainable Sugar Initiatives (SSI)

- Nabard Bank for Agriculture and Rural Development (NABARD)

Chapter 1: Introduction

Water is essential for all living beings and access to safe drinking water is the basic need for all human beings. Since India gained independence in 1947, the Government has undertaken many policies and programmes to provide clean drinking water in the rural areas of the country. Many of these schemes have fallen within the purview of the different states, which have also been responsible for the development and management of different initiatives around this objective. It is not surprising therefore that the political parties and priorities at the state-level have also influenced the opportunities and challenges of ensuring adequate water supply to the rural villages.

The state of Maharashtra has also had to deal with some of these problems as a large proportion of the rural Maharashtra and some part of urban population is dependent on ground water for drinking purpose. The use of ground water for was not a significant concern before the drought of 1972, after which the need for low cost institutional finance and energy availability let to increase in irrigation wells. (Report on Dynamic Ground Water Resource of Maharashtra 2008-2009). Since the last decade of the 20th century, the state government has aggressively promoted the commercialisation of agriculture, particularly sugarcane cultivation resulting in increasing competition for the water supply with privately-owned tankers being contracted out by the government having to provide the drinking water in many rural villages.

1.1 Research Objectives

The research paper analyses the nexus between the commercialisation of agriculture and drinking water availability, in rural Maharashtra.

1.2 Research Question

How has Government policy of commercialization of agriculture since 1990 and the politics of sugarcane cultivation, influenced the availability of drinking water in Rural Maharashtra.

Sub Questions:

1. Which are the different ways in which commercialization of sugarcane agriculture has been stimulated by the Government Policies?

2. How have the politics of sugarcane cultivation influenced the depletion of ground water supply in rural villages?

3. What are the implications of these problems for the local villages and can the principles of good governance help in resolving some of these issues.

1.3 Sugarcane Production in India-An Overview

Sugarcane (*Saccharum officinarum* L.), belongs to the grass family called Graminae (Poaceae), and it originated in New Guinea of South East Asia (Daniels 1996:129). There are three species of sugarcane of which *Saccharum barberi* originated from India, but the highly priced cane species is *S. officinarum,* which is cultivated widely in India. Sucrose is the main product received from the sugarcane crop which is collected from the stalk internodes of the plant. Sucrose, after purification, is used in industrial production of food substances. Sugarcane occupies the first position globally as the largest crop in terms of quantity of production with around 1.8 billion tonnes over 26 million hectares in more than 70 countries (FAO 2014). When we consider the total sugar production of the world, cane sugar forms $3/4^{th}$ of the total production and the rest comes from beet sugar, which had come down from its 46% share in 1964-

65 to 25% of the present day (Sugarcane Breeding Institute, Indian Council of Agricultural Research n.d).

Sugarcane is cultivated globally in many tropical countries and some sub tropical countries and India and Brazil account for approximately 40% of the world's cane sugar production (Kew Royal Botanical Gardens n.d.). India is the second largest sugarcane producing countries in the world contributing to around 15 % of world production (Department of Agriculture and Cooperation 2014:2). India is the largest country in terms of area of production (Mondal n.d.) and fifth largest exporter of sugar in the globe with around 2.5% of share in the world import market (ibid:3). Besides sugar, molasses, used in the alcohol industry and bagasse, the cane residue, used as fuel for mills, fibre in paper / synthetic textile industries and fodder for cattle, are the main by-products of sugarcane. Thus, sugar industry has been recognized as the second biggest industry in the country after textile industry. Sugar industry's contribution to the National GDP is around 1% and it has a great role in sustaining the rural economy by providing job opportunities to rural people as most of the factories are located in the rural India (Sugarcane Breeding Institute, Indian Council of Agricultural Research n.d.).

1.4 Sugarcane Cultivation

Sugarcane is cultivated in India right from vedic period and it finds its earliest mention in Indian writings of around 1400 BC (Farmer's Portal n.d.) and stronger evidence for use of sugar are available during Christ period (Daniels 1996:159). World Wide Fund for Nature (WWF 2009) informs that 35 million farmers are cultivating sugarcane and dependent upon the crop for livelihood with another 50 million people relying on the employment provided by 571 sugar factories and allied industries, thus playing a significant role in the economy of the States of Maharashtra, Tamil Nadu and Uttar Pradesh.

In India, sugarcane is grown in two types of agro climatic regions; tropical and subtropical regions, sharing 55% and 45 % of total sugarcane production with an average productivity of around 77 tonnes / hectares in the tropical regions and 63 tonnes / hectares in the subtropical region and the crop grows well in a temperature range of 30-34^{0}C(Farmer's Portal n.d). Tropical zone comprises of States of Maharashtra, Andhra Pradesh, Tamil Nadu, Gujarat and Karnataka while the subtropical zone includes the States of Uttar Pradesh, Bihar, Punjab and Haryana (ibid).

Sugarcane grows to a height of around 10 feet and may go still higher and the plant consists of a number of stems. It is a perennial crop with a solid stem, whose colour ranges from white, black, purple, yellow or violet. The internodes are usually having lesser height in the base of the plant and it increases till it the flower in the terminal (Sugarcane Cultivation in India, n.d). Sugarcane is a long duration crop facing all seasons in the life cycle of around a year and the temperature, irrigation and sunlight play crucial role in its growth and quality. It requires a rainfall of around 1100-1400 mm annually with a fairly dry season at the time of ripening (Sugarcane, n.d) Sugarcane grows well on rich loamy soils but come up well on a range of soil types like loam, sandy loam, clayey loam, black cotton soil, red loam, etc., the main requirement being the ability of the soil to retain moisture (Mondal n.d).

Sugarcane requires a lot of water and around 250 tonnes of water is estimated for the production of one ton of sugarcane (SBI ICAR n.d, WWF 2009). Sugarcane gets attacked by a number of pests and diseases and studies indicate that there is a decrease of around 20% of yield due to pests and another 20% reduction due to pests (Directorate of Sugarcane Development 2013 : 9). Therefore, pest and disease management, nutrient management and weed management play an important role in the yield of the crop. Harvesting is done both mechanically and manually and the time of harvest depends upon the maturity and climatic conditions and the average sugar recovery is estimated to be around 10.25% in India (ibid : 9-11).

The method of reproduction of sugarcane is characterized by planting the cuttings manually and every cutting should have at least one bud. Ratooning, a process where the crop is harvested and the lower portion, ratoon or stubble crop, is allowed to sprout again, is practiced in sugarcane. Normally a maximum of two ratoon crops are recommended and is done by burning the trash after harvest and close shaving of the stubbles (Sundara 2011).

1.5 Research in Sugarcane Production

Among the Indian States, Maharashtra ranks first in sugar production followed by Uttar Pradesh. While Maharashtra contributed around 9 million tonnes in the national total production of 26.3 million tonnes, Uttar Pradesh produced around 7 million tonnes in 2011-12 (Directorate of Sugarcane Development 2013 : 11). To increase the production and productivity, a good deal of research is done in India. The major steps involve crop improvement through research in plant breeding and development of new high yielding and high sucrose content varieties, development of tissue culture plants, improving seed quality, advanced crop protection through identification of clones and varieties resistant to pests and diseases, improving production through advanced agronomic and soil management practices and improving the quarantine measures (Sugarcane Breeding Institute, Indian Council of Agricultural Research n.d.).

For the research purposes in the sugarcane production, Government of India has established the Sugarcane Breeding Institute (SBI) in Coimbatore of Tamil Nadu under Indian Council of Agricultural Research (ICAR). ICAR has one SBI Regional Station at Karnal of Haryana and four SBI Research Stations at Kannur and Agali of Kerala, Motipur of Bihar and Jhamkandi of Karnataka (ibid). The research process has yielded many new sugarcane varieties some of the recent ones being Co 98014, Co 0118, Co 0238, Co 0239 and Co 0124 which are better than the existing varieties

in terms of productivity and sucrose content. These varieties have been extended for commercial production both under water logging and water stress conditions (ibid). Indian Institute of Sugarcane Research, located at Lucknow of Uttar Pradesh is another institute under ICAR, taking up research on sugarcane production in the country.

1.6 Problems identified in Sugarcane production in India

Some of the problems identified by Sugarcane Breeding Institute in India in the cultivation of sugarcane include increased cost of cultivation of the crop, lack of labour force for the agricultural operations, constraints faced by the farmers due to increased incidents of pests and diseases, declining rate of production and global issues relating to global warming and climate changes (Sugarcane Breeding Institute, Indian Council of Agricultural Research n.d.). WWF (2009) warns that since sugarcane's water demand is very high, it is high time to introduce new production techniques which assure more yield with less water, failing which the farmers will face very difficult times in the near future.

It is widely suggested that mechanization of agriculture to address the escalating cost of production and introducing advanced varieties and improved technologies in the production process can help the farmers to address the issues. The Sustainable Sugarcane Initiative (SSI), an initiative of International Crop Research Institute for Semi-Arid Tropics (ICRISAT) and WWF, suggests a method of sugarcane cultivation involving less water and optimum use of other inputs like land, seeds and fertilizers and achieving more productivity (WWF 2009). This package, based on the principles of 'more with less' aims to reduce the crop duration thereby giving the factories a more longer crushing season and to enhance the employment chances for labourers, besides focusing on reducing the pressure on the water resources and thus the ecosystem and the approach expects that the yield may increase by 20% while water

resources may come down by 30% and other fertilizer inputs by 25% (ibid: 5).

Government of India (2012) publications make it very evident that the country's food grain production has increased 4 times and its irrigation potential has gone 5 fold after independence [MoA, 2009]. In the last 2 decades the country has gone from food deficient to food surplus. Close to 90% of the water is being used for irrigation purpose and the rest is being consumed by the domestic sector. The role of ground water resources in overcoming these challenges has been phenomenal. Majority of the states in India have successfully used the ground water to suffice irrigation needs and also of the industry. The governments could use the resource in altering the agricultural profile of the state and achieving food security. However, the depletion of ground water has also led several problems. The exploitation of ground water has reached an alarming pace and little is being done to either refurbish it or manage it evenly. Statistics show us that there were 48,000 tube-wells in Uttar Pradesh in early 1960s, which had grown to 5095 thousand in the next 25 years (Le Moigne et al, 1992). The rural electrification and the infrastructure development has been the key to this exponential growth on ground water utilisation. Also, the shift towards cash crops such as sugarcane, which also happens to be water intensive, has led to this rise on ground water depletion [MoUD, 2009]. The problem has gotten complicated under state of lawlessness. The political and legal framework is such that there exist no concrete laws and political will to stop this distortion of groundwater. The studies suggest that the decline in the water table has put a big question mark on the viability and sustainability of agricultural production.

1.7 Relevance and Justification of the Research Topic

"Water is at the center of economic and social development; it is vital to maintain health, grow food, manage the environment, and create jobs. Despite water's importance, over 783 million people in the world are still without access to improved water sources, and even more are without

access to consistently safe drinking water." (World Bank n.d.). The Supreme Court of India has protected the Right to water as a fundamental human right as part of the Right to Life (under Article 21 of the Constitution of India) (Kothari 2006: 1). The safe drinking water has multi-pronged effects on overall wellbeing of a country. Safe drinking water is necessary for maintaining good health. There is no doubt that for a country to be prosperous, it should have healthy workforce. In spite efforts of efforts put in by the Government of India as well as the state Government of Maharashtra, there are lots of gaps in the protection of ground water and recurring form of depletion of ground water. Thus, there is a need to research the ground water governance of the sustainability of the ground water for meeting requirements of the present and future generations. Identification of real problems/ issues will facilitate the governments to address the issue of ground water governance in a more efficient manner.

1.8 Research Methodology

The researcher has utilized secondary data for this research. The data was of immense help to understand the policy implications. Policy analysis would be of done by studying different acts and policies for the ground water protection as well as the policies for sugar factories and cooperatives, and sugarcane farmers.

1.8.1 Sources of data and mode of data collection:

Sources of empirical data collection are primarily the following:

- The Ministry of Drinking Water and Sanitation (MDWS), Government of India is a useful and authentic source of data related the efforts being made by the central government of India (GoI). This provides an Integrated Management Information System (IMIS) which contains to data for every village in India for the various drinking water schemes.

- The GSDA would give useful information on the required.

- Academic literature from the following sources:

1.8.2 Research Techniques:

The researcher will primarily be dealing the research question from policy perspective of the sugar industry and sustainable ground water management. For analyzing role of the Government of Maharashtra in management of sustainable ground water resources, I will be looking into different government policies for sugar factories, cooperatives and farmers also to some extent the Ground Water Regulatory Act 1993.

Interactive policy analysis: Interactive policy analysis tool enables the policy maker to make change in the policy during the implementation process if he feels that the policy is not doing well as expected from the result or that it is actually not f beneficial for the purpose it made, at such phase this policy can be improved upon, by making the required changes. Grindle et al.(1991:121-122).

In my research I will be able to show what policy reforms can be beneficial for combating depletion of ground water. The analysis of policy for sugar factories and its effectiveness or failure will be discussed and commented on.

1.9 Chapter Structure

Chapter 1:
Introduction to the problems, Background to the problem, research objectives, research questions, methodology and challenges

Chapter 2:
Literature and conceptual Review focusing on Government Policies, Commercialization of agriculture and the challenges of providing adequate drinking water: A conceptual discussion, discussion the concepts like free rider problem, political patronage, market failure and so on.

Chapters 3:
Sets the particular context of Maharashtra

Chapter 4:
Focuses on Findings and Analysis

Chapter 5:
Conclusions and Recommendations

Chapter 2: Literature and Conceptual Review

As can be seen from research question, my research is related to investigation of Government Policies regarding commercialization of agriculture and its effect on ground water in Rural Maharashtra. While dealing with the research question, I would be using the concepts of 'Groundwater Governance'. Other related concepts like problems of 'common pool goods' and free rider's problem, concepts of 'government failure' , 'Political patronage' ' corruption' will be used. I would be dealing with irrigation and cropping pattern based on availability of water table mainly focussing on sugarcane crop.

Agriculture, water supply, industries and energy influence ground water use. Ground water management falls under the jurisdiction of the state governments. A model groundwater bill was circulated in 1970, and based on it Maharashtra established the Groundwater Survey and Development Agency (GSDA). The Supreme Court of India has affirmed the Government's right and obligation to protect groundwater under the right to life guarantee by the constitution. (Chowdhury et al 2011)

While the terms 'government' and 'governance' were traditionally viewed as the same institutions and processes, this aspect took on a different dimensions since the 1980s. According to Rhodes (1997a), "Governance refers to self-organising, inter organizational networks, characterized by interdependence, resource- exchange, rule of the game, the significance autonomy from the state." (cited in Kjaer 2004:3). Thus, the governance here means something broader than the government, where only government is not the actor, but also civil societies and markets. For my research, I would be using this definition of governance with respect to the inter-organization coordination for the sustainable ground water management.

2.1 Market Failure, Government Failure and Participation

Common Pool Goods are characterized by 'non-exclusion' (everybody can access it as exclusion cost of exclusion is very high) and 'rival' (use by one reduces the availability for the others). Ground water fits into the category of 'common pool goods'. One of the negativity of the common pool goods is free rider's problem. Thus, there is a need to regulate it properly for its sustainable availability for broader social welfare.

As per orthodox economics, the market mechanism (competitive market) is the best mechanism to allocate the resources. In pure market mechanism, the demand and supply rests in equilibrium which is characterized by minimum cost and maximum welfare. However, markets may fail due to information asymmetries, missing markets, monopolies and so on. To correct the market failures, the government has to intervene by way of regulation (in case of provision of services is commercially viable) or providing services directly through public sector (in cases services are not commercially viable to provide). But, governments may also fail when the public sector is not able to provide services with equitable distribution. The case of drinking water supply quality in both:

- The market failure as it is not commercially viable for the market to provide drinking water at least in rural and remote areas which is further complicated by scarcity of the ground water.

- The government failure as the government has also failed to provide universal access to the drinking water.

In case of the government failure, the civil society can to step in to pressure the government to take corrective measures through participation in the governance of the sustainable ground water availability.

2.2 Political Patronage

As per oxford dictories.com (n.d.),the patronage can be defined as 'support given a patron' or 'the power to control appointments to office or the right to privileges'. Patronage is a reciprocal relationship between Patron(who uses his influence, social position, authority and so on to protect some other person that is the client) and client (who provide certain services to the patron in return to the protection given by the patron). (Weingrod 1968:377). The Sugar cooperatives act as political clouts for the Ministers, their Directories and chairmen are highly influenced politically, they provide funds and vehicles and other favours during elections and other period and in return, the politicians make favourable policies for the sugar cooperatives which actually serve the interest of cooperatives. So the politics and cooperatives are closely related to each other.

2.3 The Nature of Groundwater Markets in Rural Areas

In the backdrop of sugarcane production, the groundwater market is typically oligopolistic and monopolistic. The large investments in this sector are either privately owned or politically motivated [Planning Commission, 2011]. In most states in India, the hydrological features and water table suffers from an uneven spatial distribution. Only a few water sellers consume the market space both, unethically and inappropriately. Particularly in the sugarcane belt the ground water usage and the agricultural produce are governed by political means [Economic Survey of Maharashtra, 2012]. Evidently, the monopolistic environment has led to a situation which is economically not justifiable.

Similar views have been made by Verma and Phansalkar (2007) in their report 'India's Water Future – 2050'. The authors believe that there has to be a greater efficiency with the publicly administered works with small farmers provided with an equitable access and a fair share of ground water. The researchers question criticizes e leadership for 'not' being able

to convert the electricity pricing from pro-rata to flat rates. Also, the farmers have been deprived of their rights to own water; they are in fact forced to buy water from the resourceful person (mostly a kin of some political leader) [Shankar et al, 2011]. Similar such amendments would have allowed the farmers to use the ground water efficiently and effectively.

In India the sugarcane production is largely dominated by the political bigwigs (Shankar et al, 2011). Often termed as *mafia*, these people run the industry with money and muscle. The tenders and the prices are mostly predetermined, under consultation with this group of people. Allocation of ground water and the prices of sugarcane are only an outcome to the 'vote bank' and the power that this nexus wields (Shah, 2009). A lot of other researchers do also endorse this 'predicament' in the Indian agricultural sector. There exists an inherent inequality in this largely monopolistic structure. Globally, the authors have suggested that the agricultural policies should be based on transparent agriculture policy and models based on equality, interlinkage and symmetry [Palmer-Jone, 1994]. The 'spatial' nature of the water market would only decide the agriculture income in the developing countries.

There are evidences that suggest that ground water allocation is affected by landholding, caste, technology and the political power [Planning Commission, 2011]. The marginal farmer, which also happens to be the larger proportion, is often the last in the queue. Almost half of the farmers don't get their fair share of electricity and water [Garg and Hassan, 2007]. There is not just scarcity of the ground water, but also of the political will to mediate the problem. The medium sized and the marginal farmers should be allowed to partner with the government agencies for removing the economic and social disparity [Garg and Hassan, 2007]. Also there is a gap between water owners and water sellers. Dubash makes an investigation into how water and the societal institutions make for a very complex relationship. The study reveals that there are multiple contracts that govern the distribution of water. The groundwater exchange is led by

'social norms' which cannot be described by any model. It is the deep rooted mechanics on the caste system that guides the political framework and so the agriculture policy. A similar study by Janakrajan (1994) proves us that there is variation in prices both within and between villages. The inequity between the interlinkage of water based resources, products and the labour has made this a very rough trough. Often the prices are below the market prices and make it difficult for the small farmer to even recover the cost. A similar study in the neighbouring country i.e. Pakistan reveals the price discrimination on account of credit constraints, high investment costs and lack of transparency with the agriculture policy [Murgai and Rehman, 2004]. The authors argue that the monopoly played by the dominant parties lead to severe consequences on ground water allocation.

This literature review agrees that there are inherent inconsistencies with the groundwater market. By and large, the literature points out the political and social framework as the main culprit to this fall on agriculture policy. Caste system and the political nexus arising out of it, go on to make a monopolistic market where the small farmer has little scope for himself. However the literature speaks less about how the lack on spatial distribution leads to efficiency losses. This paper would therefore focus on this distributive inequity and inefficiency arising out of political patronage. How the irrigation practices, ground water laws, pricing and investment is influenced by the lack of spatial distribution. The analysis would therefore be a deviation to existing literature and the researcher would try to relate efficiency differentials on ground water to efficiency differentials.

2.4 Market Failure, and Regulation and Control of Sugar Industry in India

What is market regulation and why is it required? As per Investopedia (n.d.), a regulated market is a market whereby the government exercises control by way of regulating the prices, controlling the sell and purchases

of input and output products and so on. In free market mechanism, there is no scope for regulation as it may distort the prices in the market. In the free market the only determinants of the prices are the demand and supply. As per Neo-classical economics, the market mechanism regulates itself and there is no need for government to regulate or control the markets.

Now question arise why regulation of sugarcane and sugar markets are required? Why cannot it work in the free market conditions? Sugar industry is the second largest agro-based industry in India after cotton and contributes to around 1% of total GDP of the country (Solomon 2011:255). This industry supports about 50 million farmers and their families and provides over 0.5 million employment[1] in sugar mills and ancillary industries (ibid:255-256). Sugarcane is a perishable crop and it needs to be crushed as soon as possible after its harvesting from the fields (Lalvani 2008:1481). If sugarcane is not crushed within 24 hours of its harvesting, its sucrose level will deteriorate affecting its recovery-rate of sugar cane (Attwood and Baviskar 1987: A-39). Thus, requirement is that the sugar factories are located to the sugar cane fields as close as possible. Moreover, the efficient extraction of juice from the sugarcane requires heavy machinery, thereby heavy capital investment (ibid). For heavy investment to recover, the sugar mills require assured supply of the sugarcane so that it can run at the optimum capacity level. This is a case of 'Market Failure' as the market was not able to allocate the resources optimally of its own (Investopedia n.d.).

To overcome the 'market failure', one way to assure the regular sugarcane input to the sugar factory is that sugar mill owns its own plantation as in USA and Brazil. But it was not feasible in India as India was not new settlement colony and most of the cropped land was owned by various small, medium or large farmers. Another way was to regulate and control the market to assure the supply to the sugar mills. Another way was to

form voluntary alliances between the sugarcane farmers and the sugar mills. This was done in Maharashtra back in 1950s through the sugar co-operatives (Attwood and Baviskar 1987: A-40; Lalvani 2007:1474).

Sugar co-operatives are a concept where the sugarcane producers come together to set-up sugar mill by becoming its share-holders[i]. In Maharashtra, the establishment of sugar co-operatives have also been supported by the Government by investing a part of set-up cost of sugar mill at the time of establishment (Lalvani 2007). In India (also in Maharashtra), there is a mix of private own sugar mills and cooperatives (Soloman 2011: 256). Sugar cooperatives are more successful in Maharashtra as compared to privately owned sugar mills in North India for the reasons that the interests of sugar cooperatives are aligned with those of framers. For example, the cooperatives will like to give a high price as possible to the farmers as they are the owners also while the private mill will like to give lower prices to maximize the return on their capital investments (Attwood and Baviskar 1987: A-40).

Agriculture in general is suffers from cyclic process due to its long production cycle. It becomes even severe in case of sugarcane whose production cycle is 12-18 months. This can be explained that in one season of sugarcane crop boom; there is more output of sugar which reduces the decline of sugar prices in market and delay in payments to the farmers. This forces the farmers to grow less sugarcane in the next season which reduces the supply of sugarcane and thereby sugar in the chain. (Attwood and Baviskar 1987: A-41; Soloman 2011: 259-60).

It has been seen that sugar is essential commodity and is provided by the government to the Below Poverty Line (BPL) population through the Public Distribution System (PDS). For this purpose, the government need to procure the assured quantity of sugar. This government does at a predetermined price which is cost plus price (Levy quota and levy price) and not the market clearance price determined by demand and supply. This predetermined price is available only to the government and not to

the other customers in the market. This creates inequalities in the market which is one of the causes of 'Market Failure'.

The above cases of sugar cooperatives, levy price and volatility of sugar market are the non market institutions which ameliorate the market failure (Stiglitz 1989:201-202). Through these non market institutions, the government is intervening in the market to create social welfare. In the process, the government resort to giving subsidies and fixing prices which are above the market prices.

Keeping in view the large scale socio-economic contribution of the sugar industry and well as political dynamics, there is regulation in almost complete value chain of sugar from sugarcane prices, sugar prices, procurement of sugar, sale of sugar in domestic and international markets (Solomon 2011:258). Government follows a policy of partial control and dual pricing for sugar[ii]. Under this, the sugar producers are obliged to sell a certain percent of their production to the government as compulsory levy (in every season) at a fixed price determined by the government on cost plus basis (that is certain mark-up is paid on cost of production by the sugar producer). This is used by the government for distribution in the Public Distribution System (PDS). The non-levy (free sale) sugar is allowed to be sold as per the quantity released by the Government under the free sale sugar release mechanism. Over the period of time, there has been gradual decontrol of sugar industry. Prior to 2000, this levy quota was 40% which has now been gradually reduced to 10% from 1st January 2002. (Department of Food and Public Distribution n.d.).

2.5 Regulation of Sugar Market

According to Kamath (1989:123) and Lalvani (2008:1475-76), there are two main theories of economic regulation to explain need for regulation in developed as well as developing countries. These are i) Public Interest Theory, and ii) Capture Theory. Public Interest Theory is mainly used to

explain the need for regulation in the developing countries like India where due to historical reasons the gross inequalities in income distribution cannot be minimized through market mechanism and hence government intervention is required (Kamath 1989:123). According to this theory, "regulation is enacted in response to the public's demand for the correction of inefficient or inequitable market practices and failures and for the achievement of desirable social objectives" (ibid).

However, in practice, the theory that best describe the availability of regulation in the sugar industry in Maharashtra is 'Capture Theory' (Lalvani 2008: 1476; Kamath 1989). Lalvani (2008:1476) identified that "in the case of sugar cooperatives in Maharashtra, more powerful farmers found their way into the government hierarchy and occupied offices from where they were in a position to shape policy and indulge in 'pork barrel'[iii] politics". In sugar cooperatives (cooperative sugar factories), the board of directors headed by chairman are elected by an electorate consisting of the members (shareholder farmers) of the cooperative. The operations of cooperatives are managed by the board of director. These cooperatives often provide support to the political parties during elections by way of providing space for political meetings, vehicles for political campaign and so on. The directorship in the cooperatives is very prestigious and thus, these candidates are chosen through high competitive elections. "The position of director in a sugar co-op is characterised by prestige, patronage and power.

Directors exercise patronage through the distribution of jobs and contracts to their kinsmen, castemen and fellow-villagers" (Attwood and Baviskar 1987: A-49). The positions in the board are also used as launching platform for bigger political roles in the state or national politics. Khekale (1999) found that during 1952-1972, 74% of the Chairmen of sugar cooperatives found their way to state Assembly or national Parliament (as cited in Lalvani 1989: 1477). Thus, through the political nexus, sugar cooperatives are able to bend their government policies in their favour (ibid).

Similarly Kamath (1989), analyses the case of Indian sugar industry from the angle of different stakeholders like sugar producers, sugar consumers, sugar farmers, sugar traders, employee unions, and government and politicians. They found that most of the stakeholders are in favour of regulation and control from the point of view of increasing their private benefits through patronage, clientalism and 'rent-seeking'.

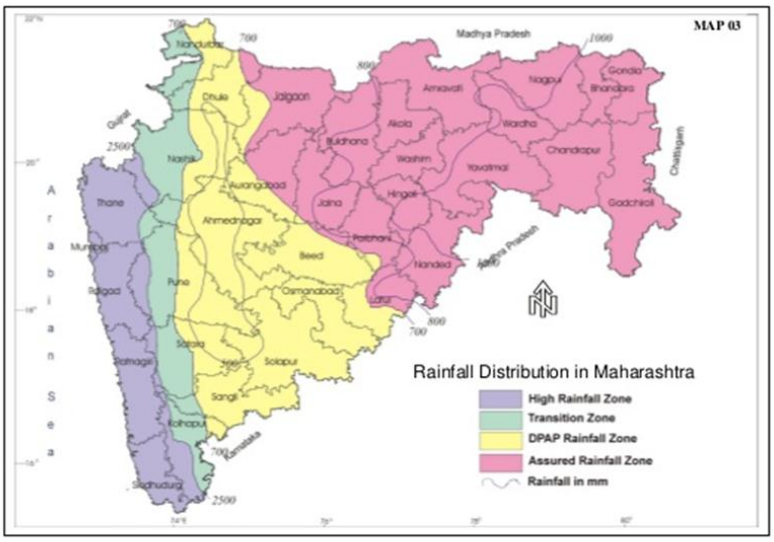
In this research paper, I will be empirically looking into as to whether the 'Capture Theory' is applicable to the sugar industry in Maharashtra by analysing the effects of various policies of central as well as state governments.

Chapter 3: Maharashtra Context

3.1 Hydro-geological setting of Maharashtra

Maharashtra's Average rainfall is 1200mm, regions that fall under rain shadow and classified as drought prone get rain of average 500mm to 750mm, which is not a very bad condition. Hence rainfall may not be chief cause of recurrent drought in the state (Desarda1994). Level of rainfall in various areas of Maharashtra is depicted in Figure-1.

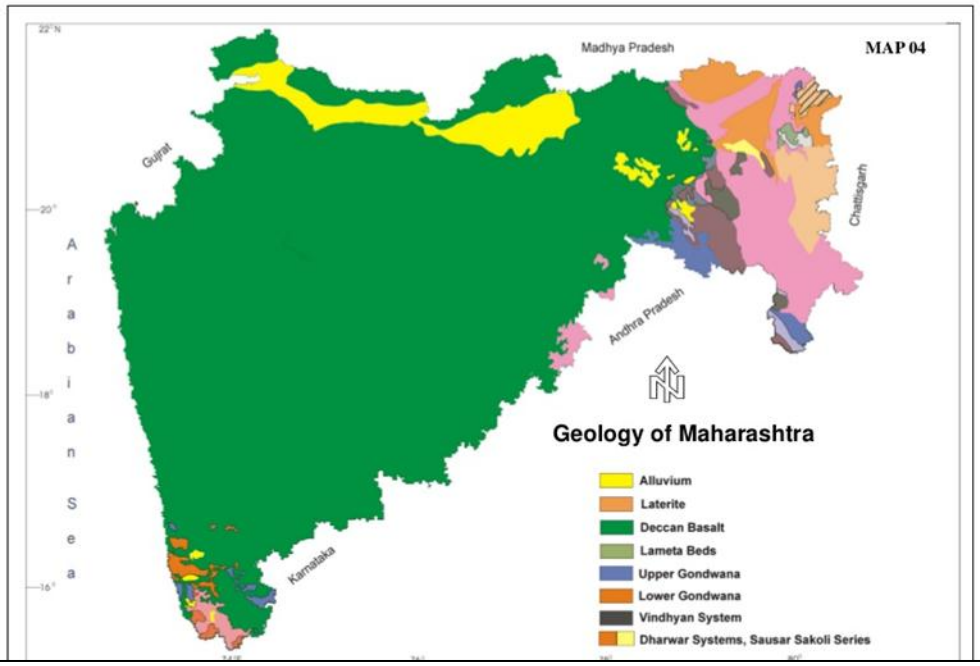
Figure-1: Level of Rainfall



Report on the Dynamic Ground Water Resources of Maharashtra (2008-09)

The land surface of Maharashtra State is mostly underlain by the Deccan Traps Basalt, including the entire highly drought-prone central area with an average rainfall of less than 750 mm. This formation gives rise to a complex low-storage weathered hard-rock aquifer system which is very essential for survival of Rural Mass and livelihood of large number of people who do not have any other source of water. But the total available storage of groundwater in hard rock aquifers as mentioned is strictly limited by their weathering characteristics and water bearing properties. (World Bank Report 2007). Figure-2 shows the geology of Maharashtra State.

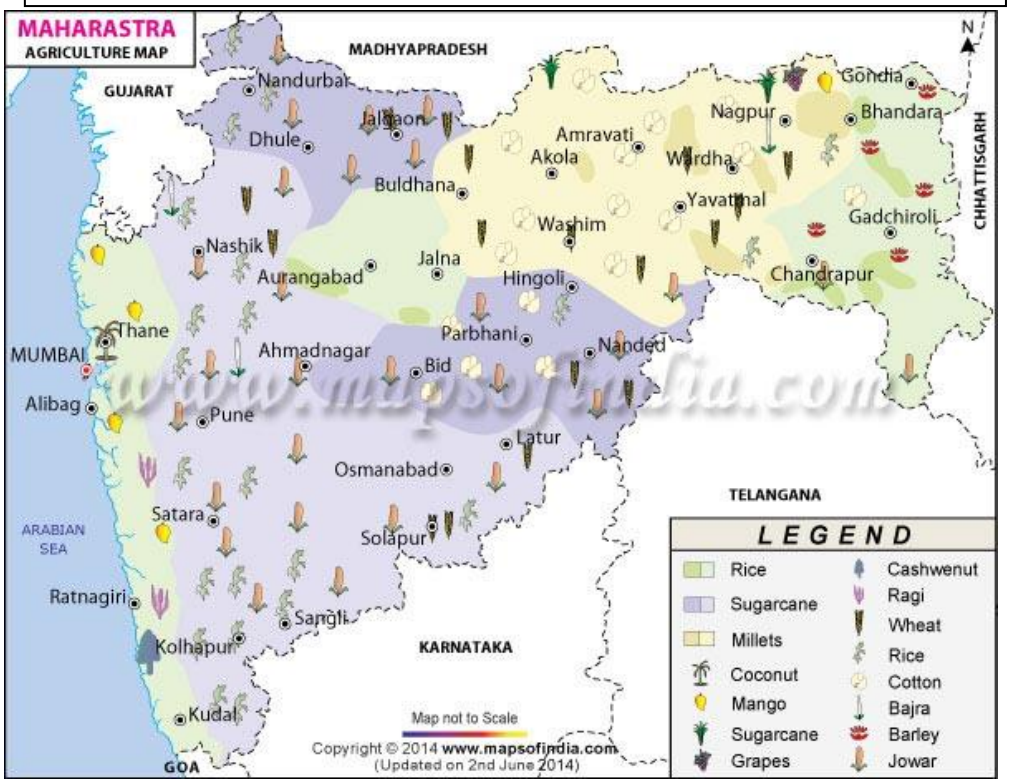
Figure-2: Geology of Maharashtra



Source: Report on the Dynamic Ground Water Resources of Maharashtra (2008-09)

Maharashtra is leading state in the production of sugar. The development of sugar cooperatives in Maharashtra has been due to favourable sugar policies towards the farmers for agriculture and policies for sugar pricing. The farmers due to favourable policies are more attracted towards growing sugar cane which led to growth of sugar cooperatives. Figure 3 shows the area under plantation of sugarcane and other crops.

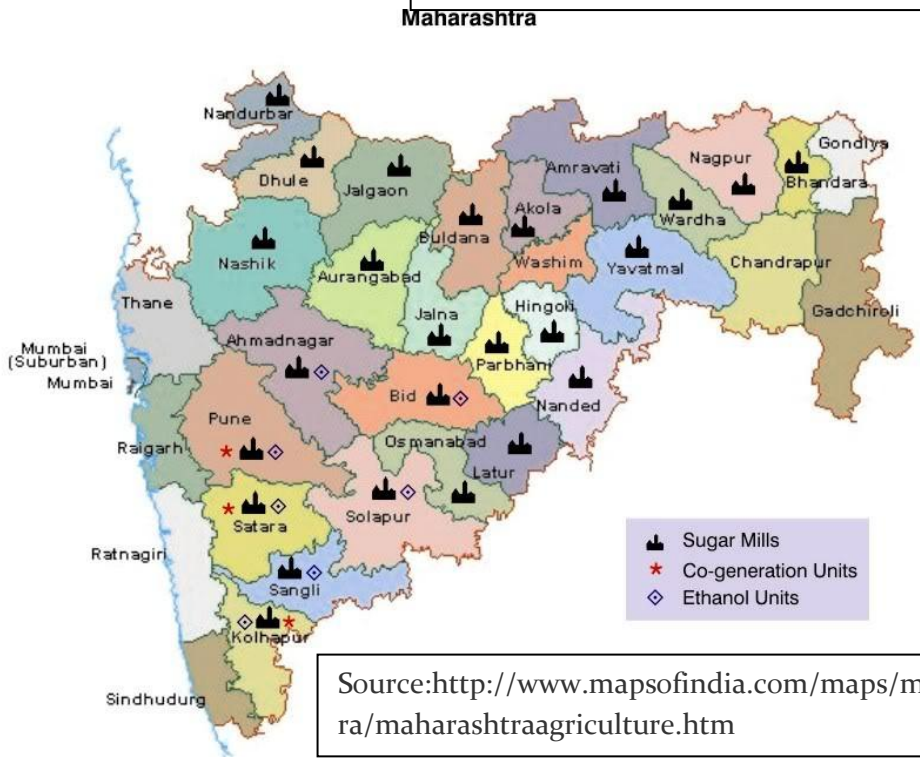
Figure 3: Area under plantation of sugarcane and other crops



Source: http://www.mapsofindia.com/maps/maharashtra/maharashtraagriculture.htm

There are totally 170 sugar factories in Maharashtra, out of which 119 is cooperatives and 51 are privately owned. These sugar factories are central agencies for economic development. The factory over the time showed its creditability and its members realize advantages of the co-operative. The members aspire for the expansion of facilities which is done through their efforts and joint efforts of the society. Yashwantrao Chavan is the leader who has actually aspired for the development of cooperatives. Locations of sugar factories have been depicted in Figure-4.

Figure 4: Locations of Sugar Factories



Source:http://www.mapsofindia.com/maps/maharashtra/maharashtraagriculture.htm

3.2 Sugar Cane and water requirement

Sugar cane crop if grown in trenches as in India requires less water, but sandy soil and more application of fertilizers may increase the requirement of water. On an average a sugar cane crop of one ton requires 60 to 70 tons of water. The crop should be irrigated again when available water reaches to 50% level. Table-1 shows the comparative water requirements for different crops.

Maharashtra has low productivity and high instability in agriculture. The cause is the distorted cropping pattern and absence of land use planning. The shift to water intensive crop again is the main reason behind this problem. In 1990 about 76% of the irrigated water was used by sugarcane whereas it covered only 3% of the totally irrigated land. The location of sugarcane factories and drought prone blocks match. This shows that the

growth of sugarcane around the factory area has given rise to depletion of ground water in that region hence they are drought prone blocks.

Table 1

INDICATIVE VALUES OF CROP WATER NEEDS AND SENSITIVITY TO DROUGHT

Crop	**Crop water need (mm/total growing period)**	**Sensitivity to drought**
Banana	1200-2200	High
Barley/Oats/Wheat	450-650	low-medium
Bean	300-500	medium-high
Cabbage	350-500	medium-high
Citrus	900-1200	low-medium
Cotton	700-1300	Low
Maize	500-800	medium-high
Onion	350-550	medium-high
Peanut	500-700	low-medium
Pea	350-500	medium-high
Pepper	600-900	medium-high
Potato	500-700	High
Rice (paddy)	450-700	High
Sorghum/Millet	450-650	Low
Soybean	450-700	low-medium
Sugarbeet	550-750	low-medium
Sugarcane	**1500-2500**	**High**
Sunflower	600-1000	low-medium

Source: <http://www.fao.org/docrep calculation of the crop water need>

Sustainable agriculture is possible only through right agriculture planning and policy. In 1994 and 1995 budget, Maharashtra had provided 50 crores for promoting new sugar factory. Employment Guarantee Scheme funds were directed for compensating sugarcane farmers hit by drought. These policy moves were favourable for sugarcane growers but detrimental from point of view of ground water depletion, since sugarcane requires 10 fold more water than any cereal crop these policies paved way for catastrophic ground water depletion in the state. This may have affected the drinking water wells in the region and we can find pressing need of tanker service to compensate the water requirement in the villages during summer.

3.3 Sugar factories and political patronage

Maharashtra especially western Maharashtra is dominated politically by a caste called Marathas which is not case with any other state in India where a caste has a edge over others in politics .(Lele 1981).

Some sugar factories are cooperatives and others are privately owned by politicians. Those which are co-operatives were also predominantly run by people of the Maratha community. The board of Directors of these sugar Factories are generally from these communities and those who become chairman or directors of a sugar cooperatives and generally later absorbed in politics as MPs or MLAs, these are really sought after positions and they enjoy lot of prestige, material gain and patronage which these directors enjoy.(Sirsikar 1995). It is even proved that these sugar industries are in many ways funding the elections expenditures of political leaders and this growth of sugar industry and the sugar lobby has given the western Maharashtra edge over the over all state politics. (Baviskar1980). This relationship between the sugar co-operatives and politics shows that these sugar cooperatives were actually political clouts enjoyed by the Maratha peasents (Lalvani 2008).

3.4 Market Mechanism and Sugar Market

It is a mechanism where demand and supply of any good or services determine the prices and the quantity in the 'free market'. The concept of 'free market' is where buyers and sellers can enter into deal as they wish without any interference. The only determinant of prices is the forces of demand and supply. (BusinessDictionary.com n.d.).

In fact, "in India sugar is an essential item of mass consumption and the cheapest source of energy, supplying around 10% of the daily calorie intake. Apart from sugar, sugarcane also supplements the energy sector through ethanol and electricity production" (Solomon 2011:256). These two products have been covered under the Essential Commodities Act

1955. In the para 2 of the Essential Commodities Act 1955, sugarcane has been defined under the food-crops (The Essential Commodities Act 1955: 2.b) and following is the meaning of sugar:

(i) any form of sugar containing more than ninety percent of sucrose, including sugar candy;

(ii) khandasari sugar or bura or crushed sugar or any sugar in crystalline or powdered form;

(iii) sugar in process in vacuum pan sligar factory or raw sugar produced therein." (The Essential Commodities Act 1955: 2.e)

Though, the sugarcane processing industry produces by-products which are useful raw material to over 25 industries like pulp and paper, energy, pharmaceuticals, chemicals and so on(Solomon 2011:263), sugar market in this paper will refer to two products in the chain; sugarcane and sugar. There are two different markets for these two commodities or products the prices and quantities are determined by the demand and supply of these products. Sugarcane works as the input to the sugar factories and crushers only. Thus, the demand for sugarcane will depend upon the capacity of the sugar processing factories as well as requirement of the final product of the sugar factories. In fact, sugarcane is main input to the sugar industry and constitutes 70% of total input costs (Solomon 2011:258). The demand and supply of sugar depend on the actual customers required and dynamics of international sugar market.

Chapter 4: Findings and Analysis

4.1 Core Reasons – *Political Debility*

Water related problems are common in most states in India and Maharashtra is no exception. However the political angle has only complicated the problems (Rath, 1997; Deshpandey and Narayanmoorthy, 2001). The government statistics reveal that Maharashtra has over 35% of the live water storage capacity, but this gets exhausted with a GCA 'Gross Cropped Area' of only 18% [The Planning Commission, 2012]. This GCA figure for Maharashtra is one of the lowest across all the states in India. This is further substantiated by the Central Water Commission Report – *efficiency of water utilization (ratio of water utilised to potential created) at Maharashtra, for the MMI sector (major and medium irrigation), is below the national average*. This looks more bleak when the planning commission reports that - *only 3% of the Maharashtra's agriculture land consumes its 60% of the irrigation water.* This gives rise to the debate whether the dry-lands or drought-prone areas of Maharashtra should continue with sugarcane cultivation. Ask this to a political leader and the reason would be prompt 'yes', not because of its sustainable cultivation but for the vote bank.

The following statement by the Maharashtra's Deputy CM summarizes the political will to augment water efficiency in the state –

> *Should we urinate into dry dams to fill them for irrigation purpose…*
>
> (ANI News, Zee News, IBNLive, 2013)

This explains why the state is constantly reeling under the pressures of water efficiency. However on the other side civil institutions like SSI 'Sustainable Sugar Initiatives', co-financed by European Bank have helped

sugarcane growers, retailers, investors, traders and producers to save as much as 50% of irrigated water on sugarcane cultivation. This comes alongside 30% increase in yield, 50% reduction on seeding material and 32tonnes per acre (state's average is 25tonnes) – SANDRP (2013). Such civil movements have motivated the farmers to move from flood to furrow system of sugarcane cultivation and adopt intercropping as a method to increase profits; while the political partnership has only been limited to offering subsidies on drip and sprinkler irrigation. Reports (The Hindu, 2013) suggest that no-cost techniques such as Better Management Practices would have yielded much better results as compared to subsidies on drip and sprinkler irrigation.

Apparently, Monsoon cannot alone be the remedy to this entire crisis on water management. The role of Sugar Cooperatives has to be understood on this. What started as an outcome to the Nehruvian and Congress vision has culminated into poor performance, both financial and technical [Das and Mukherjee, 2004]. Reports suggest that *special status* was accorded to these institutions and this in itself was enough to sow the seeds of trouble. The civil partnerships and the private sector were not allowed the level playing field. Eventually the Sugar Cooperatives played their way into the hand of politicians and made them the tools for serving political motives. There are enough evidences to believe that the important positions at sugar cooperatives were used inappropriately to create vote banks. One such report concludes that all the policy making on irrigation facilities and subsidies have gone predominantly to the politically stronger Western Maharashtra [Chakradeo, 2005]. This clearly suggests a incidence of the 'capture' theory where the regulatory framework has been used to indiscriminately use power for vested interests. In this case eastern Maharashtra had to suffer as few resources were allocated for the region's growth. For an apt example of 'Pork Barrel' politics, sugarcane prices were made a weapon to polarize voters and influence vote banks. The Cooperative owners and the factory owners used the policy statement as their declaration on election campaigns. To

prove it all – the sugarcane prices were found to be higher at western Maharashtra as compared to its eastern region [CACP, 2012].

Reports do also suggest that the sugar cooperatives have gone beyond the regulatory framework to serve the interests of the politicians [Mishra and Pandey, 2006]. The failure was evident with the unauthorised use of NABARD and nullifying the ZONEs by increasing the distance between the factories. It would therefore be 'not' wrong to consider the cooperatives as the reason for political failure on agriculture policy. World Bank has very clearly mentioned the fact that sugar factories have continued using the faulty cropping pattern in spite of the visible defects [World Bank, 2002]. The area under sugarcane cultivation has grown consistently without paying any heed to the prevalent water scarcity. The politically motivated campaigns have very aggressively increased the area under sugarcane by 6 times, while the national average for the same period is only 1.78%.

The World Bank report (2002) – 'Maharashtra: Reorienting Government to Facilitate Growth and Reduce Poverty' mentions that Maharashtra runs under the most inefficient water usage for sugarcane cultivation as the conventional flood method consumes more than 60% of the irrigated water for just 3.5% of the cropped area. A similar assessment by The Commission for Agricultural Costs and Prices (CACP, 2012) makes it evident that poverty stricken Uttar Pradesh ranks over Maharashtra in terms of water efficiency with a figure of 106%. Every kg of sugar in Maharashtra would consume 1000 litres of water more than what Uttar Pradesh does. The Godbole Committee has therefore suggested various measures for improving the status quo on sick sugar industries. A similar study by the PRAYAS foundation has reiterated the fact that political motives have deprived the sugarcane farmers their ownership on groundwater. The report finds that 23 industrial projects, under political direction, were allotted 80% of the water meant for sugarcane irrigation. This transfer of water, during the period 2003 to 2011 has had serious repercussions on the produce. The Times of India reported further that

the farmers were not even informed of this decision on water diversion. Reported, each TMC of water diverted lead to cut-down of irrigation of 8000 hectares of arable land. A comparative of water requirements for production of sugar in Maharashtra and Uttar Pradesh has been provided in Table-2.

Table 2: Water requirement for production of 1 kg of Sugar in major sugar production states in Maharashtra and Uttar Pradesh
Source :(CACP, 2012)

Sl No	Parameters	Maharashtra	Uttar Pradesh
1	Land productivity (quintal/ha)	800.97	595.83
2	Average recovery rate (%)	11.32	9.16
3	Average number of irrigation per ha	25.00	7.60
4	Average in height of water (in cms) per irrigation	7.50	7.50
5	Average water required (in lakh litres) for one irrigation of 1 cm height per ha	1.00	1.00
6	Average water requirement (lakh litres) per ha for entire sugar season [row (3)×row (4)× row (5)]	187.50	57.00
7	Production of sugar (quintal/ha) [row (1)×row(2)/100]	90.67	54.58
8	Water requirement for production of one quintal of sugar (lakh litres) [row (6)/ row (7)]	2.07	1.04
9	Water requirement for production of one kg of sugar (litres) [row (8)×1,00,000/100)	2,068	1,044

4.2 Averting Water Crisis

Water crisis is looming large over the agriculture sector in Maharashtra and the scarcity will still be there even in monsoon season. The Maharashtra Water and Irrigation Commission (1999) makes it clear that the demand-supply gap will be very big because Godawari, Krishna and Tapi basins are going to fall short of demand by 2030. It is therefore all the more important for the government to take measures on water efficiency. Focus on sugarcane is particularly more important as the crop consumes 80% of the irrigated water in the state [The planning commission, 2012]. There are more reasons to believe this, as the FMI (Flood Method of Irrigation) method of cultivation consumes more water than any other method. Unfortunately, the incentives given on cultivation farming and

the assured prices attract a lot of farmers to cultivate sugarcane on a year-on basis. Little attention is paid to the depletion of ground water. Researchers such as Narayanmoorthy (2004) believe that Drip Irrigation can be an effective strategy to bridge the gap on water scarcity. There can be substantial savings on water during the irrigation. The farm-level studies do also indicate that drip irrigation can cut the water consumption by 40%. The method is also useful in saving electricity and improving productivity.

Maharashtra Government has utilised these facts to market 'Drip and Sprinkler' irrigation across the state but little could be achieved out of it. Subsidies have been allotted not for reducing the water foot-print of sugarcane but for gaining more votes out of the government scheme. Studies suggest that after a decade long subsidies given to the farmers the water consumption has only increased on cane farming [Mishra and Panda, 2006]. The government has also used the *malgujari* tanks to improve water efficiency. At present there are close to 7000 malgujari tanks which can make-up for the water scarcity [Survey of Maharashtra, 2012]. The tanks have an irrigation potential of 1.25lakhs for the Vidarbha region. Unfortunately the tanks are lying defunct and the government has failed to use this resource. The political leadership, instead of using the malgujari tanks, is still using subsidies as the way out. On the counter position, civil institutions like SSI 'Sustainable Sugar Initiatives' have helped the producers to save as much as 50% of irrigated water on sugarcane cultivation. This comes alongside 30% increase in yield, 50% reduction on seeding material and 32tonnes per acre (state's average is 25tonnes) – SANDRP (2013). Such civil movements have motivated the farmers to move from flood to furrow system of sugarcane production. Under a deficient leadership groundwater recharge cannot be utilised effectively.

Table-3 **Live Storage and utilisation of Water**

(In MCM)

Year	As per project design	Live storage as on 15th October	percentage of Live storage	Evapo-ration losses	Water utilised for Irrigation	Water utilised for non irrigation/ other purposes	Total water utilised	per cent of water utilised to live storage as on 15th October
2007-08	30,153	25,489	84	4,481	16,413	5,540	26,434	104
2008-09	33,071	24,803	75	4,074	15,517	5,775	25,366	102
2009-10	33,211	19,366	58	3,972	12,113	4,763	20,848	108
2010-11	33,385	27,309	82	5,383	15,447	5,876	26,706	98
2011-12	34,119	26,989	79	5,298	18,617	6,693*	30,608	113

Source : Water Resources Department, GoM * provisional

Economic Survey of Maharashtra 2012-13

Maharashtra Water and Irrigation Commission (1999) has revealed that only 60% of the arable land can be irrigated by both surface and groundwater. In view of the same the WDP program (Watershed Development Program) aims at recharging pits and improving water table. The commission recommended the WDP program for improving the moisture content at different places in the state. The Maharashtra government could have utilised the program for its longer horizon. Unfortunately, there is little visibility of such efforts in the state. On the contrary the civil participation based program, *Indo-German Watershed Development Programme* could generate more impact on ground water conservation. The impact could be made because of the participation of the Gram Panchyats that facilitated transparency and community participation. Reports (CACP, 2012) outline the fact that government failed in generating confidence and never believed in mass-participation. *Power,* in this case was never shared with the public.

The Government of Maharashtra (1999) reports have published that by 2030 the river basins of the region will not be able to suffice the irrigation needs. Also, the ground water will go down substantially for reasons of climatic changes. After the industrial churning, only 52% water would be left in the river basins. However, the WFRK Konkan basin still has an untapped potential and can be seen as alternative to ground water subsistence. The GoM is well aware of these facts but concerted efforts are yet to be made in this direction. This surplus water can be used effectively

for irrigation purpose of the region without diverting much on infrastructure. In addition to ground water regeneration such arrangements are expected to nourish the water starved Maharashtra region.

4.3 Yield of Sugarcane per litre of water

Maharashtra makes the highest contribution on sugarcane production. During the year 2011-2012 the state had a yield of 80.1t/ha, much higher than the 2nd state i.e. Uttar Pradesh (59.6t/ha). It was also much higher than the national average of 70.3t/ha. This gets better with the recovery rate as the same for Maharashtra is as good as 12.3%, while UP stands at only 9.16%. Most importantly, the land productivity on sugarcane production for the state is 98.8t/ha and the same for 2nd highest UP is only 61.04t/ha. Efficiency on sugarcane production is therefore not a problem for Maharashtra. The following table-4 shows the basic parameters on sugarcane cultivation for its different varieties:-

Table-4

Method	% share	Production (lakh T)	Yield (t/ha)	No of std irrigations (7.5 cms)	Water requirement, '000 m^3/ha	% recovery rate	Yield adjusted for recovery rate t/ha	Crop duration, months	Yield t/month adjusted for recovery rate
Adsali	10	122.64	120	32.5	24.38	12.30	161.14	17.00	9.48
Pre-seasonal	30	275.94	90	27.5	20.63	12.00	117.9	14.50	8.13
Suru	20	143.08	70	22.5	16.88	11.45	87.50	12.00	7.29
Ratoon	40	276.94	65	22.5	16.88	10.50	74.51	11.00	6.77
Total/ weighted average	100	818.60	80	25	18.75	11.32	98.79	12.85	7.56

Source: Price Policy for Sugarcane: the 2013-14 Sugar season, Commission for Agricultural Costs and Prices, Ministry of Agriculture, Government of India, Aug 2012, Table 5.1

The table-4 shows it clearly that Ratoon variety gets the most area i.e. 40% of the allocated land for sugarcane farming. Ratoon also has the shortest duration on harvesting i.e. 11 months and this makes it a perfect fit for the crushing season. Similarly the Suru variety has coverage of 20% and a shorter duration of 12 months. More importantly the two varieties require the lowest number of irrigation i.e. 22.5. On the other hand, Adsali variety gives the maximum yield of 120 lakh tonnes but the highest

number of irrigation. In view of the water scarcity the Government of Maharashtra places more emphasis on cultivating Ratoon and Pre-seasonal varieties [Price Policy for Sugarcane, CACP, 2012].

Concerns are being raised by the commission (CACP, 2012) on the productivity aspect – *productivity without water efficiency is only a misrepresentation of facts*. In view of the ground water scarcity and high opportunity costs, productivity needs to be evaluated more comprehensively. Sugarcane productivity will be a lesser statement if it exploits the ground water beyond the permitted limit. It is therefore very necessary for the productivity figures to be corrected more realistically. Water intake has to be considered a valid input while drawing comparisons. Reports do also make an in-depth investigation of water based productivity for the different regions in Maharashtra. The average water productivity of UP is 1.11 T/ha/month, while the same for Maharashtra is only 0.403 T/ha/month. Clearly, Maharashtra falls behind of Uttar Pradesh if per unit water consumption is taken as measure.
The investigation reveals that Uttar Pradesh places emphasis on cultivating crops with 9 to 10 months of maturity. These crops require irrigation for only 7 to 8 times during the period which comes to less than a month. In contrast to this, Maharashtra places emphasis on sugarcane varieties with a monger maturity time i.e. 11 to 12 months. Also the irrigation is required every 15 days. On the whole, the water footprint of Maharashtra comes to 25 irrigations while the same for Uttar Pradesh is only 7.6. To put it across more convincingly, CACP explains it in '*litres of water per kg of sugar*'. Uttar Pradesh requires 1044 litres of water for every kg of sugar, while Maharashtra consumes 2068 litres of water. This becomes more compelling when we come to know that the cost of water in Maharashtra is 2-3 times higher than the cost of water in Uttar Pradesh.

Table-5

Region	Sugarcane Crushed ooo Tonnes	Cultivated Land ooo ha@80.01 Tonne / ha	Water Requirement in Million m³ @18.75 m3/ha	Sugar Produced ooo Tonnes	Water Requirement Million m³@2068 m³/Tonne	Total Water Requirement Million m³
Kolhapur	16870.768	210.858	3953.592	2110.180	4363.852	8317.444
Pune	30018.296	375.182	7034.659	3478.043	7192.593	14227.252
Ahmednagar	12616.039	157.681	2956.515	1403.088	2901.586	5858.101
Aurangabad	5910.385	73.871	1385.073	640.149	1323.828	2708.901
Nanded	10823.946	135.282	2536.545	1260.705	2607.138	5143.683
Amrawati	487.776	6.096	114.308	52.033	107.604	221.912
Nagpur	397.473	4.968	93.146	38.015	78.615	171.761
Total	**77124.683**	**963.938**	**18073.838**	**8982.213**	**18575.216**	**36649.055**

: Source – Water Resource Department, (Economic Survey of Maharashtra, 2012)

The following table-6 illustrates this more clearly-

Table-6

Factor	Maharashtra	Uttar Pradesh
Water per kg of sugar	2068	1044
Irrigations per crop	25	7.6
Maturity of crops	11 – 12 months	9 – 10 months

The researchers (Narayanmurthi and Venkatachalam, 2011) believe that the water calculations don't take into consideration the water losses at the sugar mills. If considered, then the figures are poised to take a more saddening effect. Maharashtra has one of the lowest per capita water availability and much lower rainfall. Still, 79.5% of its sugarcane crop comes from the drought prone districts. Political leadership can therefore be questioned about the prevalent rates of water based productivity and how they relate efficiency gains to this.

4.4 How sugar mills lock up Maharashtra's water future – '*Capture Theory*'

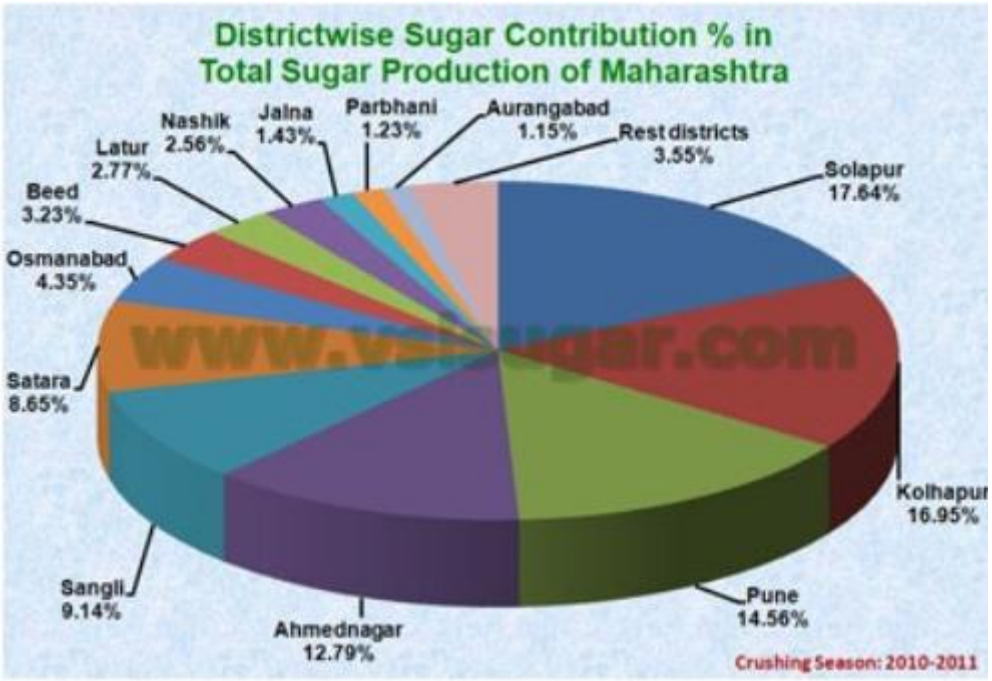
As discussed before, the sugar cooperatives have been accorded 'special' status and their discretionary powers are almost at par to the government. Still the sugar cooperatives and the political patronage have failed to understand the problem area. As an outcome to the political intervention, 79.5% of the sugarcane production at Maharashtra is done at areas which are drought prone. Researchers (Rath, 2007) have repeatedly outlined the fact that sugarcane is a trans-season crop and requires a good rainfall or ground water on a year on basis. Its cultivation in a drought prone or low rainfall area is therefore a very tough task. Heavy reliance on sugarcane as the cash crop would mean that ground water depletion goes further low. Sugar mills in Maharashtra have been established without a second thought to water availability, zones, distance between factories and sanctioned capacities. The mill owners, who run the mills under political patronage, would want to see more profits irrespective of the ground water scarcity.

The researchers have further outlined concerns on 'cost inefficiency' under which the current mill owners operate. Banerjee et al (2000) outlines the fact that the ranking of Maharashtra will go further down if the cost incurred per kg of sugar is included on end productivity. Under the political patronage, sugar mill owners continue to use sugarcane cultivation as their weapon for vote maximization. Little emphasis is placed on intercropping and crop recycling (Kumar et al, 2005). The massive inequity on ground water allocation is thus a big challenge and nothing the mill owners are doing about this. Deshpandey and Narayanmoorthi (2001) have therefore recommended that sugarcane cultivation in Maharashtra must be brought under drip or sprinkler irrigation. However a lot of studies believe that installation of drip or sprinklers would only increase the total cost incurred. Efficiency gains on ground water regeneration would still remain a challenge [Narayanmoorthi and Ventakachalam, 2011; Planning Commission Report, 2005].

The reports make it evident that Maharashtra government has provided subsidies to the tune of 5.68 lakh hectare for drip irrigation and 2.33 lakh hectare for sprinkler irrigation, in a period of 5 years i.e. 2006 to 2012. What puts a question mark on this subsidy is that only a small segment of the sugarcane growers could use the drip system. When 60% of the irrigated water is being consumed by sugarcane, then it is seemingly unjustifiable to allocate only a fraction of the total subsidy. Also, no visible relief can be observed in terms of rise in water efficiency. The World Bank report [2012 - 'Impact of climate change on drought and flood-affected areas: Case studies in India'] comments – '*with much of sugarcane being cultivated on large irrigated lands, the subsidy is regressive. There are virtually nil or undesirable consequences that come out of the current subsidies*. The report further mentions that these subsidies thrive under strong political support. The extension or irrigation facilities to drought prone areas has made it very complicated to monitor prices and reduce ground water depletion. The report has recommended measures to prevent dependency on groundwater.

- ✓ Counter climatic changes with Climate Information Management
- ✓ Planning and investment decisions
- ✓ Climate risk assessment
- ✓ Income diversification in rural areas
- ✓ Promotion of sustainable models of dry-land farming

Table 7 Source: Vasant Dada Sugar Institute(Sugar statistics) http://www.vsisugar.com/



As can be observed from the figure above, SOLAPUR constitutes for the highest sugar contribution of 17.64% in the entire state. This is in-spite of the fact that-

- Solapur District, a part of the Bhima Basin, is worst hit of drought
- Ujani Dam of Solapur has zero storage and the drinking water for the district is nearly dead
- 1000 water tankers ply to Solapur on daily basis
- Solapur has the densest population of sugar factories in the state
- **Solapur happens to be the constituency of Union Minister of Agriculture Sharad Pawar**

The Water Resource Department claims further that Ujani Dam of Solapur has a total storage capacity of 87 TMC. Under the political intervention, 60% of its live storage (i.e. 60 TMC) is being allocated to sugarcane cultivation; however the authorised limit is only 32TMC. To complicate it further, the sugar factories would extract 20 TMC of the ground water from nearby resources for sugar production.

Table 8

Area under main crops in thousand hectares (canals, groundwater and rivers) ISR 2009-10									
Region	Jowar	Wheat	Ground nut	Harbhara	Rice	Oilseed	Sugar-cane	Cotton	Fruits
Pune	221.43	191.85	38.68	52.85	96.96	61.58	315.97	5.77	13.80
Aurangabad	29.38	33.33	5.07	12.68	0.08	2.30	43.30	27.83	5.48

Area Distribution (Source – Water Resource Department, 2012)

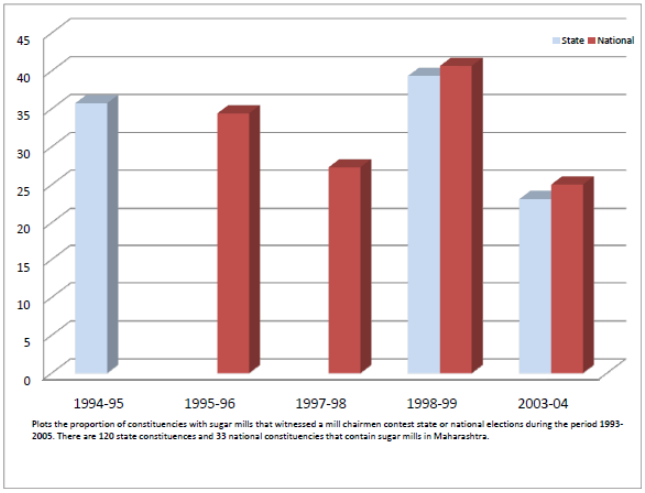
The White paper on Government procedures mentions it clearly that District Collectors have the right to reserve water for drinking purpose over any other industrial or agricultural project. Unfortunately, the District Collector of Solapur couldn't use his authority. In a similar incidence, Osmanabad collector was denied of his discretionary powers. The collector informed the state government that the district had, during the year 2012, received only 50% of its annual rainfall. The dams were also lying short of the water demand and therefore the sugarcane crushing needed to be withdrawn. The collector was prompt in issuing orders on suspending crushing and allocating water for drinking purpose. Unfortunately, in this case also the political pressures played their part more effectively. Apart from Solapur, Krishna and Godavari regions too are drought hit but the statistics on water-intensive sugarcane cultivation remain the same. CACP (2012) report has therefore made a clear recommendation that drip irrigation and sprinkler system should only be used for areas which are relatively rich in water. The drought prone areas should be explore for new models on dry-land farming. Maharashtra needs to either put on hold or cancel the new licences for sugar mills. Also, for the existing mills the level of sustainable sugarcane cultivation should be decided.

Researchers have also outlined the drawbacks on the pricing mechanism on sugarcane cultivation [Ahmed, 2014; Lalvani, 2008 and CACP, 2012]. Many believe that the real politics behind the Sugar (Control) Order, 1966 is the main culprit to this situation in the sugar industry. The authors believe that governments have failed consistently in meeting the demands of the industry. A vote bank of 55 million people who are directly involved

with the sugarcane business has made the government a 'puppet' in the hands of the politicians (Ahmed, 2014). Lalvani (2008) makes a similar argument that the cartelisation of the sugar mills has pushed the poor farmers to the very edge of beneficiaries list. Rangarajan committee (2012) has therefore prescribed that the cane reservation area must be done away with and there should be long-term contracts between the factory owners and the farmers. Such amendments would allow the farmers to survive the price volatility and plan for the long term. The report also recommended that 'zones' should be created keeping in mind the recovery rate of the factory, number of farmers and the transportation. The distance between the 2 factories should ensure fair competition and better price for the end producer. The profit between the farmer and the mill owner should also be distributed in the ratio of 70:30. The domestic market needs to be integrated with the international market by removing the control mechanism and the intermediaries in between.

This section of the work deals with findings where politicians and their ability to affect sugarcane cultivation in the drought-hit area are investigated. The findings reveal how the political cycles are directly or indirectly related to the churning cycles.

Table - 9



Political representation to mills density (source – Sukhtankar, 2010)

The chart above (Table 9) shows that sugar mills in Maharashtra are run directly under political control. It can be seen that for years (since 1998) the number of sugar mills were at par with the number of contesting politicians. No surprise that the Chief Minister of Maharashtra and the President of India own a sugar [illegible] state.

Table-10

Descriptive Statistics

	Average	Not Connected	Connected	p-value	Units
	(1)	(2)	(3)	(4)	(5)
Cane Price	929	929	929	0.996	2004 Rupees
	(265)	(270)	(262)		
Recovery Rate	10.96	10.96	10.96	0.969	%
	(0.97)	(1.03)	(0.92)		
Cane Crushed	379,605	342,074	406,044	0.083	Metric tons
	(246800)	(234100)	(252172)		
Sugar Produced	427,511	387,583	455,639	0.136	Quintals
	(297541)	(288674)	(300635)		
Cane Planted	0.244	0.251	0.238	0.592	% available cropland
	(0.232)	(0.247)	(0.22)		
Actual Days Worked	139	135	141	0.137	days
	(50.48)	(50.3)	(50.46)		
Actual Hours Worked	3,038	2,953	3,098	0.127	hours
	(1111)	(1102)	(1114)		
Hours Lost to Breakdowns	3.26	3.25	3.27	0.959	% of available hours
	(3.6)	(3.8)	(3.45)		
Hours Lost to Cane Shortage	8.58	9.24	8.12	0.349	% of available hours
	(11.96)	(12.16)	(11.81)		
Lime added	0.156	0.156	0.156	0.975	Kilograms/ton cane
	(0.037)	(0.035)	(0.038)		
Sulphur added	0.049	0.050	0.049	0.252	Kilograms/ton cane
	(0.012)	(0.012)	(0.012)		
Capacity	2,416	2,139	2,629	0.002	Tons Crushed/Day
	(1092)	(924)	(1163)		
Mill Closed	0.142	0.160	0.128	0.333	
	(0.349)	(0.367)	(0.334)		

Cane Price and Recovery rates (source – Lalvani, 2008)

Table 11 shows how the cane prices and the recovery rates differ for regions which are politically connected and politically not connected. Apparently, the recovery rate and cane prices are the same for the two regions but the average capacity marks the difference. Politically active regions have an average crushing capacity of 2629 tons and this for politically inactive regions is only 2139.

Table-11

Table 2
Are cane prices affected in election years in politically connected mills?

	Cane price							Log Cane Price
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Political chairman	12.96	12.12	13.56	5.054	4.088	3.910	2.111	0.0183
	(16.33)	(14.00)	(11.98)	(14.88)	(12.81)	(15.38)	(13.20)	(0.0160)
Political chairman * election year	-20.78**	-21.11**	-19.33**					-0.0217**
	(8.228)	(9.809)	(8.266)					(0.00936)
Recovery rate			55.59***					
			(9.090)					
Chairman contests national election				-19.50*	-20.37***			
				(10.57)	(6.437)			
Chairman contests state election						0.761	5.474	
						(16.44)	(16.83)	
Mill fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rainfall, capacity	No	Yes	Yes	No	Yes	No	Yes	Yes
Mill level controls	No	No	Yes	No	No	No	No	No
N	1,151	1,151	1,135	1,151	1,151	1,151	1,151	1,151
Adj R-squared	0.86	0.87	0.89	0.86	0.87	0.86	0.87	0.88

Cane prices during election year (Lalvani, 2008)

It can also be seen that cane prices are lower by Rs 20 a ton during the election years in a politically controlled region. Variations were also observed on rainfall capacity, recovery rates and sugar produced per unit of cane (Table 11).

Table-12

Table 5
Mill outcomes in winning and losing mills

	Cane Price				Mill Closed	
	State	National	State	National	State	National
	(1)	(2)	(3)	(4)	(5)	(6)
Political chairman * election year	-3.688	-16.63**				
	(11.71)	(8.475)				
Political chairman * year after	-8.533	9.990				
	(12.18)	(11.15)				
Chairman won * election year			16.13	-5.782	0.0162	-0.0943*
			(20.30)	(16.33)	(0.0247)	(0.0558)
Chairman lost * election year			-10.55	-17.87	-0.0173	-0.0537
			(17.36)	(13.39)	(0.0295)	(0.0398)
Chairman won * year after			4.039	79.21*	0.0195	-0.193**
			(16.81)	(46.35)	(0.0356)	(0.0766)
Chairman lost * year after			-39.79***	-8.001	-0.0202	-0.0264
			(10.97)	(24.47)	(0.0275)	(0.0512)
Mill fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Rainfall, capacity	Yes	Yes	Yes	Yes	Yes	Yes
N	1,151	1,151	1,151	1,151	1,874	1,874
Adj R-squared	0.87	0.87	0.87	0.87	0.47	0.47

Table 10: Election Campaigns and outcome on sugarcane prices (Sukhtankar, 2010)

Table 11 helps explain about how the winning or losing an election campaign affects the sugarcane prices of the region. The data shows that the region, where the chairman won, the farmers were paid Rs 80/- more per ton. Also, the prices were high for the coming years. Opposite to this the region, where the chairman lost, the prices remained the same or suffered marginally. Clearly the political result for the sugar mills of a region had consequences on both ways.

Chapter 5: Conclusions and Recommendations

This research paper has empirically looked into whether the 'Capture Theory' is applicable to the sugar industry in Maharashtra by analysing the effects of various policies of central as well as state governments. Conclusions are being drawn based on the research questions and empirical findings.

- Which are the different ways in which commercialization of sugarcane agriculture has been stimulated by the Government Policies?

The report finds that Maharashtra makes the highest contribution on sugarcane production. During the year 2011-2012 the state had a yield of 80.1t/ha, much higher than the 2nd state i.e. Uttar Pradesh (59.6t/ha). It was also much higher than the national average of 70.3t/ha. This however needs to be seen in terms of productivity - *productivity without water efficiency is only a misrepresentation of facts*. The average water productivity of UP is 1.11 T/ha/month, while the same for Maharashtra is only 0.403 T/ha/month. Similar trend can be observed with the cultivation period and maturity time. Maharashtra places emphasis on sugarcane varieties with a monger maturity time i.e. 11 to 12 months. Also the irrigation is required every 15 days. On the whole, the water footprint of Maharashtra comes to 25 irrigations while the same for Uttar Pradesh is only 7.6. To put it across more convincingly - Uttar Pradesh requires 1044 litres of water for every kg of sugar, while Maharashtra consumes 2068 litres of water. This becomes more compelling when we come to know that the cost of water in Maharashtra is 2-3 times higher than the cost of water in Uttar Pradesh. Clearly, Maharashtra falls behind of Uttar Pradesh if per unit water consumption is taken as measure.

In Maharashtra the sugarcane production is largely dominated by the political bigwigs. The politicians run the industry with money and muscle.

The tenders and the prices are mostly predetermined, under consultation with this group of people. Allocation of ground water and the prices of sugarcane are only an outcome to the 'vote bank' and the power that this nexus wields. The agricultural policies should be based on transparent agriculture policy and models based on equality, inter-linkage and symmetry. The 'spatial' nature of the water market would only decide the agriculture income in a state like Maharashtra. Also, there is a gap between water owners and water sellers. There are multiple contracts that govern the distribution of water. The groundwater exchange is led by 'social norms' which cannot be described by any model. It is the deep rooted mechanics on the caste system that guides the political framework and so the agriculture policy.

The findings suggest this as incidence of the 'capture' theory where the regulatory framework has been used to indiscriminately use power for vested interests. In this case eastern Maharashtra is seen to suffer as few resources were allocated for the region's growth. For an apt example of 'Pork Barrel' politics, sugarcane prices were made a weapon to polarize voters and influence vote banks. The Cooperative owners and the factory owners used the policy statement as their declaration on election campaigns. To prove it all – the sugarcane prices were found to be higher at western Maharashtra as compared to its eastern region.

There are enough evidences to believe that water related problems are common in Maharashtra. However the political angle has only complicated the problems. The government statistics reveal that Maharashtra has over 35% of the live water storage capacity, but this gets exhausted with a GCA 'Gross Cropped Area' of only 18%. This GCA figure for Maharashtra is one of the lowest across all the states in India. Under political patronage the sugar cooperatives have gone beyond the regulatory framework to serve the interests of the politicians. The failure was evident with the unauthorised use of NABARD and nullifying the ZONEs by increasing the distance between the factories. It would therefore be 'not' wrong to consider the cooperatives as the reason for

political failure on agriculture policy. The government has also faltered on the FMI (Flood Method of Irrigation) method of cultivation which consumes more water than any other method. Unfortunately, the incentives given on cultivation farming and the assured prices attract a lot of farmers to cultivate sugarcane on a year-on basis. Little attention is paid to the depletion of ground water.

- How have the politics of sugarcane cultivation promoted the depletion of ground water supply in rural villages?

In the backdrop of sugarcane production, the groundwater market in Maharashtra is typically oligopolistic and monopolistic. The large investments in this sector are either privately owned or politically motivated. In most states in India, the hydrological features and water table suffers from an uneven spatial distribution. Only a few water sellers consume the market space both, unethically and inappropriately. Particularly in the sugarcane belt the ground water usage and the agricultural produce are governed by political means. Evidently, the monopolistic environment has led to a situation which is economically not justifiable.

World Bank has very clearly mentioned the fact that sugar factories have continued using the faulty cropping pattern in spite of the visible defects. The area under sugarcane cultivation has grown consistently without paying any heed to the prevalent water scarcity. The politically motivated campaigns have very aggressively increased the area under sugarcane by 6 times, while the national average for the same period is only 1.78%. Evidently, Maharashtra runs under the most inefficient water usage for sugarcane cultivation as the conventional flood method consumes more than 60% of the irrigated water for just 3.5% of the cropped area. In order to correct the situation the Maharashtra Government has utilised 'Drip and Sprinkler' irrigation across the state but little could be achieved out of it. Subsidies have been allotted not for reducing the water foot-print of sugarcane but for gaining more votes out of the government scheme.

Studies suggest that after a decade long subsidies given to the farmers the water consumption has only increased on cane farming. As an outcome to the political intervention, 79.5% of the sugarcane production at Maharashtra is done at areas which are drought prone. But, *with much of sugarcane being cultivated on large irrigated lands, the subsidy is regressive. There are virtually nil or undesirable consequences that come out of the current subsidies*

What started as an outcome to the Nehruvian and Congress vision has culminated into poor performance, both financial and technical. Reports suggest that *special status* was accorded to these institutions and this in itself was enough to sow the seeds of trouble. The civil partnerships and the private sector were not allowed the level playing field. Eventually the Sugar Cooperatives played their way into the hand of politicians and made them the tools for serving political motives. There are enough evidences to believe that the important positions at sugar cooperatives were used inappropriately to create vote banks. One such report concludes that all the policy making on irrigation facilities and subsidies have gone predominantly to the politically stronger Western Maharashtra. This report also finds that the drawbacks on the pricing mechanism on sugarcane cultivation. Many believe that the real politics behind the Sugar (Control) Order, 1966 is the main culprit to this situation in the sugar industry. The governments have failed consistently in meeting the demands of the industry. A vote bank of 55 million people who are directly involved with the sugarcane business has made the government a 'puppet' in the hands of the politicians. Apparently the cartelisation of the sugar mills has led to water depletion beyond the permissible limits.

- What are the implications of these problems for the local villages and can the principles of good governance help in resolving some of these issues.

This report finds that the state is constantly reeling under the pressures of water efficiency. However on the other side civil institutions like SSI 'Sustainable Sugar Initiatives', co-financed by European Bank have helped sugarcane growers, retailers, investors, traders and producers to save as much as 50% of irrigated water on sugarcane cultivation. This comes alongside 30% increase in yield, 50% reduction on seeding material and 32tonnes per acre (state's average is 25 tonnes). Such civil movements have motivated the farmers to move from flood to furrow system of sugarcane cultivation and adopt intercropping as a method to increase profits; while the political partnership has only been limited to offering subsidies on drip and sprinkler irrigation. It is suggested that no-cost techniques such as Better Management Practices would have yielded much better results as compared to subsidies on drip and sprinkler irrigation. Alongside Drip Irrigation can be an effective strategy to bridge the gap on water scarcity. There can be substantial savings on water during the irrigation. The farm-level studies do also indicate that drip irrigation can cut the water consumption by 40%. The method is also useful in saving electricity and improving productivity.

It is observed that only 60% of the arable land can be irrigated by both surface and groundwater. In view of the same the Watershed Development Program aims at recharging pits and improving water table. The commission recommended the WDP program for improving the moisture content at different places in the state. The Maharashtra government could have utilised the program for its longer horizon. Unfortunately, there is little visibility of such efforts in the state. On the contrary the civil participation based program, *Indo-German Watershed Development Programme* could generate more impact on ground water conservation. The impact could be made because of the participation of the Gram Panchyats that facilitated transparency and community participation.

In view of the prevalent challenges, the report recommends following measures to prevent dependency on groundwater.

- ✓ Counter climatic changes with Climate Information Management
- ✓ Planning and investment decisions
- ✓ Climate risk assessment
- ✓ Income diversification in rural areas
- ✓ Promotion of sustainable models of dry-land farming

Also, drip irrigation and sprinkler system should only be used for areas which are relatively rich in water. The drought prone areas should be explored for new models on dry-land farming. Maharashtra needs to either put on hold or cancel the new licences for sugar mills. Also, for the existing mills the level of sustainable sugarcane cultivation should be decided. Rangarajan committee has therefore prescribed that the cane reservation area must be done away with and there should be long-term contracts between the factory owners and the farmers. Such amendments would allow the farmers to survive the price volatility and plan for the long term. The report also recommends that 'zones' should be created keeping in mind the recovery rate of the factory, number of farmers and the transportation. The distance between the 2 factories should ensure fair competition and better price for the end producer. The profit between the farmer and the mill owner should also be distributed in the ratio of 70:30. The domestic market needs to be integrated with the international market by removing the control mechanism and the intermediaries in between.

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