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From Green Revolution to Green Gold: The Evolution of the Indian National Mission on Biodiesel

Shishusri Pradhan
Declaration

I declare that, expect where otherwise indicated, this thesis is my own work, and that no part of it has been submitted for any other degree or professional qualification.

Shishusri Pradhan

November 2013
Notice of Publication

With permission of the supervisor, parts of this thesis have been published in a peer reviewed journal.

Acknowledgements

I would like to thank Professor M.S. Swaminathan, Dr. A. Nambi, Dr. Colin Pritchard, Mr. Sundar Vadivelu and staff at MSSRF and the PISCES project for encouraging me to pursue a Ph.D.

In Edinburgh I would like to thank my supervisors Professor James Smith, Dr. Lawrence Dritsas, and Dr. Stewart Russell for their guidance. I would especially like to express my gratitude to James Smith for bearing with my panic mails and incessant queries. I would also like to thank Dr. Thomas Molony for his help in the early stages of my Ph.D.

This research would not have been possible without the financial and administrative assistance of the University of Edinburgh’s College of Humanities and Social Science, the Graduate School of Social and Political Science, and the M.S. Swaminathan Research Foundation.

I want to express my gratitude to the numerous people I interviewed across India, without their inputs and cooperation this thesis would not have been possible. I am indebted to the research participants across Tamil Nadu, Chhattisgarh, and Maharashtra for sharing their valuable insights with me.

I would like to thank Mr. Venkataramani Govindan, if not for him, I would have not made the shift to the social sciences. I would like to thank Mr. Om Prakash Singh for patiently reading and keeping me updated about the various biofuel related news in India. I owe a lot to my friends in India and Edinburgh for supporting and helping me through this process, thank you for the constant encouragement and supply of chocolates and hugs.

I am lucky to have the support and blessings of my grandparents and relatives. Siddharth you have had to put up with my tantrums, mood swings and erratic yoga schedules, hope I can do the same when you finish your Ph.D. My dear brother Sanjeeb I thank you for putting up with my constant whining and insecurities. Dadna I owe you a big deal for never asking me about the progress of my work and allowing me do stuff at my own pace. Finally I would like to thank the source of my inspiration and the person who has always believed in me, Bindu, my Mama, I owe this thesis to you.
Abstract

Biofuels have caught the attention of the world as a source of renewable energy which can provide energy security, advance rural development, mitigate climate change, and foster international trade. India developed the National Mission on Biodiesel (NMB) as a rural development policy option to produce biodiesel from *Jatropha curcas* and promoted it as a pro-poor and pro-growth initiative. This thesis examines the emergence, trajectory, and the consequences of the NMB to assess how the NMB worked as a test development policy programme in India.

The thesis focuses on the policy-making process in India, particularly the role of narratives in development policy-making and how it leads to blueprint development. It argues that the narratives supporting the NMB were based on shaky scientific facts and did not represent the needs of the rural people. The thesis takes into account that policy processes involve various actors, networks, their interactions and their knowledge, communication of knowledge and politics. It traces the role of various actors such as policy-makers, bureaucrats, researchers, professionals from private companies and NGOs, farmers, and landless labourers involved in the biodiesel mission.

This thesis is anchored in the discipline of Science and Technology Studies (STS) and it draws from Actor Network Theory (ANT) and Social Construction of Technology (SCOT) to analyse how the NMB progressed as a test policy model and whether it really was a ‘pro-poor’, ‘pro-growth’ development initiative. Hence this thesis studies how development narratives were used to promote the biodiesel initiative, how networks were created to establish the biodiesel mission as a policy option and advocate its adoption, and in turn how the NMB progressed as a development initiative. As the thesis draws from SCOT the discussion will emphasise on the practices of a society adopting a technology/development initiative, the importance of users (scientists, policy-makers, farmers, labourers, representatives from the industry and NGOs), how users are represented, and in turn how the NMB had an impact on the people adopting it.

This thesis contributes to the understanding of the policy-making process of development renewable policies in India and it also examines the apparent inevitability of technological solutions to development challenges. It also contributes to the literature of narratives serving as ‘blueprints’ for development policy-making. Additionally it adds to the literature on biofuels and reveals the complex nature of regional and national networks that comprise a part of the rising Global Biofuel Network.
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<td>ANT</td>
<td>Actor-network Theory</td>
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<tr>
<td>BARC</td>
<td>Bhabha Atomic Research Centre</td>
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<td>BIS</td>
<td>Bureau of Indian Standards</td>
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<tr>
<td>CAPART</td>
<td>Council for the Advancement of People’s Action and Rural Technology</td>
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<tr>
<td>CBDA</td>
<td>Chhattisgarh Biofuel Development Authority</td>
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<tr>
<td>CPCB</td>
<td>Central Pollution Control Board</td>
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<td>CPRs</td>
<td>Common Property Resources</td>
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<tr>
<td>CREDA</td>
<td>Chhattisgarh Renewable Energy Development Agency</td>
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<tr>
<td>CSIR</td>
<td>Council of Scientific and Industrial Research</td>
</tr>
<tr>
<td>DBT</td>
<td>Department of Biotechnology</td>
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<tr>
<td>DOLR</td>
<td>Department of Land Resources</td>
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<td>DORD</td>
<td>Department of Rural Development</td>
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<tr>
<td>DRDO</td>
<td>Defense Research and Development Organisation</td>
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<td>EBP</td>
<td>Ethanol Blending Programme</td>
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<td>EGS</td>
<td>Employment Guarantee Scheme</td>
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<td>EU</td>
<td>European Union</td>
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<tr>
<td>FAO</td>
<td>Food and Agricultural Organisation</td>
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<td>GIBN</td>
<td>Global Integrated Biofuel Network</td>
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<td>GoI</td>
<td>Government of India</td>
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<tr>
<td>HSD</td>
<td>High Speed Diesel</td>
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<tr>
<td>IAS</td>
<td>Indian Administrative Service</td>
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<tr>
<td>ICAR</td>
<td>Indian Council of Agricultural Research</td>
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<td>ICFRE</td>
<td>Indian Council of Forestry Research and the Environment</td>
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<tr>
<td>ICT</td>
<td>Information Communication Technology</td>
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<tr>
<td>IEA</td>
<td>International Energy Agency</td>
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<tr>
<td>IIP</td>
<td>Indian Institute of Petroleum</td>
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<tr>
<td>IIT</td>
<td>Indian Institute of Technology</td>
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<tr>
<td>IOC</td>
<td>Indian Oil Corporation</td>
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<td>IT</td>
<td>Information Technology</td>
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<td>JFM</td>
<td>Joint Forestry Management</td>
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<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>KVIC</td>
<td>Khadi and Village Industries Commission</td>
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<td>LCA</td>
<td>Life Cycle Analysis</td>
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<tr>
<td>LPG</td>
<td>Liberalisation, Privatisation and Globalisation</td>
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<td>MLTs</td>
<td>Multi Locational Trials</td>
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<tr>
<td>MNES</td>
<td>Ministry of Non-Conventional Energy Sources</td>
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<td>MNREGS</td>
<td>Mahatma Gandhi National Rural Employment Guarantee Scheme</td>
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<td>MNRES</td>
<td>Ministry of Non-Renewable Energy Sources</td>
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<td>MoA</td>
<td>Ministry of Agriculture</td>
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<tr>
<td>MoEF</td>
<td>The Ministry of Environment and Forests</td>
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<tr>
<td>MoP&amp;NG</td>
<td>Ministry of Petroleum and Natural Gas</td>
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<tr>
<td>MoRD</td>
<td>Ministry of Rural Development</td>
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<tr>
<td>M-SECU</td>
<td>Mobile Seed Collection Unit</td>
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<td>MSMS</td>
<td>Mobile Seed Market System</td>
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<td>MSSRF</td>
<td>M.S. Swaminathan Research Foundation</td>
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<td>NBP</td>
<td>National Biofuel Policy</td>
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<td>NGO</td>
<td>Non-governmental Organisation</td>
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<td>NMB</td>
<td>National Mission on Biodiesel</td>
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<td>NOVOD</td>
<td>National Oilseeds and Vegetable Oils Development</td>
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<td>NREGA</td>
<td>National Rural Employment Guarantee Act</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
</tr>
<tr>
<td>OPP</td>
<td>Obligatory Passage Point</td>
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<tr>
<td>PISCES</td>
<td>Policy Innovation Systems for Clean Energy Security</td>
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<tr>
<td>PRA</td>
<td>Participatory Rural Appraisal</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>Research and Development</td>
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<tr>
<td>RLS</td>
<td>Reliance Life Sciences</td>
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<tr>
<td>RTFO</td>
<td>Renewable Transport Fuel Obligations</td>
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<tr>
<td>SCOT</td>
<td>Social Construction of Technology</td>
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<tr>
<td>SHG</td>
<td>Self Help Group</td>
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<tr>
<td>SMS</td>
<td>Short Messaging Service</td>
</tr>
<tr>
<td>STS</td>
<td>Science and Technology Studies</td>
</tr>
<tr>
<td>SVO</td>
<td>Straight Vegetable Oil</td>
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<tr>
<td>TBO</td>
<td>Tree Borne Oilseed</td>
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<tr>
<td>Acronym</td>
<td>Full Form</td>
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<tr>
<td>TIFR</td>
<td>Tata Institute of Fundamental Research</td>
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<tr>
<td>TNAU</td>
<td>Tamil Nadu Agricultural University</td>
</tr>
<tr>
<td>UNEP</td>
<td>United Nations Environment Programme</td>
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<tr>
<td>VO</td>
<td>Voluntary Organisation</td>
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<td>World Bank</td>
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Chapter 1: Introduction

1.1 Introducing Biofuels

According to the 2013 World Energy Outlook (IEA 2013) global marketed energy consumption will grow by 56% from 2010 to 2040. Although the world is recovering from the 2008–2009 global recession, rates of recovery are uneven. In many of the advanced economies recovery has been slow, unemployment rates are still high and real estate markets and household income growth remain weak. In contrast, growth rates have been higher in many emerging economies. Due to the growing demand associated with signs of recovery and insufficient oil supply response, oil prices rose in 2010. Prices catapulted to higher levels by the end of 2010 and into 2011 as social and political unrest unfolded in several Middle Eastern and African economies (IEA 2011).

From the predicted levels of energy demand and available resources it is increasingly apparent that new sources of science and technology should be tapped to meet the ever increasing demand for energy. Among the varying options being explored, biofuels have emerged as a viable option. The term biofuel refers to energy produced from biomass through processes such as solid combustion, gasification or fermentation (Demirbas 2007). Biofuels are liquid fuels produced from renewable resources; they are mainly derived from organic matter and are a versatile source of energy. Biofuels have gained popularity as a global solution due to their potential to “reshape livelihoods, patterns of resource consumption, environments and agro-food production systems” (Smith 2010, p.1).

Biofuels present one of many enterprising but complicated technologies characterising what may be broadly considered the ‘bioeconomy’ – moving from the strictures of the genetic revolution to wider perspectives of replacing the fossil-based economy with a bio-based one. From a broad economic perspective, the bioeconomy refers to the set of economic activities relating to the invention, development,
production and use of biological products and processes which can contribute to socio-economic impacts in developed and developing countries (OECD 2009).

Mol (2007) states that “biofuels are booming” because they are portrayed as a panacea for problems of energy insecurity, climate change, and rural underdevelopment. These ‘win–win’ narratives have premised the development of a ‘globally integrated biofuel network’ (Mol 2007), ‘biofuels complex’ (Borras et al. 2010), or ‘assemblage’ (Smith 2010), which has been driven largely by policies in the ‘North’, the European Union, and the United States in particular (eg, Franco et al. 2010, Hollander 2010). Policies such as the EU’s Directive 2003/30 EC have generated market signals and provided subsidies leading to a proliferation of biofuel projects, targets, and missions, mustering significant research into their dynamics and impacts, associated technologies, and best practices amongst others. Following Brazil’s success, the supportive framework is also increasingly supported by the ‘South’ (Dauvergne and Neville 2009).

Various authors have adopted a range of approaches to explain the recent expansion of biofuels. One of the approaches which are being applied to understand global change is the role of ‘networks’ and ‘flows’ as “architects of global modernity” (Castells 1996 cited in Mol 2007). Castells (2004) states that “networks constitute the fundamental pattern of life, of all kinds of life” and argues that networks are pervasive and they formed the backbone of societies, thousand years ago. Mol (2007) adopts this terminology to explain the rise of a Global Integrated Biofuel Network (GIBN). He discusses the emergence of a GIBN characterised by the concentration of actors, objects, relations which formed biofuel regions at the national, local, and international level. According to him local biofuel regions expanded into national biofuel regions and the increase in national biofuel regions in a number of countries advanced the spread of biofuels globally.

Smith (2010) employs the terminology of ‘global assemblages’ (Ong and Collier 2005) to explain the expansion of biofuels world over. “Global assemblages represent the tangible configurations through which global forms of techno-science,
economic rationalism, and expert systems gain significance and shape” (Smith 2010, p.10). The global assemblage on biofuels resulted in the proliferation of biofuel targets the world over and by 2007, at the start of this research, twenty seven countries had policy under consideration or had enacted mandatory requirements for biofuels to be blended with traditional transport fuels, and forty had legislation to promote biofuels (Rothkopf 2007). USA, UK, European Union, Brazil, China, Canada, India, and South Africa had introduced blending targets and many more countries were joining the list.

Borras et al. (2010, p.575) speak about a new agrarian political economy created by the ‘biofuel complex’ and offer perspectives from political economy, political sociology, and political ecology to comprehend the “new agrarian relations”. They focus on the emergent political and social relations in the biofuel complex, politics of representation, institutional structures, discursive frames through which biofuels are promoted/opposed, impacts of biofuel investments, and forms of resistance or support that unite or divide actors in the biofuel complex.

Mol (2007) and Smith (2010) in their work discuss the broad nature of an emergent GIBN, global assemblage, while Borras et al. (2010) use their framework of a biofuel complex to explain the complex political-social relationship amongst actors in Brazil, India, Africa, USA, and Europe. A range of authors have focused on the emergence of biofuels (particularly biodiesel) in India, for example, Maija (2008) focuses on the National Mission on Biodiesel by analysing the policy processes and her work centres on rural governance in Andhra Pradesh, Ariza et al. 2010 discuss the role of soil fertility and low yields of Jatropha in Tamil Nadu, Rajagopal (2008) speaks about the environmental, economic, and policy aspects of biofuels, Baka (2011) reveals the politics of wasteland and land grabbing associated with biofuels in Tamil Nadu, Tompsett (2010) centres on the biofuel policy as a development project in Rajasthan, and Shinoj et al. (2010) did an economic assessment of a biodiesel value chain in India. A majority of these papers either focus on the role of the government, research centres or private companies in promoting biodiesel production in a particular state in India. I argue that the National Mission on Biodiesel (NMB) in
India emerged and progressed as a result of national and regional networks comprising actors from the government (politicians, bureaucrats, policy-makers), research centres, private companies, and Non-Governmental Organisations (NGOs) who actively supported the promotion of the NMB. In this thesis I will draw from Actor Network Theory (ANT) to reveal how the policy network was created at the central level to support the drafting of the NMB and how the various actors played a key role in stabilising it as a policy initiative. I then debate that the NMB was not adopted across the different states uniformly rather it spread across India because of the creation of 3 types of networks, namely: government led network, research centre led network, private company-NGO led network. I will draw from three case studies to explain the role of these networks in promoting the NMB and in turn how it affected the people adopting this initiative. The case-studies on these regional networks will further Mol’s (2010) argument that regional biofuel networks are playing a key role in promoting biofuels and will compare and contrast the types of actors and their roles across the three networks from three different regions in India. The case-studies will answer questions such as what are the politics underlying the biodiesel policy-process in India? What are the impacts of the biodiesel initiative? What consequences does it have on rural livelihoods? What factors unite/divide actors for or against the biodiesel initiative? Are there alternate biofuel development examples that support rural livelihoods?

1.2 The National Mission on Biodiesel

The previous section introduced biofuels and how a GIBN, global assemblage, or a biofuel complex, are being used to explain the rise of biofuels and biofuel policies world over. Eyben (2008, p.6) in her research on policy practices on women’s empowerment states that, “the policy environment is highly susceptible to wider trends in the global political economy”. Similarly liquid biofuels were in the limelight and countries the world over were advocating biofuel programmes.

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1 Chapter 6 focusing on the creation of a policy network and policy-processes of the NMB has been published in Environment and Planning A.
missions, and policies and India was among them. The Government of India (GoI) introduced the **Ethanol Blending Programme (EBP)**, and the **National Mission on Biodiesel (NMB)** as policy options which supported the production and blending of bioethanol and biodiesel in petrol and high speed diesel (HSD) respectively. Prior to the global recession the Indian economy was growing at a rate of 8% per annum and India was among the top five consumers of energy in the world (World Bank 2008). Despite the recession having an impact on the growth rate, the demand for energy has still been rising and to meet the accelerating requirements GoI has been promoting renewable sources of energy production. The EBP and the NMB aligned with the aims of the government to promote green sources of energy production.

The NMB was publicised by the Government of India as a development initiative and the objective of introducing a new technology/strategy was portrayed as an environmentally friendly method of producing energy domestically, in the process generating rural employment, improving the agriculture sector, and reducing oil imports (GoI 2003). It aimed at producing biodiesel from Jatropha curcas, a non-edible oil seed, which would be cultivated on — land under the scheme of Joint Forestry Management (JFM), hedges around agricultural land, ‘culturable fallow lands’, stretches of public land along railway tracks, highways, and canals, and dry, marginal ‘wastelands’ (ibid.).

While the global assemblage on biofuels had created an enabling environment for the adoption of biofuel production the world over, concerns were being raised by the UN, FAO, OXFAM, local NGOs, and researchers about the environmental friendly production process of biofuels, and that arable land was being diverted for biofuel production which was in turn raising food prices (Oxfam 2008). The development of biofuels was involved in debates on monoculture, food versus oil, land grabbing, and the not so green production of biofuels (ibid.). While concerns were emerging on the viability and sustainability of biofuels globally, voices of scepticism were also arising in India on the production and viability of biofuels (Gundimeda 2005, Ariza et al. 2010). Various actors from research organisations and NGOs, farmers, and labourers raised issues of concern which were in opposition to the goals and claims...
Introduction

of the development initiative. The biodiesel initiative was promoted by the GoI as a ‘pro-poor’ initiative that would use ‘wastelands’ for the cultivation of Jatropha (GoI 2003). The rural farmers and labourers questioned the classification of land as ‘wasteland’ and ‘unused’ and were against the cultivation of Jatropha on the common property resources (CPRs) (Baka 2011). Jatropha had been publicised as a hardy crop that was resistant to pests and required minimum inputs, but the farmers observed that it was susceptible to pest attacks, and its yield rates reduced markedly without inputs of irrigation and fertilisers (Ariza et al. 2010). The actors involved in oil production said the quality and quantity of oil produced from Jatropha varied significantly across different genotypes of the seed. Another major concern was the model of contract farming adopted by domestic and international companies which had drastic consequences on the rural farmers, in turn being contradictory to the development goals of the project.

1.3 Aim and Scope of Research

The aim of this research is to trace the emergence, progress and consequences of the NMB as a rural development policy initiative and to do so; this thesis focuses on the policy-making process in India, particularly the role of narratives and how public policies are influenced by discourses. While the thesis analyses how the biodiesel mission was influenced by discourses it also takes into account Sabatier’s (1999) conception of how a policy process involved various actors, networks, their interactions and their knowledge, communication of knowledge and politics: and thus needs to be seen through ‘multiple lenses’ for a holistic understanding of it. Hence this thesis traces the role of various actors in the policy process of the biodiesel mission and takes into account their interests, knowledge and politics, networks, and their interactions. Although this thesis stresses on the intricacies of the

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2 The development initiative refers to the National Mission on Biodiesel
policy-process of a development initiative in India it also looks at the NMB as a socio-technical development project. This thesis is anchored in the discipline of Science and Technology Studies (STS) and from the perspective of STS studies it addresses the role of the NMB as a socio-technical solution to address development challenges. The thesis draws from Actor Network Theory (ANT) and Social Construction of Technology (SCOT) to analyse how the NMB progressed as a test model and whether it really was a ‘pro-poor’, ‘pro-growth’ development initiative. The aim of this thesis is not to only find out whether development initiatives work but also how development projects work in India; not only whether the NMB worked, but how it developed and progressed.

Hence this thesis addresses the potential of a technological solution to address development challenges (NMB to address energy security and rural development); it centres on the introduction and trajectory of the NMB – a pro-development energy initiative. It addresses the issue of how the NMB was socially constructed, how development narratives were used to promote it, how networks were created to establish the biodiesel mission as a policy option and advocate its adoption, and in turn how the NMB progressed as a development initiative. As the thesis draws from SCOT the discussion will emphasise on the role of society in shaping technology, the importance of users (scientists, policy-makers, farmers, labourers, representatives from the industry and NGOs), how users are represented, and in turn how the rural development initiative had an impact on the people adopting it.

This thesis contributes to the understanding of the policy-making process of development renewable policies in India and it also examines the apparent inevitability of a technological solution to development challenges. It also contributes to the literature of narratives serving as ‘blueprints’ for development policy-making and how technologies, development initiatives, and missions are socially constructed and associated with different meanings. Additionally it makes an

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3 The term user is defined in Chapter 3.
empirical contribution to the literature on biofuels by revealing the complex nature of regional and national biodiesel networks in India that comprise a part of the rising Global Biofuel Network.

While this thesis mainly focuses on the NMB, the policy-making processes analysed in this thesis can be used to get an idea of how development renewable policies are formulated and promoted in India and to what extent do they work or address development challenges. This research reflects the growing convergence of social science disciplines. The research is situated within Science and Technology Studies (STS), which is itself an interdisciplinary field of scholarship. While STS offers the starting point for this research, concepts from other disciplines – most notably those from development studies, policy-making studies, and anthropology of technology – will be drawn upon to gauge specific issues.

### 1.4 Objectives and Research Questions

The main objective of this thesis is to study the emergence and trajectory of the NMB as a development policy option in India and examine the consequences of this development programme. To answer this question I have three sub-questions.

1. What are the narratives supporting the development of biofuels (biodiesel) in India and how reliable are these narratives?

To understand how biofuels have been popularised in India it is imperative to analyse the narratives promoting biofuels and their underlying assumptions. According to Roe (1991) narratives are widely used in development policy-making because they simplify complex development problems, he also adds that narratives are used as shorthand in the process of blueprint policy making, hence by identifying and deconstructing the narrative it is possible to discover what assumptions it is founded on. Among the narratives used to promote the NMB I will focus on two issues; the role of ‘Jatropha as a wonder crop’ and its ability to grow on ‘wastelands’. I will analyse the claims of Jatropha being a hardy crop that can grow on degraded land with minimum or no inputs of irrigation, fertilisers, and pesticides. I will then discuss the issue of wastelands being used for the cultivation of Jatropha and whether these
so called lands are really wastelands? I argue that these narratives had no scientific backing or truth to it.

The second sub-question focuses on how the biofuel discourse was supported as a development initiative and constituted as a policy programme.

2. How was the biodiesel programme constituted in India?

To answer this question the thesis unpacks the policy-making process in India and studies the role of technocrats and formation of actor-networks that supported the NMB at the central and state-level in India. The analysis on the policy-making process in India centralises on the role of technocrats and policy-makers in devising the NMB to prove that “development policy ideas are important less for what they say than for who they bring together” (Latour 1996). The discussion draws on Scoones’s analysis of the science-politics-bureaucracy interface in India and aims to discern how particular storylines were embedded in the National Mission on Biodiesel. It focuses on the strong presence of technocracy in policy-making in India and in turn reveals the interest of others actors which were represented in the NMB. The thesis draws from Actor-Network Theory (ANT) to describe the linkages formed at the national and local level. It employs the metaphor of actors and draws from Callon and Latour’s work to demonstrate how the networks were formed and in turn compares and contrasts the creation of three types of networks, government led network, research centre led network, and private company-NGO led network across three different states (Callon 1986, Latour 1987).

3. Why did the rural actors/users (farmers and landless labourers) cultivate Jatropha and how did the NMB affect them?

Based on the three types of networks that promoted the NMB at the local level, I will focus on the consequences of the NMB across the three case-studies. As this thesis draws from SCOT, I argue that it is important to reveal the outcomes of the
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NMB from the perspective of the users\(^4\) adopting it. The empirical data collected in this thesis will be used to explain how the various users associated with the initiative and why they adopted it. The data will reveal how the NMB was viewed differently by various actors and in turn how it affected them.

1.5 Structure of the dissertation

The thesis will proceed as follows:

**Chapter 2** introduces India. After a brief introduction on India the chapter focuses on the role of science and technology in colonial and post-colonial policy-making in India. It highlights how science, technology, and expertise play an important role in development policy-making in India and cites examples from the atomic programme, agricultural development and forestry department.

**Chapter 3** introduces the three research themes that answer the three research sub-questions. Research theme one focuses on the literature on narratives in development policy-making and how they result in blueprint development. It aims to highlight how policy-makers and experts use narratives to simplify complex development issues and in turn misrepresent the needs of the local people. Research theme two focuses on the role of networks, policy-networks in policy-making. It introduces ANT and the importance of national and regional networks in India. It introduces the framework I will use to trace the creation of the national policy network and the regional networks in India. Research theme three introduces the role of users in STS literature and anthropology of technology. It focuses on social and cultural practice and how it impacts the adoption of a development initiative. The three research themes introduce the literature used to answer the three research sub-questions, gaps in literature, how I intend to address these gaps and the frameworks used to address these gaps.

\(^4\) Here users refer to the rural users (farmer and landless labourers) who adopted the NMB as a development initiative. This is discussed in Chapter 3.
Chapter 4 introduces the methodology of this research. It explains the research process in detail and the various methods used in data collection. The research adopted a qualitative approach towards data collection and analysis. This research focuses on the development of NMB as a rural development policy option and its adoption across India. The research followed a case-study method to analyse the creation of three regional networks in Tamil Nadu, Maharashtra, and Chhattisgarh. The secondary and tertiary data were collected from various documents while primary data were collected during the fieldwork carried out in India from January 2009 to September 2009. The chapter introduces the three sites where data were collected. It delineates the research experience and also reflects on the role of the researcher in the research process. It focuses on the research methods, their strengths and weaknesses, and how the research experience in turn shaped the manner in which data were analysed.

Chapter 5 draws from research theme one to explain the importance of narratives in policy-making. It introduces the global biofuel scenario and lists the global narratives that played an important role in popularising biofuels the world over. The chapter then focuses on the local biodiesel narratives in India. It discusses how the narratives while being influenced by the global narratives followed regional characteristic unique to India. The chapter then contests the reliability of pro-poor and pro-development narratives of the NMB and focuses on the two main biodiesel narratives; Jatropha being an ideal crop to produce biodiesel and the use of wastelands to cultivate Jatropha. The chapter contends that these two narratives were not backed by sufficient scientific data and misrepresented the needs of the local people. The chapter discusses the unreliability of these narratives and how they were still used to support the NMB.

Chapter 6 discusses the policy-making processes of the NMB. It focuses on the role of technocrats and policy entrepreneurs in supporting the NMB. It then discusses the how the national policy network was created and how it played a key role in supporting the introduction of the NMB as a policy option. The chapter then focuses on the creation of the three regional networks; government-led network in
Chhattisgarh, research organisation-led network in Tamil Nadu, and private company-NGO led network in Maharashtra. The chapter introduces the actors across the networks, how they enrolled more actors and created primary and secondary networks to support the adoption of the NMB across India. Finally the chapter compares and contrasts the three regional networks.

**Chapter 7** focuses on the role of rural users (farmers and landless labourers) in the adoption of the rural development initiative the NMB. The biodiesel initiative was advocated as a *pro-poor, pro-growth* initiative and to answer the final research question it is necessary to concentrate on the role of the rural users who had to cultivate Jatropha under the NMB. The discussion in chapter introduces the two types of users across the three research sites and reveals how they associated with the other actors in their regional networks and in turn how and why they cultivated Jatropha. The chapter reveals the tacit meanings associated with the cultivation of Jatropha across the three networks.

**Chapter 8** aims to highlight the consequences of the biodiesel initiative in India from the perspective of the various actors in the biodiesel network in India. It reveals how the government officials, bureaucrats, and officials from private companies and NGOs represented the outcomes of the NMB. The chapter then discusses the consequences of the NMB on the rural people and highlights issues of contract farming, diversion of CPRs to cultivate Jatropha, gender issues, and land grabbing issues. The chapter also highlights some of the positive impacts of the NMB. The chapter finally discusses the end of the NMB as a policy option.

**Chapter 9** concludes the discussion. It reiterates the main arguments of the thesis and will discuss the key issues identified in this thesis. It will focus on the inability of narratives to solve development problems and in turn it will highlight how counternarratives used in the new biofuel policy are inadequate. The thesis will critique the role of technocratic policy-making in India despite the GoI saying the policy-making process is decentralised and involves local planning. The thesis will then discuss a flaw in ANT and argue that networks do not only function by enrolling
actors and the negotiations between them. Rather from the NMB it is evident that the rural actors involved in the biodiesel network were either coerced, manipulated, or lured to cultivate Jatropha. Finally the thesis will discuss the gaps it has addressed and the theoretical and empirical contributions of this thesis.
Chapter 2: India

2.1 Introduction

The NMB was introduced as a development policy initiative in India as a test model. This chapter will introduce India as a country, it will list details such as the population of the country, number of states in India, languages spoken, how the constitution is set up, the rising economic and growth rate and in turn why India is trying to promote renewable energy policies. The chapter will focus on the role of science, technology, and expertise in colonial and post-colonial development policy-making. To highlight the importance of science and technocrats in development policy-making in India, the chapter cites examples from the nuclear programme, agricultural development, and the development of a forestry department.

2.2 Introducing India

India gained independence on 15 August 1947, and even though it remained a member of the Commonwealth, it was proclaimed a republic when the constitution was inaugurated. The Indian constitution sought inspiration from the domestic British political practice and adopted a Westminster style of government. The parliament comprised two houses, the Lok Sabha and Rajya Sabha; the Prime Minister was elected by members of the Lok Sabha while the President was the titular head of state. Jawaharlal Nehru was the first Prime Minister of India and he sought to create a ‘modern’ free India. Under him the constitution laid out a vision of a modern, sovereign, federal, socialist and secular country (Corbridge and Harris 2000).

India is the world’s second most populous country with a population of over 1.21 billion comprising a multiethnic, multilingual, multicultural, and multilevel society (Census of India 2011). India has 28 states and 7 union territories; Figure 1 is a map depicting the states and union territories in India. India is a diverse country and encompasses a broad spectrum of religions like: Hinduism, Islam, Christianity, Sikhism, Buddhism, Jainism, Zoroastrianism, Judaism, and other tribal religions. Of the total population Hindus comprise 80.5 %, Muslims 13.4%, Christians 2.3%,
India is termed as the world’s largest and most fractious democracy, however many scholars argue that the democracy in India is a paradox to the prevailing theories and preconditions that stipulate democracy (for instance see Kohli 2001). The success of a democracy depends on determinants like – high level of industrialisation, developed economy, ethnic homogeneity, civic culture, and low levels of poverty. Despite the absence of these determinants India is still a democratic country and democracy has prevailed since Independence (ibid.). Various arguments and
interpretation exist on the emergence of democracy in India. According to Weiner (1989 cited in Kohli 2001) democracy in India is a legacy of British colonialism, however his argument has been challenged on the ground that democracy in Pakistan and other former British colonies did not survive or thrive well. While India inherited a centralised state, functioning civil service, and early introduction of elections during the colonial rule, the Indian nationalist elite and nationalist movements played a key role in the institution and sustenance of democracy in the country (Weiner 1989, Varshney 1998 cited in Kohli 2001).

The Indian National Congress (or Congress) was the party that headed the national movement for freedom and the majority of the nationalist leaders were part of it which made the party widely popular among the people. Jawaharlal Nehru belonged to the Congress and was the first Prime Minister of India under whom institutions and practices of democracy were embraced in India. According to Kohli (2001, p.6), “Nehru, utilised his inherited political capital wisely” by accommodating rival elites under the banner of the congress. During his period India’s “new” civil service was instituted from the prevailing civil service of the colonial period (Potter 1986 cited in Kohli 2001, p.6) and it contributed to effective management of the government and imparted political stability. The ruling Indian National Congress and the civil service ensured the presence of democracy in the country and the other fact which helped democracy prevail was the lack of a strong political society in the early years which could result in political conflict. In the initial years conflicts were prevalent between rival elites, particularly regional elites demanding a greater share of control of power and resources with the Central Government. Conflicts between the elite and mass were minimal and such conflicts hardly spread across different regions.

However, this status quo was challenged in the 1970s and 1980s, when numerous new elites entered the political arena challenging the power and position held by the Congress and at the same time there was a new growing population of mobilizable citizens who were willing to stand up or revolt against the existing system (ibid.). The decline of Congress’s hegemony resulted in the rise of the Bharatiya Janata Party and other regional parties. While the BJP was a right–leaning nationalist party,
the regional parties won the majority on regional nationalism which has a greater appeal than Hindu nationalism (Basu 2001). They built their power base around the issue and support of “backward castes” and associated themselves with the backward castes whom the Congress had failed to incorporate. As a result, in the last two decades many regional parties have gained significance in their opposition to the Congress and have played a major role in decreasing the hegemony of Congress.

The Indian constitution calls for “equality of status and of opportunity” and prohibits discrimination based on religion, race, caste, sex, or place of birth (Weiner 2001, p.193). Despite a long history of opposition to the ideology of caste both within and outside the Hindu tradition (Rao 1989 cited in Kohli 2001) caste-based practices and politics still exist in India. The movement for change is not aimed at putting an end to caste; it rather “employs caste as an instrument for social change” (Weiner 2001 p.194). Weiner (2001) states that:

The democratic system in India created an incentive for political mobilisation along the lines of caste, religion, and language. Indian politics became the arena within which group identities were sharpened, and individuals sought material benefits through group membership (Weiner 2001, p.198)

There are myriad cultural differences in India, and the Government of India (GoI) has responded to this issue by constituting “a federal conciliation of regional community, identity, and autonomy” and the presence of the central and state governments has ensured a “novel mode of multicultural national development” (Dasgupta 2001, p.49). Despite stratification in the Indian society based on caste, religion, identity, language and region; democracy has prevailed in India.

This thesis traces the development of the biodiesel initiative in India and it is important to discuss the Indian economy and the reforms which liberalised the Indian economy. When India gained independence it was a large, diverse, and poor country that inherited many economic problems from its colonial past. At independence the economy was largely dependent on agriculture, with four-fifths of the population
residing in the rural areas and only 10% of the population worked in the manufacturing sector (Tomlinson 2008). To increase growth rates, which had been dismal during colonial rule, the new Government of India (GoI) emphasised inward-oriented growth and protected home market for the development of the economy (Sengupta and Neogi 2009). India adopted a ‘mixed economy’ approach combining Keynesianism with socialism, with major investments in the public sector but also with some sectors open to private capital (Ahmed 2007).

The government played an important role in directing the course of the economy and set up the Planning Commission, which was entrusted to promote a rapid rise in the standard of living of the people by efficient utilisation of the resources of the country (Planning Commission of India 2011). The economy was controlled through the introduction of five-year plans developed and monitored by the Planning Commission. The Indian economy was stringently controlled, both internally and externally, and the International Monetary Fund (IMF) referred to India as “one of the most heavily regulated economies in the world” (IMF 1995 cited in Nayar 1998, p335). Athreya’s lecture in 2008, stressed the serious balance of payments India faced in 1990-91 following a decade of loan-financed expansionary policies, accompanied by indiscriminate commercial borrowing abroad and trade liberalisation, along with adverse international developments, especially with respect to the price of oil. He further stated:

expansionary policies financed by large scale internal borrowing and large budgetary deficits arising from an unwillingness to tax the rich to finance increased government spending, resulted in a fiscal crisis, with government’s revenues falling far short of expenditures (ibid., p.5).

The twin crises impelled the Indian Government to borrow money and follow a programme of structural adjustment dictated by the World Bank and the IMF. The “New Economic Policy” adopted in 1991 resulted in,

devaluation of the rupee, increase in interest rates, reduction of public investment, restructuring of the industrial sector, increase in imports and foreign investment in capital-
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intensive and hi-tech activities, and abolition of the cash compensatory support for exports (Ahmed, Kundu and Peet 2011, p.25).

The new reforms embraced globalisation, liberalisation, and privatisation, and the subsequent change from “Licence Raj” to the “New Economic Policy” resulted in very high growth rates (Athreya 2008, Ahmed, Kundu and Peet 2011). The Gross Domestic Product (GDP) of India grew at a rate of 5.9% a year in the period of 1990-2005, with annual rates of growth of 8.5, 7.5, and 8.1% in the budgetary years 2003-2004, 2004-2005, and 2006-2007 (india.gov.in). The neoliberal reforms altered the balance between nationalism and globalisation with the top leadership adopting a paradigm shift from the state to the market and openly embracing globalisation and the integration of the Indian economy with the world economy (Nayar 1998). Indeed the Indian economy in recent decades has been one of the world’s fastest growing economies and unlike other countries with high growth rates in east Asia, the Indian economy has risen within the framework of a democracy (Kohli 2006).

The economic revolution created a strong base of professionals who constitute the middle class; however it benefitted the business elite the most. The high growth rates and economic expansion has also brought in its wake a multitude of problems. Ahmed, Kundu and Peet (2011, p.29) state:

Such growth has spectacular effects in the way of “world cities” with tall, new office buildings, opulent houses, high levels of conspicuous consumption, “modern looking” young people, new cultural styles, cosmopolitanization, and so on.

They argue the economic growth under neoliberalism has been beneficial to the minority of the population and has not helped the poor or the rural people in India. The new reforms has resulted in a decrease in investment in agriculture, reduction in subsides on fertilisers, and has instead increased rural to urban migration. Farmers are now working as labourers in the construction industry in urban areas and those who are still in the farming sector are not seeing the benefits of the new economy, but rather their conditions have deteriorated. The rapid economic advancements have accelerated the serious challenges faced by the government with respect to energy
security, environmental sustainability, and rural development (Patnaik 2006). Due to the high growth, today India is one of the top five energy consumers in the world and to meet the ever increasing demand for energy the GoI has been developing alternative renewable technologies. Renewable technologies are in the limelight as they have gained the status of being environmental friendly and offer an alternate route to the developing countries to achieve industrialisation without the detrimental effects of using conventional sources of energy.

Among the viable options of renewable technologies, biofuels have been in the limelight for a while. However, in India biofuels are being adopted not only to address energy security and environmental sustainability; they are being promoted to tackle the issues of poverty by creating employment in the rural areas and revitalising the agricultural sector.

### 2.3 Science and Technology, and Technocracy in Indian Policy-making

The introduction of Western science and technology in India can be divided into three phases; the first phase dealt with the exploration of India by conducting widespread topographical, statistical, trigonometrical, cartographic and other related surveys. These surveys were conducted on a scientific basis and had significant effects on the development of science and scientific knowledge in India and Britain. The second phase resulted in the creation of scientific and technical education in colonial India and the third phase consisted of attempts by the colonial state to create institutional links among science, technology, and the Indian economy and this ultimately resulted in the development of scientific institutions which had substantial effects on the evolution of science and technology as well as development of the Indian society (Basalla 1967, Baber 1996). Science and technology was initially advocated during the colonial rule to meet the interests and motives of the British Empire and with the passage of time it was recounted as a mean to empower the...
country to be able to govern itself which is evident from Alfred Chatterton’s\textsuperscript{5} statement, “When India can do her own engineering work and carry on her own industries, then, and only then will she be able to govern herself” (Chatterton 1912 cited in Baber 1996, p.137). It was reiterated that science and technology was requisite for the people of India and would alleviate them from poverty and instill a sense of moral responsibility and subsequently enable them to contribute to the politics of the country. According to Lord George Curzon:

\begin{quote}
We are trying to graft the science of the West on to an Eastern stem. We have raised entire sections of the community from torpor to life, and have lifted India on a higher moral plane. In proportion as we teach the masses, so we shall make their lot happier, and in proportion as they are happier so they will become more useful members of the body politic (Curzon 1904 cited in Baber 1996, p185).
\end{quote}

With time Indian scientists and industrialists realised the necessity of articulating science in the national movement (Arnold 2000) and the first among them was a Mahendra Lal Sircar. He was one of the most prominent educated elites from Calcutta in the nineteenth century; he was also a doctor who had a successful medical service (Lourdusamy 2003). Sircar wrote “on the desirability of a National Institution for the Cultivation of Sciences by the Natives of India”, in which he demanded for an institution which would “combine the character, the scope and the objects of the Royal Institution of London and of the British Association for the Advancement of Science.” He added, “I want freedom for this Institution. I want it to be entirely under our own management and control. I want it to be solely native and purely national” (Sircar 1869 cited in Kumar 2000, p.242). The goal of the Association, as envisaged by Sircar was to “cultivate and propagate a taste for modern science among the learned public”. One of the primary defects of the colonial education system was the inadequate provision in teaching science and the

\textsuperscript{5}Alfred Chatterton was an official of the Madras Government Service and is well-known for introducing the Department of Industries.
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Association aimed at addressing this deficiency. Arnold (2000) further argues that when India was developing its own scientific expertise there were many scientists and civil service personnel who did not believe in the credibility of Indian scientists and therefore they aligned colonial science even more firmly with metropolitan authority. Hence the goals of the Association were to create a strong scientific base of Indian scientists and serve as a pedestal for the pursuit of science and technological innovations (Arnold 2000, Lourdusamy 2003, p.381).

However, it was not an easy task because Sircar’s dream of setting up the Association, involved a complex web of socio-cultural and political challenges. He appealed to the scientific community and the rich landlords of India to help set up the Association. He was supported by contemporaries like Bankim Chandra Chatterjee, Iswar Chandra Vidyasagar, Swami Vivekananda, and Keshub Chandra Sen who appealed to their compatriots to support Sircar’s endeavour. Ultimately after concerted efforts of key scientists, the Indian Association for Cultivation of Science was set up in Calcutta in 1876 (Kumar 2000).

Gyan Prakash (1999) in his book ‘Another Reason’ speaks about the calls for translation of power in science in India. He explains how with the passage of time many renowned scientists pressed for improvements in the field of science and technology and the call for it was associated with the nationalist movement of India. Indian scientists called for “science’s authority” to be transferred to the Indian scientists and not imposed by Western scientists (ibid., p.49-51). Several scientists offered their opinion and expertise to solve the myriad problems plaguing the Indian society. The scientists had varying views to achieve progress and develop science and technology in India. The approach adopted by the scientists differed, some supported progress through industrialisation, others the swadeshi movement, while few others wanted to adopt the best of both. For example, Maghnad Saha a pioneer astrophysicist ardently supported industrial progress through means of careful and deliberate planning backed by scientific research (Kumar 2000). Whereas P.C. Ray under whom Saha had trained supported the swadeshi movement, while Visvesvaraya an eminent engineer demanded rapid industrialisation by utilising India
Indian capital and enterprise. While Saha insisted on rapid industrialisation applying the rationale of the scientific method; S.S. Bhatnagar and Homi. J. Bhabha preferred to build centres of excellence in frontier areas of science research (ibid. 2000). They were pioneers in their field and played an important role in instilling a tradition of science and technology in policy-making in India. S.S Bhatnagar built a chain of laboratories which came under the Council of Scientific and Industrial Research (CSIR), while Bhabha pioneered the development of nuclear technology in India. Thus prior to Indian independence there had emerged a group of Indian scientists who were keen to pursue science for development and industrialisation in India (Abraham 1998, Prakash 1999, Arnold 2000, Kumar 2000). The views and expertise of these scientists laid the foundation of technocracy playing a part in policy-making in India.

2.3.1 Science and Technocracy in Independent India
Post-independence, in his address to the Indian Science Congress, the first prime minister of India, Jawaharlal Nehru spoke of the “relationship of science to development, and of atomic energy to war” (Abraham 1998, p.46). Nehru was keen to harness the power of science for national development and advocated ‘a scientific temper’ for Indians (Abraham 1998, Scoones 2006). Nehru set his sights on transforming India’s industrial production through large-scale technological projects, and technocracy envisaged for independent India was concretised by linking science and technology to planning. Under his leadership the CSIR, the Atomic Energy Commission, and the Planning Commission took shape; and it was within these institutions, and their subsequent counterparts, that scientific and technological expertise were brought to bear on policy-making. The Planning Commission was instituted with the aim of it being a core policy institution that would manage sectoral coordination of different planning themes for the achievement of socio-economic goals set by political leadership and would be pivotal in spawning a tradition of centrally-coordinated science and technology projects aimed at fuelling India’s socio-economic development (Mathur and Mathur 2007).
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On 15th August within hours of gaining independence “a portfolio for scientific research was created under the Prime Minister, symbolising his deep attachment to science and technology as the key to India’s modernity” (Arnold 2000, p.209-210). The role of science, scientists and their expertise laid the foundation of technocracy playing a key role in policy-making in India and to illustrate it, the ensuing section will cite examples from developments in atomic energy, agriculture, and forestry.

Dr. Homi J. Bhabha (1966) expressed that Western Europe surpassed the rest of the world since industrial revolution due to the development of modern science which enhanced their ability to better utilise the resources of nature and improve their standard of life. In due course of time the U.S.A overtook them in industrial development and few other countries also joined the list of developed nations. However, the majority of the countries the world over have not attained that status and he attributed it to the lack of modern science and an economy based on modern technology. He felt that a scientific outlook must be a part of the metal makeup of every individual and for that the education system had to be reshaped accordingly. He expressed that scientific teaching and research at the Indian universities must be strengthened and expanded (Abraham 1998). He was a pioneer in the field of science and technology in India and developed the nuclear programme in India.

Bhabha realised the potential of nuclear energy as a viable alternate source to power generation from non-renewable sources and sent a proposal to Dorabji Tata Trust, to fund him in instituting a nuclear research programme in India. On 19 December 1945 the Tata Institute of Fundamental Research (TIFR) was inaugurated and within a span of less than three years the Atomic Energy Act was passed on 15 April 1948 which was further supported with the creation of an Atomic Energy Commission on 10 August 1948. This commission was entrusted with the task of intensifying research and studies related to the exploitation and development of nuclear energy that would benefit the nation. Under the aegis of this commission the Atomic Energy Establishment Trombay, was set up in 1954 and the commission which had been functioning under the Ministry of Natural Resources and Scientific Research was brought under the control of the newly constituted Department of Atomic Energy.
Dr. Homi Bhabha was the Secretary to the GoI for that department which remained directly under the control of the Prime Minister Jawaharlal Nehru. Hence the Prime Minister was the head of the department and the next important person was a scientist who played a key role in decision making and all nuclear policies were set by an unwritten understanding between Nehru and Bhabha (Abraham 1998, GoI, Department of Atomic Energy, Bhabha Atomic Research Centre 2011). The appointment of a scientist of credible expertise manifested the tradition of science and scientists playing an important part in policy-making in India and they were revered to such an extent that when Dr Homi Bhabha died in an air crash the then Prime Minister Indira Gandhi renamed the Atomic Energy Establishment Trombay to Bhabha Atomic Research Centre (BARC).

Initially technocracy in India was dominated by physicists and engineers and was aimed primarily at industrial production, however new concerns emerged in the post-Nehruvian era in the mid-1960s. Nehru’s successor, Shri Lal Bahadur Shastri, redirected the efforts of science and technology towards agriculture and his efforts led to the shift in emphasis from heavy industry to agriculture whereby plant breeders and agricultural scientists defined the new era of technocracy and paved the path for the emergence of Green Revolution in India (Varshney 1998). The Government of India (GoI) pursued a policy of promoting agriculture, and a network of agricultural research institutions and universities – under the umbrella of the Indian Council of Agriculture Research (ICAR) – along with extensive bureaucracy were set up to implement the vision of Green Revolution (Arnold 2000). It was believed that by creating model scientific institutes and recruiting and training experts the condition of rural peasants could be improved. To help revitalise the agricultural sector American agronomist Norman Borlaug was invited to India, and the GoI in collaboration with the Ford Foundation introduced 200 metric tons of a high-yielding variety of Mexican wheat. Along with Borlaug, an Indian scientist M.S. Swaminathan played an important role in the introduction of high yielding varieties (HYV) of wheat in India. India’s green revolution took place from 1967-1978 and Swaminathan was appointed as the director general of the ICAR from 1972
to 1979. The concerted efforts of Swaminathan and his team of agricultural scientists convinced the minister of agriculture of the high-yielding capability of the new variety of seeds which resulted in the approval of the decision to import 18,000 tons of HYV wheat. The introduction and distribution of these seeds at subsidised rates marked the beginning of the Green Revolution in India (Parayil 1992). Soon the green revolution turned in to a mass movement in India and revolutionised the agricultural sector in India. Although funding and technical advice were solicited abroad, the Green Revolution was largely cast as a national endeavour and M.S. Swaminathan was given the title of the Father of Green Revolution in India.

Atomic energy and agriculture were not the only areas where the alliance of science and state grew rapidly in India, scientific approach also characterised the development of the forestry department (FD) (Arnold 2000). An “enlightened group of [scientists]…saw in rapid deforestation…cause of dessication, soil erosion and climatic change…a cause of India’s…worsening droughts and famines” (ibid., p.147). These scientific views were acknowledged and resulted in the setting up of the Indian forestry department in 1864 and this department played an important role in post-independence development policy in India (ibid.) Under both the British and independent Indian administration, the forestry department was linked to the economic development of the state, and after independence “forests became increasingly tied to the needs and goals of the independent Indian state” (Haeuber 1993). Post-independence the GoI reckoned not only that “forestry was destined to play an important role in Indian industrial and agricultural development, but that forestry issues would become a critical element in inter-state relations” (ibid., p.58).

The Central Board of Forestry (CBF) was created in 1950 to coordinate forestry research, education and practice and “assume an active policy development role” (ibid., p.58). The members of this board comprised central and state government forestry officials and policy-makers and they issued a forestry policy as GoI resolution in 1952 (Guha 1983). According to this resolution, the forestry policy aimed to protect not only the interests of the state and central government but also the forestry communities (tribals and adivasis) who depended on forests (ibid.).
However Haeuber (1993, p.59) contends that the “new policy explicitly maintained the colonial emphasis on precedence of national interest over local demand”. The policymakers further stipulated that to increase productivity of natural resources and minimise deterioration a “system of balanced and complementary land use needs to be evolved (ibid., p.59). To achieve this goal the CBF recommended that “one third of Indian land should be under forest cover and that the proportion of forest to overall land area should be 60 percent in mountainous areas and 20 percent in the plains” (ibid., p.59). Guha (1983) argues that this modified policy catered to the interests of technocrats and bureaucrats in the CBF and did not address the needs of the rural populations dependent on forests. The bureaucrats acknowledged that rural communities access the forests for fodder, fuelwood, and domestic agricultural needs but still their access to the forests should not compromise the national interests of the country. The GoI sought the suggestions of these technocrats and bureaucrats and “forest area controlled by forest departments [were] divided into protection forests, national forests, village forests (instead of minor forests) and treelands (the category of pasturelands was eliminated)” (Haeuber 1993, p.60). Hence despite the creation of the CBF to promote rural development, the policies created were represented by the interests of technocrats and bureaucrats comprising the CBF. Robbins (1998) reckons that despite the FD being a part of the state governments, policy, models, and targets for quantity, coverage, and species planted are decided at the centre by top bureaucrats in the Indian Forest Service. Saxena (1997) argues that, this empowers the central ministries to legislate over forests despite this being the responsibility of state. The forestry department officials played an important part in the NMB as they were in charge of cultivation of Jatropha in waste and dry lands in the forests. They prevented the rural farmers and labourers from accessing the common lands in the forests and this caused problems between the officials and the rural farmers. This will be discussed in Chapter 8.

The Green Revolution in India has become virtually synonymous with Prof. M.S. Swaminathan and atomic research programme with Dr Homi Bhabha. The majority of the projects whether focused on agriculture, nuclear research, space programme,
or any other field have displayed similar characteristics. They were headed by renowned scientists backed by the government and the initiatives were further strengthened by the central and state government (Scoones 2006, Mathur and Mathur 2007).

The previous section highlighted the introduction of western science in India, and the emergence and role of scientists in policy-making. The following discussion will introduce the concept of technocracy in policy-making. The formulation of policy is creative work, negotiating different points of view and different bodies of knowledge. While knowledge might not get established in policy in a straightforward linear manner, it is still assumed that policy-making pertaining to various fields, particularly agriculture and environment is driven by scientific knowledge (Keeley and Scoones 2003). Scientists and experts are called upon to speak “truth to power” (Jasanoff 2003) and based on these facts policy-makers form policy options.

Technocracy reflects a distinctly Western worldview and its ascendance coincides with the Enlightenment in seventeenth century Europe and later periods of industrialisation. Technocracy refers to a system of governance where technically trained experts rule by virtue of their specialised knowledge and position in dominant political and economic institutions. The union between science and politics has been described as technocracy (Fischer 1990) and science has thus acquired a privileged position in the political sphere. It is considered that those with expertise are highly experienced in their given field and are trained in the specialised collection and systematic analysis of data, and as professionals they tackle issues with neutrality and aim at dispassionate objectivity (Keeley and Scoones 2003).

Thus technocracy envisions a society guided by technical elites, who abide by the rules of scientific and technical rationality. Technocracy also assumes that certain kinds of experts will have jurisdiction over particular areas of concern. Further assuming the positivist philosophy, there is no need for excessive consultation over technical decisions because any group of scientists would arrive at similar conclusions (Fischer 1990). Hence it is not surprising that the cognitive authority of India
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science and scientists is being used to solve global and local problems and their expertise is being applied in the arena of policy-making (Yearley 1996). From the above discussion it can imply that anyone with technical expertise related to the field on which a policy is being contemplated can contribute to the process of policy-making, however according to the theory of technocracy, technical expertise solely refers to those trained in applied sciences. Technocracy refers to the adaptation of expertise to the tasks of governance and in turn gives rise to a theory of governmental decision making designed to promote technical solutions to political problems (Fischer 1990).

Mathur and Mathur (2007) contend the expanse of technocracy has changed in India over a period of time; initially renowned scientists, politicians, and bureaucrats played a major role in shaping the policy-processes. However, in 1991, neoliberal reforms were introduced leading to versatile reconstitutions resulting in a sharp reduction in government spending and an increase in the privatisation of public enterprises. This had an impact on the constituency of technocracy and policy-making which expanded to incorporate the private sector along with the civil-society and non-governmental organisations (NGOs). India’s contemporary economy has been described as ‘The New Economy’ a term used to denote the changes in the relationship between the central and state governments; the increased fiscal independence of the states and the emergence of private enterprises (Athreya 2009, Sengupta and Neogi 2009). This, as a result, has led to a gradual erosion of the centrally-led programmes and growing importance has been placed on the private sector and knowledge-based industries (Jenkins 1999). Introduction of new technologies, policies, schemes, and related ventures are encompassing a broader spectrum of actors at both the central and the state level. Reflecting this new setting, ties between science, technology, and politics in India today are not forged amongst only politicians, public sector scientists, and civil servants, but also scientists and

6 It includes engineering, applied mathematics, computer sciences, economics and the managerial and policy-oriented sciences now termed as managerial and policy sciences
entrepreneurs from the private sector in India and abroad (Scoones 2006). The base of expertise has indeed expanded and during the conceptualisation of the Second (1956-51) and Third Five Year Plans (1961-66) policy economists from both the Western Bloc (such as J.K. Galbraith from Harvard University, Jan Tinbergen from Netherlands) as well as the Eastern Bloc (Oskar Lange from Hungary) were a part of the expert community that deliberated on the models to be followed in India to achieve its development objectives (Mathur and Mathur 2007).

The above discussion has centralised on the role of science and technocrats in policy-making in India and how technocracy has expanded over a period of time. However, Scoones (2006) forewarns that although the gamut of actors forging technology-based policy might have expanded in India, it still remains the domain of elite experts. Many of the respondents said, even though the base of expertise has increased, the policy-making process in India does not include inputs from the wider population. One of the respondents, a government official said “the initial consultations about the biodiesel mission only involved key policy actors”, and once consensus was reached amongst them, formal documents were drawn and “released for wider approval”. The Indian government bureaucracy is dominated by “elite generalists” from the Indian Administrative Service (IAS) and they view open and widespread consultations with scepticism (ibid., p.71). Scoones (2003, p.34-35) cites the role of politics in the biotechnology policy in Karnataka and says, “by serving the interests of a particular elite, with a particular vision of what future economic development should be, the new politics of biotechnology in Karnataka creates a defined trajectory for change, one isolated from a broader and more inclusive, democratic debate”.

2.4 Conclusions
This chapter introduced India and highlighted the emergence of a new economy in India. It focused on the role of science and technology in colonial India, how Indian scientists demanded for the introduction of science in India and tried to establish an association of Indian scientists. The chapter traced the introduction of science in India
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colonial India and highlighted how science and technology still plays an important role in independent India.

The discussion in the chapter focused on the importance given to science and the expertise of scientists by the GoI. The chapter contended that scientists are considered above reproach and beyond critique in India. Scientists play a key role in development policy-making in India and often they hold important posts in the government. To prove this the chapter cited examples from the nuclear programme, agricultural development, and forest department in India. The chapter emphasised the importance of technocracy in Indian policy-making and how technocrats are not insulated from politics in India. Ultimately the chapter spoke about the changing expanse of technocracy and how actors for private sector and NGOs are being included in it. However policy-making in India is still the domain of policy-makers, and bureaucrats and scientists who act as policy entrepreneurs.
Chapter 3: Thematic Background - A Literature Review and Discussion

3.1 Introduction

In Chapter 1, I introduced the main question of this thesis and the three questions that aim to address it. Each of the three questions deal with three research themes, the first research theme focuses on the role of narratives in development policy-making, the second research theme focuses on the policy-making process and role of actor networks in India, the third research theme focuses on the role of users (government officials, bureaucrats, policy-makers, research scientists, officials from private companies and NGOs, farmers, and landless labourers) and the consequences of the NMB from their perspective.

In this chapter I will discuss each of these three themes, reviewing the literature and issues raised. In each theme I will discuss the literature I draw from, how the literature furthers my work and in addition how I address existing gaps in literature. The discussion in this chapter will give an introduction to the role of narratives in development policy-making, how they lead to blueprint development and why they are still used in policy-making. The chapter will then focus on the role of policy networks in policy-making and how narratives are used by actors in policy networks to promote certain policies. The discussion will draw from Actor Network Theory (ANT) to explain the terminology and importance of networks. Ultimately the chapter will draw from Social Construction of Technology to emphasise the importance of users (government officials, bureaucrats, policy-makers, research scientists, officials from private companies and NGOs, farmers, and landless labourers) promoting and adopting the NMB.

3.2 Theme 1 – The role of development narratives and the rise of biofuel narratives as blueprint development

For a long period of time policy analysis considered stories as inferior forms of information and reasoning, and favoured rigorous scientific methods and objective
data (Eeten 2007). In the 1980s a policy analyst named Majone, “demonstrated that good policy analysis revolves around crafting an argument, rather than applying logic and science” (ibid., p.251). This development paved the way for different and new approaches in policy analysis (Fischer and Forester 1993, Fischer 2003) as alternatives to the dominant empiricist models. Among the new options, narrative policy analysis emerged as one of them (Roe 1994).

Policy narratives are stories bearing a beginning, middle, and ending which describe or define events in a certain manner inherently shaping the outcome of policy decisions (Sutton 1999). Narratives function to simplify complex development problems because they represent particular ways of thinking and arguing which involves the political activity of naming and classifying and excludes other ways of thinking, thereby decreasing the scope for policy makers to ponder about new alternatives or approaches (ibid.). Feldman et al. 2004 emphasise the importance of stories in policy-making and state that

> Stories carry information relevant to decision making and enable participants in policy and administration to predict, empower and even fashion change. Stories have been said to mediate reality and construct political space and are critical constitutive forces in politics and public policy making (Boje 1991, Czarniawska and Skoldberg 2003, Martin et al. 1983, Schram and Neisser 1997 cited in Feldman et al. 2004, p.147).

Policy frameworks are often constructed as narratives or stories that give meaning to a situation. Conceptual frameworks in science, technology and innovation policies are usually constructed in the form of a story or narrative (Godin 2009). A narrative serves to simplify complex issues and creates a story which feeds in to the interests of various actors who will form alliances to promote the policy. For example, Fairhead and Leach (1997), and Keeley and Scoones (2003) speak about the narrative of African deforestation and savannization which was reinforced and supported by various actors.

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Mosse (2004) postulates that common narratives or commanding interpretations are supported for various reasons and serve a diversity of contradictory interests. Keeley and Scoones (2003) say that there is a history of selling a story: a narrative of potential crises which in turn result in the adoption of particular set of practices and actions, which require an international attention. Biofuels evoked interest the world over due to the creation and promotion of global narratives exemplifying the benefits of biofuels while positioning the interests of various actors (Borras et al. 2010). Similarly national narratives were created and promoted in India to popularise the NMB and foster its acceptance across the various stakeholders.

Biofuels subscribe to science, technology and innovation, and development policy options. While promoting developmental issues biofuel narratives have put science, technology and innovation on the political agenda. Godin (2009) advocates that a narrative on science, technology and innovation commences with the suggestion that something new is happening in the economy, and the new phenomenon or change will generate good returns. He states that, a “narrative is either in the form of hype, hyperbole or utopia, suggesting that enormous outcomes are looming” (Godin 2009, p.17). Narratives are backed by statistics because they suggest it is necessary to know about the new phenomenon or change, and statistics are needed to validate that a change is happening.

The biofuel narratives suggested that biofuels were green sources of energy and would reduce greenhouse gas (GHG) emissions, and in turn would reduce the consumption of fossil fuels. While supporting the promotion and introduction of a new technology, biofuels also served developmental issues such as rural employment and improvement of livelihoods (Mol 2007).

Even though narratives tend to simplify complex development, and science and technology issues, they have been widely criticised, as they lead to ‘blueprint’ development, prescribing particular set of solutions and reducing the space for alternatives (Leach and Mearns 1996). Narratives are created and promoted by policy-makers and policy-networks and they often tend to serve the interests of these Thematic Background
epistemic communities, and in the process reduce the role of indigenous groups by justifying the role of experts and outsiders in the policy process (Clay and Schaffer 1984, Roe 1991, 1994, Leach and Mearns 1996). According to Roe (1994) these experts and outsiders argue that local people do not have the necessary knowledge to handle their local resources hence there is a crisis and the local people need the help of development experts and professionally trained resource managers. Development narratives marginalise the interests of indigenous groups by “labelling and categorising them” and tend to conceive the target groups as “passive objects of policy rather than as active subjects”, this has been referred to as the ‘disarming of labelling’ (Sutton 1999, p.28). Roe (1991) argues that narratives tend to oversimplify complex development issues and are often based on shaky scientific facts. Leach and Mearns (1996) say that narratives while oversimplifying issues also tend to misrepresent a situation which results in decisions being formed based on false information.

This section has focused on the role of narratives in development policy-making and how they are used by policy-makers to solve complex development issues. The section also critiqued how narratives result in blueprint development, reducing the role of locals in the policy-making process and labelling of target population. The first research theme focuses on the importance of narratives in development policy-making and questions the reliability of narratives used to promote biofuels in India. To understand how biofuels gained prominence, Chapter 5 lists the global narratives supporting biofuels and it then focuses on the local narratives used to support the production of biofuels in India. Among the various narratives used to develop biofuels in India, I will focus on the reliability of two main narratives. The first is the claim of Jatropha being a hardy crop that can grow on degraded wastelands, has high yield rates and requires minimum or no inputs of irrigation, fertilisers, and pesticides. I will then focus on the labelling of the term ‘wastelands’ and examine whether these are really ‘wastelands’? Hence I will emphasise on the role of development narratives and in turn pay attention to how they label lands and target populations and if these narratives can actually solve rural development challenges.

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3.3 Theme 2 –The role and types of actor-networks that supported the NMB at the central and state-level

The second research question examines how the NMB was introduced as a policy mission at the central level and in turn how it was introduced across the states. To answer this question I focus on the role of actor-networks, policy-networks that play a key role in policy-making and in extending development projects. Policymaking occurs within specific social structures or through various ‘structural apparatus’, including existing institutional arrangements or ‘rules of the game’ (Ostrom 1992, Scott 2001) and actor-networks; the latter also referred to as policy communities, issue networks, or historically as iron triangles (John 2012). Latour and Callon, have through their Actor Network Theory (ANT) emphasised a ‘sociology of association’ (Latour 2005) the main principle of which—moving beyond the social as a given—is to trace multiple associations and translations between actors—both human and non-human—operating within certain networks. Once actors/actants are enrolled, social interests are temporarily stabilised. These allegiances function to build specific forms of truth, through moments of translation and finally mobilisation. Despite a rich lexicon, ANT faces some criticism. Steven Yearley (2005, p.65) considers that, if scientific controversies are understood as trials of strength and proof of that strength is whether the alliance is victorious then the “procedure is manifestly circular”. Nevertheless, ANT allows description of the importance of allegiances and consensus building as a form of legitimisation, especially in policymaking, even if not entirely providing a theory determining causality. This opens up the question as to how such support is harnessed (and perhaps how policy itself ‘acts’ with discursive power within such networks).

Policy networks incorporate a variety of government agencies, key legislators, pressure groups, relevant business and industry representatives, consultants and policy analysts and journalists, through which policies are forged (Keeley and Scoones 1999). To extend a policy, research project, or development initiative to other spheres, networks require actors who are protagonists or ‘policy entrepreneurs’ (Hart and Victor 1993). These actors play “crucial roles in publicising an issue,
succinctly defining the urgency of a problem and offering the possibility of a solution” (Keeley 2003); entrepreneurs and their ‘interpretative communities’ allow for further enrolment (Latour 1996) and they “participate in the established order as if its presentations were reality” (Sayer 1994 cited in Li 1999, p.374). While policy thus tends to reflect political interests a structuration argument further suggests that discourses and political interests influence each other, and both are shaped within and reshape existing networks and institutional structures or rules of the game (see also Jones 2009).

Policy decisions also do not automatically reflect evidence gathered to inform decision makers. Rather, ‘science’ may align with vested interests, is formed within and by various networks, or in cases can be entirely neglected. Narratives, such as pro-poor development serve as a means to enroll and propagate support, a means to sell rather than direct specific ends. Thus, focus needs to be given towards understanding how policies are formed by the actions of actors within their various policy networks, dissecting underlying discourses and narratives in a given context.

To understand how the NMB was introduced as a mission at the policy-level in India I will focus on the creation of the policy-network at the central level and actors that supported the NMB and how in turn the actors formed various networks to support this initiative. After emphasizing on the networks at the policy-level I will then examine how the NMB was established across the state-level. As stated in Chapter 1, the NMB initially emerged and progressed rapidly across India as a result of national and regional networks comprising actors from the government (politicians, bureaucrats, policy-makers), research centres, private companies, and Non-Governmental Organisations (NGOs) who actively supported its promotion. I argue that three types of networks namely government-led, research centre-led, and private company-NGO led network were pivotal in the promotion and uptake of the NMB across the different states in India. Hence I will trace the role of these three types of networks; the first network will focus on the creation of a government network in Chhattisgarh; the second network will focus on the role of scientists and research institutes in Tamil Nadu; and the third network will focus on the role of private

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companies and NGOs. Chapter 6 will explain in depth the creation of the various networks at the central and state-level. To explain the role of these networks I draw from ANT and argue that the actors supporting the formulation of the NMB as a policy option followed a four stage process which Callon (1999) describes as the ‘four moments of translation’. The terminology I use draws from Callon’s case study which dealt with new attempts to farm scallops off the north coast of Brittany in St Brieuc Bay. In the following section I will explain Callon’s case study to get a clear idea what the four moments of translation are.

The fishery of scallops was dwindling in St. Brieuc Bay and the French scientists wanted to try a new method to harvest scallops based on trials carried out in Japan. To try the new method of scallop rearing and farming the scientists followed a four-stage process termed the four moments of translation. The first ‘moment’ of translation is the process of ‘problematisation’; according to this the proponents of a new strategy have to propose ways in which it is in other groups’ interest to align themselves with the new undertaking (Yearley 2005). The scientists stressed that the scallop farming rates were reducing and it was in the best interests of the scallop-fishers to associate with the new type of farming if they wanted to safeguard their economic future. Hence the “desire of the farmers to sustain their fishery translated into” their acceptance of the scallop-rearing venture (ibid. p.58). Callon (cited in Yearley 2005) introduces the term ‘obligatory passage point’ OPP in which the scientists proposed their new method of scallop-rearing as the answer to solve the problems of the fishers. The scientists argued that their method was the best method, it would increase the yield of scallops, and they could be reared throughout the year.

However Callon (1999) says that there is no guarantee that all the actors (in this case fishers and other researchers) would give in to the problematisation proposed by scientists introducing the new scallop-rearing method. This then leads to the second moment of translation termed ‘interessement’, which is defined as “the group of actions by which an entity (here the researchers) attempts to impose and stabilize the identity of the other actors it defines through its problematisation” (Callon 1986, cited in Yearley 2005, p.58). Interessement is achieved by various techniques, for
example, in this case the scallops are interested by confining them in fine netted bags which shelter them and allow sea-water containing nutrients to flow through the bags. The fishers are interested through repeated meetings with fishers’ representatives where the researchers emphasise repeatedly about the dwindling scallop numbers and the success of the Japanese scientists’ experiment of farming scallops with netted bags. This process of interessement then leads to the possibility of ‘enrolment’ (ibid.). “Interessement achieves enrolment if it is successful” (Callon 1986, p.211).

Enrolment is the process by which the concerns and interests of various actors and parties’ involved with a project are translated into the project advocated by the key proponents of the project (Yearley 2005). Hence in this case-study without changing their interests the fishers and other actors adopted the new approach advocated by the French scientists. The final moment of translation is the ‘mobilisation’ of allies (Callon 1986). Once the scientists enrolled the other actors in their project, they could act as spokespersons for the “entire chain of allies: for the scallops, the fishing community and the scientific specialists” (Yearley 2005, p.59). According to Callon (1986, p.216) mobilisation “allows the exercise of power over and through one’s allies” that is “to speak to for others is to first silence those in whose name we speak” (ibid.).

I will use these terms to explain the manner in which the NMB was established as a policy mission and how in turn it resulted in the creation of associated networks. However it has to be emphasized that a creation of network involving the four successful moments of translation does not result in the success of a project (Callon 1986, Yearley 2005), this will be discussed in chapter 8. As stated in Chapter 1 various studies on the biodiesel mission in India have focused either on rural governance, policy-processes, yield rates of Jatropha, or economic feasibility of biodiesel production with examples from only one state. I address this gap by drawing from three case studies and tracing the role of three different types of networks across the three states. The three case studies add to the literature on ANT and networks of biofuels by citing relevant examples of three different regional networks.
networks and explaining how they differed in their role in promoting the NMB and resulting consequences across the three sites.

3.4 Theme 3 – The role of users (government officials, scientists, professionals from Private Companies and NGOs, farmers and landless labourers) in adopting the NMB and the consequences of the NMB on the rural users (farmers and landless labourers)

The third research question focuses on the adoption and consequences of the NMB from the perspective of the users (government officials, scientists, professionals from Private Companies and NGOs, farmers and landless labourers). As this thesis draws from Social Construction of Technology (SCOT), I argue that it is important to discuss the role of the various actors (government officials, scientists, policy-makers, professionals from private companies and NGOs, farmers and labourers) in promoting and adopting the NMB. A range of studies and research done on biofuels focus on the GIBN, biofuel complex, biofuel assemblage, governance processes in India, land issues, related consequences of the NMB in India, however, I argue that there is a gap in the literature on biofuels pertaining to the role of users and the social construction of this technology in India and across other countries. To address this gap my third research theme focuses on the various actors such as government officials, scientists, policy-makers, professionals from private companies and NGOs, farmers and labourers and their role in the promotion and adoption of NMB. I further emphasise on how the rural actors – landless labourers and farmers were affected by the NMB.

Prior to the discussion on SCOT, I would like to explain what I mean by the term user. The term user often implies to a person/group of people who use a particular technology. Hence in case of the NMB the user technically refers to the people who

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buy biodiesel and use it in their cars. In this thesis the user does not refer to the end user of the biodiesel technology rather it focuses on the users of the NMB as a rural development initiative namely the farmers and landless labourers who took up the cultivation of Jatropha. The thesis also refers to government officials, policy-makers, bureaucrats, officials from NGOs and private companies as users as they played important roles as actors during different stages of the NMB. Hence to clarify again the farmers and landless labourers are not classified as producers of the oilseed for the production of biodiesel but as users of the rural development initiative as they were the ones who cultivated Jatropha under the NMB. When fieldwork was carried out for this thesis, the NMB was in its initial phase, i.e. the plantation phase, hence it was beyond the scope of this thesis to focus on the users who were supposed to use biodiesel in their cars, as mass production of Jatropha had not commenced and it would take 3 to 5 years to yield oilseeds. The thesis hence studies the role of actors who promoted this initiative and in turn the role of the rural users such as farmers and landless labourers who undertook Jatropha cultivation.

To reveal how the NMB was viewed differently by various actors promoting it and why the rural actors (farmers and landless labourers) adopted it and in turn how it affected them, I draw on the literature focusing on the role of users and their practices from STS and anthropology of technology. Users and technology are often viewed as separate objects of research, but in reality users and technology are two sides of the same problem — as co-constructed (Oudshoorn and Pinch 2003). The general argument is that users are not passive recipients or consumers of the technology; they are also active agents of change who shape the trajectory of innovation (Kline and Pinch 1996, Oudshoorn and Pinch 2003). STS literature also mentions that the two spheres are co-constructed; users may shape the trajectory of innovation, but the technology also has an impact on their daily lives.

In the 1980s and 1990s, the old view of users as passive consumers of technology was replaced in some areas of technology studies, and one of the first approaches to draw attention to users was the social construction of technology (SCOT) approach (ibid.). The question is who exactly are these users? Who defines them, who speaks Thematic Background
for them, and how are they conceived by the designers of a technology? Theorists of SCOT conceive of users as a social group that play a part in the construction of technology (Pinch and Bijker 1987). The SCOT approach concentrates on the interpretative flexibility of a technology, and how different social groups construct radically different meanings of a technology. The studies focus on the early stages of development when the users are viewed as the shaping agents. Once ‘stabilisation’ is reached interpretative flexibility vanishes and a predominant use emerges (Pinch and Bijker 1987, Bijker 1995). This approach of SCOT was highly criticised, because even after stabilisation is reached users could still actively modify stable technologies (Mackay and Gillespie 1992).

Other STS scholars have focused on how users are configured or represented by designers? This approach introduces the notion of the user as a reader of a text and emphasizes on the interpretative flexibility of technological objects and processes that may delimit this flexibility (Woolgar 1991). The configuration is a two way process: the designers configure the users, but they are in turn configured by the users and their own organisations (Mackay et al. 2000). The capacity of the designers to configure the user can be constrained by the powerful groups within organisations which design projects and normally in large organisations the designers have to abide by specific methods and procedures that constrain design practices (Oudshoorn et al. 2004). Other scholars have further argued that the configuration process is not restricted to the actors within the companies producing the technology, and have in turn focused on the configuration work carried out by journalists, public-sector agencies, policy makers, and social movements acting as spokespersons for users (Oudshoorn 1999, Epstein 2003, Parthasarathy 2003, Van Kammen 2003).

The second notion in the approach to user-technology relationship is the concept of ‘script’. “The concept of script tries to capture how technological objects enable or constrain human relations, as well as relationships between people and things” (Oudshoorn and Pinch 2003, p.9). Akrich (1992) compares a technical object to a film script; just like a film script, technical objects encompass a framework of action along with the actors and the space in which they act. She suggests that in the design Thematic Background
phase technologists anticipate the interests, skills, motives, and behaviour of future users and in turn their needs are represented in the design of the new product. Subsequently, technologies contain a script: “they attribute and delegate specific competencies, actions, and responsibilities to users and technological artifacts” (Oudshoorn and Pinch 2003, p.9). However, the approach has a limitation — it stresses more on designers and technological objects and in turn under-emphasizes the cultural and social processes that shape how a technological script is read.

The biography of a technology reveals that it is not just the actual, real-life users who matter, but ideas about the user-user representations-are equally important in the relationships between users and technology (Lindsay 2003). Theorists of STS allege that users are designed or identified along with the technology. When the National Mission on Biodiesel (NMB) was envisioned, the designers (policy-makers, government officials, scientists) identified the rural users and their roles, however they did not perceive the extensive nature of different social groups of users (farmers and landless labourers) and how their resistance or shortcomings would in turn affect the outcome of the programme. The designers constructed a static image of the users and assigned roles to them and did not foresee the presence of other imagined users and how they could configure the technology.

Lindsay (2003), in her work on the TRS-80 and the role of users argues there is much more to the imagined users than the image constructed by certain groups of developers of the technology. She argues that user representations encompass many other users and they do not exist in isolation. My argument is that the developers of the biodiesel mission in India envisioned the farmers and landless labourers as mere passive recipients of the technology and did not anticipate their cultural and social impacts on the progress of the NMB. This will be further discussed in chapters 7 and 8. Findings from my research inform that, cultural relations in a particular area play a vital role in the manner in which the rural actors adopt or accept a particular technology. Any study of technology/development initiative and the role of the users should situate the technological practices within the community where the technology is being introduced. This is very important in addressing the role of the

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three types of regional networks researched in this thesis. Based on the cultural practices of the rural actors and their perception of the actors promoting the NMB across the different networks the adoption and consequences of the NMB differed. Hence it is imperative to analyse cultural practices and social relations of a community/region prior to introducing a new technology, development initiative or policy. To emphasise the importance of practices the ensuing sub-section will concentrate on the literature of anthropology of technology and the practice theory.

### 3.4.1 The Anthropology of Technology and Role of Practice Theory

As mentioned above the progress of NMB differed across the three states based on the types of networks, actors promoting it and the social relations and practices of the rural actors adopting Jatropha cultivation. Theorists within the discipline of anthropology of technology acknowledge that co-constructive processes shape technological development. According to them any technology (new initiative) should be viewed “as a system, not just of tools, but also of related social behaviours and techniques” (Pfaffenberger 1988, p.249). Practices or techniques are central to the analysis and it is stressed that technological practices are embedded in, and derived from, larger symbolic systems. According to the literature “technology is defined as a set of operationally replicable social behaviours: no technology can be said to exist unless the people who use it can use it over and over again” (Tornatzky et al. 1983, p.2). Technology then is essentially social and not technical, and while examining the impact of a technology on society, one is compelled to examine the impact of the technology’s embedded social behaviours and meanings (Pfaffenberger 1988). Pfaffenberger (1988) stresses that technology is not an independent, non-social variable that has an ‘impact’ on society and culture; rather, any technology comprises a set of social behaviours and a system of meanings. According to Mackenzie and Wajcman (1985, p.3) when we examine the ‘impact’ of technology on society, we are referring to the impact of one kind of social behaviour on another.

Lemonnier (1993, p.2) raises certain questions as: “why do societies adopt certain technological features and reject others?; to what extent do these technological changes influence society?”
choices influence transformations of technical systems and societies?; and how are these choices compatible with other social choices? He reasons that to answer these questions the anthropology of technology, besides providing inventories of technologies and studying the effects of technology on society, must rather deal with the relationship between technical systems and social practices. He argues that “the study of technology deserves a sociological approach: because techniques are first and foremost social productions” (ibid., p.3). According to Pinch and Bijker (1987) a technology appears in a variety of forms, while some forms ‘survive’ others ‘die’, the determinant of the surviving form does not depend merely on economic, technical, and rational choices. The form that survives is chosen by the social groups that succeed in imposing its choice over other competing forms. I draw from Lemonnier’s work to advance my claim that it is imperative to understand the role of the different types of networks and actors promoting the NMB across the three case studies and in turn how the social factors shaping practices and perceptions of the rural actors played a key role in influencing and defining the uptake and progress of the NMB.

There are several examples in the literature discussing how social factors shaped technological practices. I cite a few examples from the literature to prove my point that the consequences and progress of the NMB varied markedly across the three case studies because of the social factors and practices of the actors and rural users present in each site. Mahias’s (1993) studied pottery making in India to show how social factors impacted the technique of pottery making. From her study she observed that there are many different ways of making the same pot and there was a significant variation across sub-classes which indicated that such variation had social significance. Across India indigenous methods of pottery making were central to the processes of differentiation as well as caste identity. Potters from a particular clan and region were not allowed to share their techniques with potters from another clan, proving the presence of social status and hierarchy of potters.

Guille-Escuret’s (1993) analysed the refusal of farmers to use weedkillers in the wine growing regions of Southern France. Chemical weedkillers had been proven to be

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efficient and less labour intensive than ploughing the weeds. Despite its benefits farmers refused to revert from ploughing, they refused the new technology because of the social hierarchy afforded to a plough man in the rural society. According to their agricultural practices a proper wine-grower is one who is a good ploughman. The social hierarchy revolved around this practice, with the ploughmen at the top and the brassiers who pruned the vines occupying a subordinate position. The dislocation of the ploughing practice would also mean the reorganization of the entire structure. Such a reorganisation was not advantageous for the ploughmen who held an ideological superiority within the community. These two examples substantiate that technological practices are ingrained in social strategies. A major gap that this research wants to address is the presence of social practices, behaviour, and status of rural actors and how it affected their acceptance of the development initiative the NMB and in turn how the initiative affected them. There have been global and regional studies (mentioned in Chapter 1) focusing on biofuels and critiquing them but with my discussion on the perceptions and practices of the rural users I intend to address a gap in the literature of user perceptions of biofuels in a developing country and hope to cite examples from the regional case studies in India.

The literature further contends that whatever be the type of technical phenomenon on which cultural options impinge, the fate of a new artifact or technological procedure relies on its compatibility with the natural environment and with the state of the natural system at that time (Lemonnier 1993). Akrich’s (1992) study in rural Costa Rica, deals with the introduction of a gas generator and how the total lack of knowledge of the internal functioning of the machine, resulted in the villagers and local experts being unable to operate it. Representations of a technology or an artifact play an important part in how there are viewed by the group of users who will adopt, reject or modify it. Hence for a technology to be successful it has to be meaningful in terms of representations (Lemonnier 1993). The literature also focuses and analyses why certain technologies are accepted. Pfaffenberger (1992) expresses that a technology or a resource is accepted easily if it can fit into the existing or new activity system. Schaniel (1988) illustrates this point with his study of the Maori

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appropriation of iron artifacts. Initially when iron artifacts were introduced the Maori’s rejected them and continued using their hoes and spades for agriculture. Later they realised that iron artifacts could be incorporated in their indigenous system of agriculture, they modified their tools by attaching an iron rod to their digging stick and bound their hoes to short handles. The Maori’s accepted iron artifacts when they realised that it could fit into their existing patterns and conform to their local ideas of appropriateness. Hence the process of adopting and adapting to an introduced technology did not imply that a technology does not lead to change, but the change does not solely depend on the technology but also on the society where it is being introduced (Schaniel 1988). I draw from the above example to frame my argument and prove that the various rural actors across the three research sites viewed the NMB differently; they interacted with several kinds of actors (government officials, researchers, officials from private companies and NGOs) and adopted the initiative according to their understanding and representation of it. I will discuss this in detail in Chapter 7.

The appropriation of a modern technology may also result in ‘de-localisation’, the irreversible growth in the dependence of non-local sources (Pelto 1973 cited in Pfaffenberger 1992). Accordingly, “de-localisation expands the geographical scope within which people actively appropriate artifacts, with extensive implications for social change” (ibid., p.511). Lauriston Sharp’s (1968) analysis of steel axes among the stone-age Australians illustrates this point. The steel axe was accepted by the Yir Yorant because it fit into their existing practices and made life easier. When the Europeans provided the Yir Yorant with steel axes they thought the shift from stone to steel axe was a technical progress as it enabled the native Australians to cut wood and construct houses faster. However, this allowed them to spend more time on an art they had mastered thoroughly, which according to Sharp was sleeping. Initially stone axes belonged to the chiefs or older men and a system of culture existed on the use and lending of axes. However, the missionaries started distributing steel axes to young men and women who earlier did not own stone axes. Sharp explained that a variety of unintended consequences resulted with the adoption of the steel axe in...
place of the stone axe – kinship structures were weakened, gender relations were challenged, and trade – partnerships were affected. According to Sharp the cultural practices revolving around the stone axe were embedded by the social system comprising social relations, cultural norms, values, and economic arrangements within a community. The steel axe displaced the practices associated with the stone axe and resulted in new values and practices. Similarly I argue that Jatropha cultivation displaced certain practices associated with the cultivation of cash crops, and the migration of workers from rural to urban areas in search of work, which will be discussed in Chapter 7.

Numerous other studies have dealt with how changing technological practices engendered social change. Mathur’s (2005) study describes the evolving nature of signboards and associated craftsmen in India. During pre-independence and from the 1950s to late 1970s there was a surge in hand-painted signboards in India. The tradition of carrying forth the ancestral profession was maintained by the new generation of signboard painters. Indian consumer product industries, elections, and the film industry called ‘Bollywood’ provided a platform to the painters to experiment and develop a unique visual language. The painters were also commissioned to paint on large canvasses of twenty by ten feet and in turn established themselves as versatile professionals. In the late seventies new techniques of illuminating signboards were introduced in India along with 3D signboards. These new techniques resulted in carpenters, electricians and vinyl cutters joining the painters as professionals in signboard development. Mathur explains how the cola companies in the late 1980s caused the signboard industry in India to receive its first ‘culture shock’. The cola companies promoted aggressive advertising and the painters could not keep up with their demand paving the way for the introduction of industrial technologies like silk-screen printing, vinyl cutters, and large-format digital printers. Mathur further explains how these technologies resulted in the designing and creation of signboards being carried out by newly set up design studios and within a span of few years hand painted signboards were replaced with new age manufactured signboards (ibid.). In this case the introduction of a new technology

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replaced an existing culture and system comprising of painters and introduced new designers who created new computerised signboards. Similarly the introduction of the NMB resulted in the CPRs being diverted from the rural actors and they could not access these lands to graze their cattle or collect fuelwood.

This section has presented two points. First, it stressed the importance of social factors in shaping technological practices. Second, it highlighted that technological practices also shape society. Several authors in the anthropology of technology, and science and technology studies have pointed out the important relationship between technological practices and the social system. They have acknowledged that the social system is primary in how these practices are adopted. However, they have also noted that the opposite is also true. Hence it is important to understand that the introduction of a new technology can radically alter the social structure. It is also because of the embedded social practices that a technology is rejected or used differently from how it was conceived.

The ideas and examples presented above will be used to frame the empirical findings in Chapter 7. Chapter 7 will introduce the rural users (farmers and landless labourers) across the three research sites, their technological practices, social behaviours and how they associated with the actors promoting the NMB, the plantation techniques, how their cultural practices affected the progress of the NMB, and additionally how the NMB affected them.

**3.5 Conclusions**

This chapter outlined the aim of this research and introduced the three research questions and main research themes of this thesis. Through the discussion I introduced the three research questions, the literature I draw from, gaps in knowledge and contribution to literature. In doing so, this chapter outlined the role of narratives in policy-making, how they are often used by policy-makers to mask complex issues in development policy-making. I traced the role of creation of narratives and cited examples from Africa to give examples of narratives from a development country/region perspective. I have shown how narratives as a development tool can
often result in blueprint development and I further argued that narratives are based on shaky scientific grounds that misrepresent the needs of the local people. I draw from the literature on narratives to put forth my argument in Chapter 5 that biodiesel narratives played a key role in the development and uptake of biofuels world over and in India. My argument contributes to role of narratives as a development tool in policy-making in development countries and also contributes to the literature on the local characteristics of narratives across various countries (this is discussed in Chapter 5).

This chapter then focused on the role of networks in policy-making and how actors play a key role in supporting narratives that promote and popularise new development initiatives. I introduced the literature on ANT and explained how networks incorporate a variety of government agencies, key legislators, pressure groups, relevant business and industry representatives, consultants and policy analysts and journalists, through which policies are forged. Research theme two unpicks the policy processes at the central level and then focuses on the role of networks at the state level. The second research theme revealed that there is a deficiency in the literature on biofuels pertaining to the role of networks at a local level. The discussion revealed that a range of biofuel studies, reports focus on the GIBN, biofuel complex, biofuel assemblage but there is a lack of literature on the regional networks and the various types of biofuel networks in a particular country. The discussion on research theme two highlighted the presence of three types of networks namely government-led, research centre-led, and private company-NGO led network and argued that these three networks were crucial in the promotion and adoption of the NMB across India. The discussion on the three networks in Chapter 6 will address the gap in knowledge on the role and types of regional biofuel networks.

Finally the chapter focused on the various actors involved in the biodiesel mission. Research theme three emphasizes that it is important to discuss the role of the various users (government officials, scientists, policy-makers, professionals from private companies and NGOs, farmers and labourers) in promoting and adopting the NMB. Research theme three clearly defines the role of a user in this thesis and why I

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focus on the social practices and status of the rural actors adopting the NMB across the three case studies. The discussion reveals that literature focusing on biofuels and critiquing their consequences have not addressed the perceptions and practices of the rural users adopting it. I argue that any technology/development initiative is socially constructed and its outcome/trajectory is dependent not only the role of the actors promoting it but also by the actions and practices of the actors adopting it. Hence I use examples from SCOT and anthropology of technology to situate the role of users in the adoption of a new initiative and address a gap in the STS and biofuel literature on the role and social perceptions of the rural actors who adopted the NMB across the three research sites. The overall aim of this chapter was to introduce the literature of the three research themes, explain how I draw from it and in addition how my research furthers the literature or addresses gaps in it.
Chapter 4: Methodology of Research

4.1 Introduction

This chapter will introduce the research methodology of the thesis. The development initiative under consideration is the National Mission on Biodiesel (NMB) in India. This policy mission was the first biodiesel programme in India and it laid the foundation for the uptake and production of biodiesel in India. During the period from late 2008 and early 2009 this mission was scrapped and the Biofuel Policy was introduced in India. Despite the introduction of the new biofuel policy, people still associated with the NMB as it had laid the basis for developing high yielding varieties of Jatropha, development of nurseries, cultivation of Jatropha, establishment of oil extraction and processing units, market mechanisms, and identification of various stakeholders in the production of biodiesel in India. Hence it was appropriate to focus on the NMB as it was the premier initiative on biodiesel production in India and at the time of data collection the majority of the people associated with it and many were not even aware of the existence of a biofuel policy. The aim of this thesis is to study the development and consequences of the NMB as a test policy mission and to do so the thesis traces the types of networks created to promote the NMB at the central and state level. In this thesis I argue that the NMB was supported by policy networks at the central level and subsequently three types of networks played an important part in the promotion and adoption of the NMB at the state-level. The types of networks were; government-led networks, research centre-led networks, and private company-NGO led networks. This chapter discusses the methodology of this research and explains the various methods and sites chosen to conduct research.

The chapter is structured as follows. Section 4.2 gives a brief introduction to the research strategy, it lists the research questions and rationalises the choices of methods for this research. Sections 4.3 and 4.4 focus on data selection and sites chosen to collect data. The next section encompasses the various data collection
methods adopted during the research process and is followed by a discussion on the analysis of data in section 4.6. Section 4.7 deals with ethical considerations, while 4.8 describes the various issues faced by the researcher during the research process which is then followed by the conclusion.

4.2 Research Strategy

4.2.1 Starting Points

I will list the research questions (previously stated in chapters 1 and 3) as starting points for the development of the methodology of this thesis. The first research question is:

1. What are the narratives supporting the development of biofuels in India and how reliable are these narratives?

In Chapter 2, I stated the importance of narratives in development policy-making, how they simplify complex development issues and why they are used by policy makers. To answer this research question it is necessary to discern the narratives used to promote the biodiesel mission in India and in turn assess their reliability. To determine the narratives employed to encourage the formulation of NMB I employed a range of data collection methods which are discussed in detail in section 4.5. To test the reliability of these narratives it was necessary to collect data from the various actors such as policy-makers, government officials, scientists, professionals for private companies and NGOs, farmers, and landless labourers. To get data from such a wide range of actors I adopted a case study approach so that I could interview different actors across different states in India. The case study approach will be discussed in section 4.3.

2. How was the biodiesel programme constituted in India?

This research questions aims to trace the creation of policy networks at the central level and how the key actors: policy-makers, bureaucrats, and technocrats formed

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networks to support the creation of the NMB as a policy mission. This research not only traces the creation of these networks it also tries to analyse the role of these key actors in the NMB. To answer this question I focus on qualitative research methods which are explained in sections 4.3 and 4.5. This research question further focuses on how the NMB progressed across the various states in India. As stated earlier I argue that three types of networks; government-led, research-led, and private company-NGO led networks played a key role in promoting the NMB across India. To trace the creation of these networks across different states it was necessary to adopt the case-study approach. I collected data from three different states to analyse the three types of networks. In Tamil Nadu I traced the role of the researcher-led network, in Chhattisgarh I focused on the government-led network, and in Maharashtra I studied the private company-NGO led network. The various research sites will be discussed in detail in section 4.4.

3. What were the consequences/outcomes of the NMB and how were they represented by the various users (government officials, scientists, officials from private companies, NGOs, farmers and landless labourers)

This research question examines the importance of the various users in adopting the NMB and in turn how they represented the consequences of this development initiative. I focus on why bureaucrats, researchers, officials from private companies and NGOs actively promoted the NMB and in turn I analyse why the farmers and landless labourers started cultivating Jatropha. I then aim to trace the views of these various actors on the consequences of the NMB. To answer these questions I used qualitative research methods to collect data from the three research sites.

4.3 Data Selection

Case studies are regarded in a variety of ways in the history of social research – as a type of research design, as involving the use of particular research methods, and as a method of selecting the source of data (Blaikie 2010). Blaikie (2010) and Stake Methodology of Research
From Green Revolution to Green Gold: The Evolution of the Indian National Mission on Biodiesel

(2005) emphasise a case study does not imply a methodological choice rather a choice of what is to be studied. Their view is in direct contrast with authors who regard case studies as particular research methods (Adelman et al. 1977, Gillham 2000) or a research strategy (Yin 2003).

Yin (2003) has defined a case study as an empirical enquiry examining a contemporary event that is not subject to control by the researcher; that is inseparable from its context; and is a sustained process. According to him case study is “not either a data collection tactic or merely a design feature” it is rather a comprehensive research strategy (Yin 2003, p.14). My research was informed by his definition and was thus a case study of the emergence and adoption of the biodiesel initiative in India. Case study research pertains to the complexity and nature of the case being studied (Stake 2005) which in this case was India. However, due to the large size of the unit being analysed, three main research sites were identified and data was collected from there.

To understand the social order, practices, and daily life of the farmers and landless labourers who were undertaking Jatropha cultivation I undertook a multi-sited ethnography. I employed ethnographic methods because it was necessary to be – involved with the people, to observe their behaviour, listen, and be a part of their conversations, so as to be able to comprehend their environment and their decisions. In the field of STS various ethnographic studies (Latour 1993, Cooper et al. 1995, Latour 1996, Downey and Dumit 1998) have employed intensive fieldwork methods to show how power relations and cultural meanings are embedded in the adoption of a technology and these studies further influenced me. Hence in this thesis I have looked at the case study as belonging to the discourse of research strategies, and ethnography as belonging to the discourse of data collection methods.

Prior to the PhD I was employed as a research fellow in a DFID project named Policy Innovation Systems for Clean Energy Security (PISCES) in the Methodology of Research
M.S. Swaminathan Research Foundation (MSSRF). The PISCES Research Programme Consortium aimed at contributing to innovation and providing new policy-relevant knowledge in the energy sector – leading to better practices and ultimately impacts in helping the poor in developing countries. I was entrusted with conducting research on bioenergy in India, and among the viable options biofuels caught my interest. India was among the developing countries actively promoting the development of biofuels and had separate biodiesel and bioethanol production programmes. Several reasons prompted me to choose India as the site of study. At that time of my research the National Mission on Biodiesel (NMB) was nearing the end of the first phase and was progressing to the second phase of self-expansion activities of the mission. However, as the first phase of the NMB came to an end it was scrapped and the biofuel policy was introduced. The introduction of the policy proved to be a good start to analyse how the NMB developed and worked as a mission to test the development initiative prior to the formulation of the new biofuel policy. I could research how various actors formed a biofuel network that promoted biofuel narratives and in turn resulted in the creation of the NMB. Additionally I could study how the NMB progressed as a test policy mission, and in turn analyse how the NMB had performed in the mission (trial) mode prior to the introduction of the biofuel policy. I wanted to find out whether the activities carried out under the mission mode were successful and if it was conducive to implement a new biofuel policy?

During the first phase of the NMB, biodiesel production was actively taken up by many state governments and it was beyond the scope of this research to carry out fieldwork and collect data from all the states involved. A multi-site approach was adopted, once I gained a better understanding of the states actively adopting Jatropha cultivation and biodiesel production I realised that it would be possible to conduct fieldwork in two or three states. Initially I selected six states – Tamil Nadu, Maharashtra, Chhattisgarh, Andhra Pradesh, Orissa, and Karnataka and did a
reconnaissance study. Based on – access to sites, permission to collect data, state Jatropha programmes/schemes, and presence of research centres, private companies, and NGOs – Tamil Nadu, Chhattisgarh, and Maharashtra were chosen as the sites to conduct the fieldwork. Each site was unique in the type of actors and networks used to promote the NMB. In Tamil Nadu I focused on the role of researchers in promoting the cultivation of Jatropha, in Chhattisgarh I emphasised on the role of government officials in promoting the cultivation of Jatropha, and in Maharashtra I studied the role of officials from private companies and NGOs in promoting the cultivation of Jatropha. A map depicting the states of India is shown in Figure 2 and the research sites have been highlighted in blue, the next section will introduce the research sites.
4.4 Sites of Data Collection
4.4.1 Tamil Nadu

Methodology of Research
Tamil Nadu is geographically the southern-most state and ranks fifth in GDP among the states in India. It is one of the leading states in Jatropha development and has a well-articulated biodiesel policy (Government of Tamil Nadu 2007a, 2007b).

In Tamil Nadu, the State Agricultural department is the nodal office entrusted with the cultivation of Jatropha, however, the Forest Department and the Rural Development Department are also involved with the nodal agency to oversee nurseries have been built, saplings planted on waste and degraded land, and related development programs have been undertaken. Figure 3 shows the districts of Tamil Nadu, in this state fieldwork was carried out in Chennai and Coimbatore.

Methodology of Research
Coimbatore is a district situated in the western part of Tamil Nadu and is characterised by the high level of industrialisation and higher per capita incomes in comparison to other districts of India. After Chennai (the capital of Tamil Nadu), Coimbatore is the second most urbanised district with 40% of its total land under agriculture. The Tamil Nadu Agricultural University (TNAU) is located in Coimbatore and the ‘Centre of Excellence in Biofuels’ was established as a multidisciplinary research facility in June 2006 at TNAU. This centre was funded to research on Jatropha and develop the right genotype for cultivation. In Coimbatore, the researchers from the Centre of Excellence in Biofuels played a key role in Methodology of Research.
promoting the cultivation of Jatropha. The presence of a state biodiesel policy, nodal agency, and centre of excellence in biofuels were the main reasons why Tamil Nadu was chosen as one of the states to conduct fieldwork to map the role of a research led network in promoting the NMB.

4.4.2 Chhattisgarh

Chhattisgarh is located in central India, and was formed when sixteen Chhattisgarhi-speaking south-eastern districts of Madhya Pradesh gained statehood on 1 November 2000, and it derives its name from the thirty six (chattis is thirty-six in Hindi and garh is fort) princely states in this region. Raipur is the capital of this state, which is the tenth largest state in India. Despite being given the status of one of the rapidly developing states of India the per capita income net state domestic product was around ₹8000, which is far below the national average (Government of Chhattisgarh 2010). The state has a rich reserve of mineral resources and its economy is fuelled by the presence of large-scale industries, however, the abundant supply of natural resources and the emergence of new industries has not replaced agriculture as the main economic activity (Government of Chhattisgarh 2005).

In this state 20% of the population resides in urban areas and more than 80% of the people rely on agriculture for subsistence. Varied ecological conditions enable the cultivation of assorted crops in different parts of this state which has 43% of its geographical area devoted to agriculture. As 83% of the population is still engaged in agriculture and allied sectors, it has been envisaged that the state can become self-sufficient in biodiesel to be blended at 5% by 2015 by planting Jatropha (Human 8)

The state government of Jatropha wanted to be able to cultivate and harvest adequate amount of Jatropha to produce sufficient biodiesel to be blended at 5% by 2015

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Development Report Chhattisgarh 2005). Chhattisgarh was the first state to express an active interest in the biodiesel mission and was the forerunner in the advancement and uptake of biodiesel production in India. On 26 January 2005 the Government of Chhattisgarh established the Chhattisgarh Biofuel Development Authority (CBDA), which was designated as the primary organisation entrusted with the responsibility of promoting widespread plantations of Jatropha in the state and producing biodiesel subsequently.

Figure 4 District map of Chhattisgarh

In Chhattisgarh the state government played a key role in promoting the cultivation of Jatropha and hence I traced the creation of the government-led biodiesel network in this state. Figure 4 depicts the districts of Chhattisgarh and in this state fieldwork was carried out in seven districts ─ Bilaspur, Janjgir, Korba, Mahasamud, Raigarh,
and Surguja. The research participants in this state helped me — understand the complexities within the biofuel network in this state, cope with the extreme weather conditions, and feel safe despite the insurgency in the area.

### 4.4.3 Maharashtra

Maharashtra is located in the western part of India; it is the richest state in the country and is known as the business capital of India. In April 2006, the state government of Maharashtra announced a policy for Jatropha plantation through the horticulture program of state’s Employment Guarantee Scheme (EGS) (Government of Maharashtra 2007). The state government of Maharashtra aimed to develop Jatropha-specific cultivation practices and promote the cultivation of Jatropha across different districts. Figure 5 is a map showing the districts of Maharashtra and in this state fieldwork was carried out in Pune and Jalgaon. Pune is the second largest city after Mumbai and in this region many private companies and non-governmental organisations (NGOs) were involved in the cultivation of Jatropha, hence I studied the private company-NGO led biodiesel network in this area. Jalgaon is an agriculturally productive area and is famous for banana cultivation and has caught the attention of the media in the past few years for the large number of farmer suicides in Vidarbha near Jalgaon. In Jalgaon district fieldwork was carried out in five villages: Vishnapur, Adgaon, Ambade, Vadati, and Borajanti.
Figure 5 District map of Maharashtra

The main language spoken in Maharashtra is Marathi, however a majority of the people speak Hindi and hence I conducted the interviews in Hindi. In Pune numerous NGOs were promoting Jatropha cultivation across the state and they had ties with private companies and agricultural universities. The NGO personnel were willing to speak about the practices on irrigation, inter-cropping, and types of genotypes being used. They strongly believed Jatropha was a crop that would improve the livelihood of the farmers and thus they had invested in massive nurseries and were eager to share their experiences.

In Jalgaon I got a chance to interact directly with the farmers, even though personnel from the NGOs were present there. The experience here was different from the other two states. There were two groups of farmers – the first group comprised farmers who had received subsides, and the second comprised disgruntled farmers who had

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not received subsidies. There was an air of tension between the two groups and it was difficult to interview them together. The farmers thought I was a government official who was in charge of giving loans and showed their resentment towards me. Initially they just ignored me and then they started shouting at me and asked me not to stand on their field. I decided to go and speak to the farmers who had received subsidies and they were easier to speak to. This continued for a while and after a few days, I started speaking to wives of the farmers who had not received subsidies to grow Jatropha, slowly they opened up to me and convinced their husbands that I was not a government official and only then they were willing to speak to me and be part of the focus groups. The research in this site was very important to prove how social relations in a particular area affected the adoption of Jatropha and how the people in this area associated with this initiative.

4.5 Data Collection Methods

“Methods are not simply neutral tools: they are linked with the ways in which social scientists envision the connection between different viewpoints about the nature of social reality and how it should be examined” (Bryman 2008, p.4). The unit of analysis of this research was a single case that is India, but the research employed a variety of methods to collect data across the three different states. Initially I collected data from documents – government reports, policy papers, reports, academic journals, websites, and newspapers. Then I attended workshops on biofuels in India, Africa, U.K, Europe, and Canada, interviewed key speakers and informants, and met with government officials involved in the biofuel initiative in India. Then I conducted research in the sites where Jatropha was being cultivated. Consequently, I generated micro-level data on individuals and small groups; meso-level data on organisations and communities; and macro-level data on social institutions. The majority of the data was generated in natural settings by interacting with the people in their natural social setting and observing them going about their everyday lives. Rest of the data was gathered in a semi-natural setting, by interviewing government,
private company and NGO officials in their offices and workshops. The data presented in this thesis comprises primary, secondary, and tertiary data.

As stated earlier a variety of research methods were employed to collect data. I felt that the use of multiple methods would allow me to obtain a comprehensive view of the NMB and these methods would in turn reinforce each other. For example, participant observation helped to understand the relationships between people, which were difficult to fathom from individual interviews. While transect walks helped the women to open up and speak to me. The various PRA practices helped in gaining a better understanding of the social structure and structure of authority in the villages. The following section will discuss the various methods used to collect data.

4.5.1 Questionnaires replaced by Interviews – Unstructured and Semi-structured

In the early stage of my research I prepared a questionnaire that had questions to help me gain a better understanding of why the rural users (farmers and landless labourers) were cultivating Jatropha. The questionnaire is provided in Appendix 1. I prepared the questionnaire in English and translated it into the local languages of the different sites. However, this method did not work in any of the sites. The first problem I encountered was the majority of the farmers were illiterate and even those who could read were not willing to fill in the questionnaire as others were not doing it. I adopted a different approach and thought that I could ask them the questions in the questionnaire and fill it out myself but this method also failed. Many of them were uncomfortable in me jotting down what they were saying and felt that I worked for the government and would use the notes as evidence against them. Hence their responses were guarded and therefore I had to replace this method with interviews.

Qualitative interviewing is widely different from interviews in quantitative research. In qualitative research the interview is less structured to maximise flexibility and there is greater emphasis on the interviewee’s point of view. The interviewee is...
allowed to sway from the main topic and even pose questions to the interviewer. Based on the course of the interview the interviewer can ask new questions which will add better insight to the topic (Bryman 2008). According to Bryman (2008) interviews helps in gathering rich data and help the researcher to gain a better understanding of what is being studied. Blaikie adds that (2010) the process of qualitative interviewing aids the researcher in getting close to the social actors’ meanings and interpretations, and attaining a better account of the social interactions they have been involved in.

The first few days in each site was spent conducting unstructured interviews, asking the respondents about their daily activities and their hobbies. I then started conducting semi-structured interviews and asked them about Jatropha cultivation, farming practices, irrigation facilities, subsidies, and their experiences till date. The interviews were carried out in different places; the majority of them were done in the field; often women invited me to their homes and offered tea and spoke to me there; at other times interviewees wanted me to take them to restaurants for lunch and then they would speak to me. In each of the three sites there were different expectations from the research participants. In Chhattisgarh many of the farmers wanted their photos taken and were not keen on speaking unless I clicked their pictures and gave them copies. While in Jalgaon two respondents insisted it was too hot and I should get them Kulfi9. The various challenges during the research process helped me improve my interviewing skills and collect data.

Across the three states, I interviewed farmers and their family members, labourers, NGO personnel, staff from the agricultural universities and research organisations, government officials, private investors, and representatives from the industry10. The

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9 Traditional Indian ice cream
10 The list of informants comprising personnel from the government offices, universities, industry and NGOs is given in Appendix 2.
majority of these interviews were carried out in the natural settings of the people being interviewed and were done in the local language. In Tamil Nadu I had a bit of difficulty in understanding the local Tamil dialect in Coimbatore; however one of the farmers’ wives was from Chennai and she helped me understand the nuances between the dialects. In Jalgaon the majority of the respondents spoke in Hindi, which I can comprehend fluently. In Chhattisgarh the officials from CBDA conversed in Hindi or English, while the farmers spoke in Chhattisgarhi, which I did not speak or understand. During my initial fieldwork here, I was accompanied by one the members from CBDA and they translated what was being said by the respondents. However, their help and presence also had its drawbacks; most of the people did not speak openly about their problems and misgivings in front of an official from CBDA. Soon I realised they were only ‘singing praises’ of Jatropha and I had to find a way to hear the other side of the story too. I made friends with people in Raipur and one of them was willing to come with me and act as my translator if I gave him three meals and paid for his bus journey. He was a student and was on holidays and did not mind travelling with me and his presence was very helpful as people opened up to him very easily.

The interviews with government officials, policy makers, academics researching on Jatropha, private investors, and personnel from the industry and NGOs were done in their offices or research centres, while few interviews were also carried out in national and international biofuel conferences and workshops. These interviews were more formal than the ones conducted in the field. While interviewing government officials at high posts in their offices, I had to be careful in selecting my questions as I did not want to offend them and they were quite guarded while responding to my questions. However, when I met some of those officials in conferences they were relaxed and were willing to reply frankly to my questions over dinner or tea.

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Academic researchers from the agricultural universities were easier to interview and they spoke openly about the crop, its viability and shortcomings, and were keen to exchange information. Industry personnel were very cautious while speaking to me, it was very difficult to get an interview with them and they were very sceptical of my research and some even said that I wanted to ‘steal their ideas and sell it to their competitors’. I was also denied entrance to some companies even after being promised an interview with them. This happened in Chhattisgarh when after months of calling and sending letters, officials from D1 Oils had promised that I could visit their Jatropha plantations and interview their staff. However, when I reached their site they shut the door on my face and refused to let me enter. In addition to one-to-one interviews, I also conducted; group interviews (focus groups), participant observation, and transect walks which will be discussed in the ensuing sections.

4.5.2 Focus Groups and Participant Observation

When I conducted one-to-one interviews I only got the perspective of the respondent on Jatropha cultivation, their problems, yield rates and other related details. The next step was to attain a better understanding of why communities had adopted Jatropha cultivation and for that I had to get a better insight of the opinions of the people in a group, how they interacted with each other, and if there were any power relations between them. Hence I adopted group interviews popularly referred to as focus groups (Berg 1995, Morgan 1998, Krueger 2000, Kamberelis and Dimitriadis 2005, Blaikie 2010). Krueger and Casey (2000, p.18) have defined the focus group as “a carefully planned discussion designed to obtain perceptions on a defined area of interest in a permissive, non-threatening environment”. In a focus group data are generated by interaction between participants, while the participants present their views they also get a chance to listen to other people. They listen and reflect on what is being said and additional material is triggered as a response to it. As the discussion progresses back and forth, individual responses become clearer and refined, and graduate to a deeper and more considered level (Legard, Keegan and Ward 2003).

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Many researchers and government officials were willing to participate in a focus group discussion, however most of them lived in different parts of India and it was not possible for all of them to be in place at a particular time, and a Skype conference was not acceptable to a few of them. However, the closest chance I got to conduct a focus group with researchers, government officials, policy-makers, and representatives from the industry and NGOs was in conferences when we would sit together in the evening and speak.

I conducted seventeen group interviews across the three states and most of the discussions involved a range of Participatory Rural Appraisal (PRA) techniques. Robert Chambers (1992, p.1) describes PRA as a “growing family of approaches and methods to enable local people to share, enhance and analyse their knowledge of life and conditions, to plan and to act”. During most of the focus group discussions, participatory mapping was also carried out. First the people were given chits with the word Jatropha and asked to say what they thought about it. Different people associated different meanings with the crop; in some villages the sarpanch associated Jatropha with money, subsidies, prosperity; while the labourers cultivating it on common property resources (CPRs) considered it a bane, waste of time, and associated it with subjugation by the government. These discussions revealed how the sarpanch who was paid money or approached by the government officials said only good things about Jatropha while those who were forced to cultivate it had different ideas about it. In the participatory mapping a greater deal of diversity was seen. Women associated Jatropha with money and an opportunity to buy new stoves, clothes or jewellery, small-scale farmers associated it with extra income, and some villagers associated it with energy to run their pumps. During these exercises, I tried my best to be a passive observer and follow the tide of the conversation. I tried to

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11 The list of group interviews is given in Appendix 3
12 Head of a village
ensure that the questions I framed were open-ended and did not prompt the participants to feel it was ambiguous. The interview guide comprised ‘ground-mapping’ (to open a topic) as well as ‘dimension mapping’ (to ensure the respondents debated on sensitive issues within the topic) questions.

In most of the focus groups I aimed to have a mixed composition; however it was not possible always. In some areas the landless labourers felt that they could not discuss issues openly in front of their employers and preferred to have a separate discussion; while the majority of the women were very shy and did not speak in front of the men, they communicated better when the focus group comprised solely of women.

During these focus groups I acted as a participant observer. Participant observation involves “a researcher in one or more periods of sustained immersion in the life of the people being studied” (Spradley 1980, Jorgensen 1989 cited in Blaikie 2010, p.206). According to Bryman (2008) it is difficult to distinguish between ethnography and participant observation. He supposes that the participant observer/ethnographer immerses himself or herself in a group, observing their behaviour, listening to what is being said, and asking questions. He argues the term ‘ethnography’ is preferred because ‘participant observation’ implies just observation. However, in practice, participant observers do more than just observe (Bryman 2008) and in this thesis I use both the terms participant observation and ethnography. However, it has to be mentioned that ethnography also refers to a method of research and the written product of research (Blaikie 2010, Bryman 2008). Participant observation can be practised in many ways, ranging from complete participation to just observation, or a combination of both (Blaikie 2010). During my research I had to use a combination of both, initially it was not possible to just observe the people, as they would look at me and fall silent and would expect my contribution to the discussion. However, once they accepted my presence they got more comfortable and would argue or discuss about their problems and it was easier for me to just

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observe them. However, it was never possible to stick to any one form, I had to alternate or combine the different methods and employ PRA techniques during most of the focus group discussions.

### 4.5.3 Transect Walks

“Transect walks are walks through a community or location to identify different places, people and activities regarding the community” (International HIV/Aids Alliance 2006, p.62). Transect walks are used to identify the activities of people within a community. For example, where people meet, work, and relax. It is helpful to observe the people in their daily routine and gain first-hand knowledge of an area and the key locations. It is useful to get to know the place better and find out where men, women, and children meet at different times of the day and how they interact with each other. It is also very helpful for covert observation where the researcher can walk around the place and quietly observe the people, get to talk to them and in my case have a look at the different areas where Jatropha was being cultivated.

After conducting the initial unstructured interviews and focus group discussions, I adopted transect walks to gather more data about the people, their habits, and how they perceived the introduction of Jatropha cultivations. The transects walks were very useful as the people felt they were in control as they were showing me around their village, and during the course of the walk they were relaxed and spoke frankly about their expectations and views of the introduction of Jatropha cultivations and production of biodiesel. They told how much land was devoted to Jatropha cultivation, whether they had formed alliances with personnel from the industry, NGOs, or government.

At the end of each transect walk I would ask the people to draw a map of the places we had visited. These maps were drawn on the ground with chalk or rice powder, people used rocks and pebbles to show the roads and leaves to mark their fields. During this exercise they would discuss how they could improve their Jatropha...
cultivations, the problems they had, and how they could handle them. This exercise proved very helpful for me to understand how the various rural actors (farmers and landless labourers) viewed Jatropha and biodiesel production and also helped the people speak freely amongst each other and to me. This entire section discussed the different methods employed to collect data, the next section will focus on the analysis of the data collected.

4.6 Analysis of Data

My research was unfolding in nature and was guided by the empirical developments during data collection. I was informed by the framework of grounded theory, whereby data was gathered, coded, and analysed through the research process and the theory was derived from the data (Strauss and Corbin 1998). In this method, data collection, analysis, and theory are in close relationship to another.

Most of the data I collected was in the form of language. After collecting the first set of data I carried out coding. The coding was divided into two phases, initially I did open coding where the data were broken down, examined, compared, conceptualised, and categorised (Strauss and Corbin 1998). From the first phase of coding I formulated the initial data categories. It was followed by subsequent phases of data collection and comparison of data. After that I resorted to axial coding, “whereby data are put together in new ways after open coding, by making connections between categories” (Strauss and Corbin 1998, p.96). The open coding aided in categorising the data, while axial coding involved linking or finding a relationship between the categories generated from the coded data.

Dey (1993) describes coding as a circular process comprising three activities: describing, classifying, and connecting. The first step in my research was to describe the phenomenon being studied, that is biofuels and the adoption of biodiesel as a technology in India. It entailed stating the global and local narratives on biofuels and the social actors involved in the process. It then involved classifying the data
collected from different sites and comparing it. It was then followed by connecting the categories generated from the classification of data. Finally, I developed a narrative that formed the basis of the overall conclusions of the research (Strauss & Corbin 1998).

4.7 Ethical Considerations
My research involved interviewing rural people across different parts of India and prior to it was necessary to carry out an ethics self-audit. While designing my research proposal I ensured that I abided by the ethical practices set by the Graduate School of Social and Political Science. While conducting field research the respondents were informed about my research and why I was interviewing them. They were never assured of fake promises or monetary help and wherever confidentiality was requested I ensured it was maintained. Many governmental officers insisted that they should be kept anonymous and their wishes have been respected.

4.8 The Research Experience
In the following sub-sections I will explain the role of the researcher and challenges faced during the research process.

4.8.1 Researcher’s Place in the Context
The first major challenge was the fact that I was a young, unmarried female. My age was equated with lack of experience and most of the time I was initially not taken seriously. I was always called ‘ladki’ or ‘poonu’ which means girl. Once I could prove that I was a researcher and had a Master’s degree and was pursuing a PHD, the next questions would be “You are not married are you?”, “Why are you not married”? It would lead to a conversation on how I should get married soon and being modern does not mean that I should be single or unmarried. My research training had not prepared me for this sort of advice and initially I was taken aback,
with their interest in my personal life. I soon realized that just as I was curious to find out why they were cultivating Jatropha and what they thought about it and the technology of producing oil from it, in the same manner they were keen to know more about me before they were willing to respond to my questions.

I learnt that even I was an actor in the process of research and had to answer numerous questions about my personal life, education, family, and even my style of dressing. To be accepted across the different sites I had to answer many questions, dress in a particular way, and follow certain mannerisms so as to not offend members of a particular community.

After personal issues, the other major problem I faced was that many people in the villages thought that I was a government employee and had the power to report the problems they were facing in the village to the right authorities, and could solve their issues. An old lady slapped me during fieldwork; for five years she had been reporting the disappearance of her grandson and she thought I was from the census board and was not taking her request seriously. After that incident I ensured that I reminded the people I was not working for the government or any company, rather I was just a researcher. I realised that it was unfair for me to take up their time and speak to them. They were not going to benefit from me; rather I was the one who gained from them, by being able to gather data for my thesis. Hence I realised that they had to be compensated in some way or the other, the role of money and compensation will be discussed in the next section.

Over a period of time I was accepted by people and they started trusting me. When I conducted interviews with them a second time, they were honest with and some even said that they had lied to me the first time. It proved that I had to be accepted by the community to be able to gather meaningful data. Many people respected the fact that I had a Master’s degree and was studying for a higher degree abroad. It helped me circumvent the patriarchal structure because the old men felt that as I was studying in

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the U.K and I was worth speaking to. My gender helped me have focus group discussions solely with women which would not have been possible in many rural areas if I was a man.

4.8.2 The role of money or gifts
Several authors have contended that ethnographers often fail to recognise the role of money in their final knowledge production (Weinreb 1998, Senders and Truitt 2007). They further add that money—more than any other object, force or sign—gives shape not only to initial fieldwork relationships but also to the entire ethnographic encounter. During the course of my fieldwork different people had varying expectations from me which will be discussed below.

During fieldwork I realised that I was the one benefiting from the people and not the opposite. I was taking up their time and would use the information collected from them to write my thesis, publish papers, and further my career. I understood that I had to compensate them for their time, but this was not simple and straight-forward. During my fieldwork in Tamil Nadu the people did not want money or gifts; instead they wanted me to represent their needs to the government authorities. When they were certain that I was not a government official they were convinced that I was a journalist and could highlight their plight to the concerned authorities. Then the head of the village said that I worked in MSSRF and as an employee I could speak about them to M.S.Swaminathan who is a member of a parliament and an eminent scientist in India. They said that if I told him about their problems they would be fine with me being in their village and gathering data. When I finished my fieldwork and returned to Chennai I wrote a report and spoke to M.S.Swaminathan in person about the people and what they wanted me to convey to him.

In Maharashtra most of the respondents wanted to eat in air conditioned restaurants, hence I would have lunch or dinner with a few people every day in a restaurant and pay for them. They felt very important eating in a nice restaurant and would

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introduce me to the staff at the restaurant as the ‘young researcher’ studying in the U.K. Most of the time women did not accompany me as they had to stay back and take care of the children; hence I took biscuits, chips, and stationery items when I visited them. For these little gifts I was always invited to their homes and offered tea and could sit and speak to them in the comfort of their homes where they were at ease to speak to me. Most of the time children would ask for my pen, and soon I had to walk around with at least twenty pens. During my fieldwork in Maharashtra while interviewing the respondents whenever a vendor was passing by I would have to buy Kulfi or peanuts, or whatever he was selling. Most of the time compensation was in kind, I never gave money to respondents, as I thought it was not ethical and also felt it would be considered as a bribe and could offend many people. Little gifts and food items were easier to give and were better accepted than handing out money.

Finally, a discussion about money will be incomplete without mentioning the funding bodies. My research was funded by two institutions—the University of Edinburgh and M.S.Swaminathan Research Foundation. The scholarship from the University covered my tuition fees and enabled me to pursue my doctorate. While my job as a researcher at MSSRF funded my field trips and the little gifts for the respondents.

4.8.3 The Power Relationships
Part of my research involved interviewing high level government officials, policy makers, scientists, and top officials in many companies. Most of the research books deal with collection of data from the ‘lay’ population and there is a lack of literature in studying the ‘elite community’ (Hertz and Imber 1995). As most of the methodological texts assume the researcher is mainly collecting information from the lay man, it implies that the researchers are in a position of power, relative to participants. Hence they deal more on ethics, objectivity, and reflexivity and tend to ignore the other types of power relationships that can exist.
In my case more than often the dynamics of power relationship were reversed. I often had to interview officials who were very influential in their field and gaining access to them was very difficult. Ostrander (1995) suggests “gaining access from the top” and using your contacts with the top officials to find new contacts they might suggest. Initially when I wanted to collect data in Chhattisgarh, I sent a letter to the CBDA officials requesting permission to meet them and visit the Jatropha cultivations in the state. I tried calling, emailing and sending them letters but I did not receive an answer from them. After waiting for a few months I used my position as a researcher in MSSRF to ask M.S.Swaminathan to write a letter to them. Within days of receiving the letter I was contacted by CBDA officials and was assured they would extend all the help I needed. I prepared carefully for all the interviews; however I had to be extra careful while interviewing elites. Ostrander (1995) foregrounds that gaining access to elites does not necessarily mean gaining their trust, rather a continuous process of “being checked out” is likely to occur. Most of the time my credentials and reliability as a researcher were questioned and I felt like I was being tested on my knowledge on the subject. Many times when they did not agree with my answers they would say I was ignorant and would explain what they thought was the correct explanation. Normally they were pleasant but more than once I have been intimidated by the people I have interviewed.

On one occasion I was at the Winrock International Conference on Biofuels and the head of D1 Biofuels spoke about their operations in India. I raised a question about their procedures to the Indian Administrative Service (IAS) officer on the panel and asked why they were being allowed to take the seeds from India and process it in the UK and sell it back at a higher rate? The IAS officer in front of two hundred people asked me to shut up and said that such questions would not be entertained and I would be asked to leave the conference if I did it again. It was a good learning experience for me and I realised to respect power and authority and know what to ask when and to whom.

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4.9 Conclusions

This chapter outlined the research methodology of the thesis. It introduced the nature of the research based on the research questions and emphasised the collection of qualitative data. The chapter dealt with the adoption of case study as a research strategy and multi-sited ethnography carried out across India.

This chapter introduced the different sites and explained why they were chosen as field sites to collect data and it further explained the difficulties faced by the researcher in gaining access and collecting data across the different sites. The chapter explained that primary data was collected from interviews and focus groups of various stakeholders and secondary data from analysis of various government reports, research papers, policy documents and literature published by NGOs and private companies. Although every attempt was made to interview the main stakeholders, one of the limitations of the study is inability to interview all the stakeholders in a country as large as India. The study also faces the general limitations associated with the various research methods. In spite of these limitations, the study presents a collection of diverse viewpoints of stakeholders involved in the biodiesel production in India.

Various sensitive issues were discussed in this chapter such as cultural perceptions across the different sites and how the people perceived the researcher which in turn affected the manner in which they interacted with her. Various issues pertaining to barriers in the language, access to interviews, unwillingness to talk to the researcher, and problems of being a lady were discussed to highlight the entire research process. The various research methods were discussed in detail and the role of money and gifts were an important issue in the research process.
Chapter 5: Biofuel Narratives

5.1 Introduction

In the 1990s Cadenas and Cabezudo (1998) concluded that ‘the future outlook of biofuels is beset by uncertainty’, but today biofuels have carved out a distinctive niche in the international political agenda and are rapidly gaining leverage among a range of communities. Successful ventures of Brazil and the USA in this field captured the attention of various countries, which in turn led to the establishment of biofuel policies and incentives – transport fuel replacement targets – to stimulate the development of biofuel sectors locally and abroad. The concept of biofuels as a technology is evolving rapidly and this fast paced technological change has led to a conviction that it will give rise to manifold societal benefits. The rising interest in the bioeconomy of biofuels has also sparked debates on food security, mono-cropping, land grabbing, and the practicality of biofuels.

Godin (2009, p.1) states that “policy-makers construct their problem through conceptual frameworks that structure policy actions”. Policy frameworks are often constructed as stories or narratives that give meaning to situations (Kaplan 1986). Narratives are present everywhere, they give meaning to a socio-economic situation and try to answer a series of analytical and policy questions (Godin 2009). In chapter 3, I discussed the importance of development narratives in policy-making and how they lead to blueprint development. In this chapter I argue that biofuels are being portrayed as a blueprint tool through narratives that portray them as a solution to a multitude of problems. To prove this point I focus on the global biofuel scenario and how biofuels gained prominence and in turn I list the narratives that were employed to support the development of biofuels globally. The chapter then focuses on local groundings of biofuel narratives in India, particularly in reference to the National Mission on Biodiesel (NMB).

The analysis of the local narratives supporting the production of biofuels in India advances Keeley and Scoones (2003) claims that while global narratives do influence local narratives, local narratives have unique characteristics of their own that “reflect
local knowledge, local interests and local complexity” (p. 68). In their work on narratives they focus primarily on environmental narratives in Africa, my analysis on how the local narratives in India were shaped by the global narratives but were unique in certain ways, adds to this debate especially by drawing from an Indian development policy case-study.

The aim of this chapter is not only to discern the various local biofuel narratives that were used to promote the NMB in India abut also to contest their reliability. While contesting the reliability of the narratives I draw from Clay and Schaffer 1984, Roe 1991, 1994, Leach and Mearns 1996, Sutton 1999, and Keeley and Scoones 2003\textsuperscript{13} to extend my analysis and prove that the local biofuel narratives in India were based on shaky scientific grounds that labelled and categorised the interests of the local people and perceived them as passive objects of policy.

This chapter is structured as follows. The first section introduces the global biofuel scenario touching upon the development of biofuels in Brazil and the USA. It then lists the global narratives supporting the production of biofuels. Section 5.3 introduces the national narratives supporting the development of biofuels in India, particularly biodiesel; section 5.4 contests the reliability of two of the national biofuel narratives.

### 5.2 Global Biofuel Scenario

The pursuit for energy security is a major driver of change in the world order today. It has been described as a game, engaging players across the globe; industrial and industrialising countries, energy suppliers, and consumers (Ahuja 2008). Countries around the world are beleaguered with rising oil prices, which is threatening to undermine global economies and in April 2011 oil prices surged to the highest in two and half years (Bawden and Hawkes 2011). Growing global concerns about the drilling and burning of fossil-fuels and its consequent environmental threats have

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\textsuperscript{13} See chapter 3

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forced key stakeholders in expediting their search for exploring sustainable alternative sources of fuel. To avert the imminent energy crisis as pressure mounts on the finite nature of crude oil reserves and to smoothly scale into the alternatives, most informed stakeholders are focusing on the development of biofuels.

Different countries, positioned on various sides of the prospective biofuel sector, are promoting biofuel programmes due to diverse factors. One category of factors pertaining to a strong Northern agenda is related to fuel security, increasing oil prices, and environmental concerns. Another category is linked to an ostensibly Southern agenda and has envisioned biofuel production as a key driver for the generation and promotion of rural employment, which will, it is hoped, in turn lead to development. Many countries across the globe are promoting biofuels and have put in place various incentive mechanisms to advance the development of biofuels—either domestically or abroad. These include biofuel policies or blending mandates supported by: agricultural subsidies and price support mechanisms which encourage the production of feedstock; blending targets which ensure the production and sale of liquid biofuels; subsidies, buy back mechanisms, and tariffs to safeguard the biofuel infrastructure; as well as funding for research and development (FAO 2008).

Among the various categories of biofuel and uses, liquid biofuel for transport has caught the attention of the world and has experienced strongest growth in recent years. Every day blending targets are being announced by countries around the world and blending mandates which have emerged are testimony to the fact that liquid biofuels are being developed all over the world. Table 1 lists the biofuel mandates of key countries involved in producing liquid biofuels for transportation.
From Green Revolution to Green Gold: The Evolution of the Indian National Mission on Biodiesel

<table>
<thead>
<tr>
<th>Country</th>
<th>Blending Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>20-25% blending of ethanol with petrol; 5% blending of biodiesel with diesel by 2012</td>
</tr>
<tr>
<td>Canada</td>
<td>5% renewable content in petrol by 2010 and 2% renewable content in diesel fuel by 2012</td>
</tr>
<tr>
<td>China</td>
<td>15% blending of ethanol by 2010; 15% blending of biodiesel by 2020</td>
</tr>
<tr>
<td>European Union</td>
<td>10% renewable content in transport fuel by 2020 (mandatory; proposed by European Union Commission in January 2008)</td>
</tr>
<tr>
<td>India</td>
<td>10% blending of ethanol and biodiesel by 2012</td>
</tr>
<tr>
<td>South Africa</td>
<td>8% blending of ethanol by 2020</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>5% renewable content in transport fuel by 2010 and 20% by 2020</td>
</tr>
<tr>
<td>United States of America</td>
<td>9 bn gallons renewable content in transport fuel by 2008; 36 bn by 2022 (mandatory); of these, 21 bn are expected to be derived from advanced biofuels (of which 16 bn from cellulosic biofuels)</td>
</tr>
</tbody>
</table>

Table 1 Fuel blending targets (Conjero, Neves and Pinto 2010)

Biofuels are being seen as a new technology, clean, efficient, natural to replace fossil fuels and the notion of something new and better replacing something old is powerful within policy circles (Smith 2010). Another driver propelling the promotion of biofuels across many developing countries is the success of Brazil in producing biofuels. The term biofuel was accorded a global status and its development was pursued across the globe due to Brazil’s success in producing ethanol from sugarcane. The Brazilian experience of producing and blending ethanol with petrol dates back to the 1920’s, but only in 1931 ethanol produced from sugarcane was officially blended with petrol, however there were no blending targets in place or programmes promoting the production of ethanol from sugarcane (FAO 2008).

The global oil crisis in 1973 magnified the oil import bill of Brazil in turn exerting considerable pressure on the Brazilian economy (Goldemberg 2006) resulting in the government embarking on the PROALCOHOL (alternatively known as PROALCOOL) programme. The PROALCOHOL programme sought to reduce energy imports and make Brazil energy secure by supporting the domestic sugar and
ethanol sectors, along with the production of both anhydrous ethanol (which could be blended with petrol) and hydrated ethanol (which could be used as a fuel in its own right), and by encouraging car manufacturers to modify engines and vehicles which could be fuelled by higher blends of bioethanol.

The aftermath of the second oil shock in 1979 brought in its wake a more ambitious and comprehensive programme fostering the need for new plantations and developing a fleet of ethanol-fuelled vehicles. This was in turn complemented with a range of tax and financial incentives which resulted in the programme inducing a strong response leading to a rise in ethanol production and utilisation in vehicles. Initially the financial incentives boosted the initiative, however as oil prices receded and sugar prices increased, the programme appeared to stagger. From 1989 to 2009 the Brazilian government set about deregulating the fuel supply system and government institutions were gradually replaced by the private sector. The use of hydrated ethanol as a fuel diminished with the end of subsidies, however a mandate in 1993 specifying the blending of anhydrous ethanol with petrol resulted in a recovery for sugar and ethanol production. In 2002, ethanol prices were liberalised and the rise of global oil prices boosted the sugar and ethanol industries in Brazil. Since then, the bioethanol industry has made remarkable progress by expanding production and modernising technologies and the widespread introduction of ‘flex-fuel’ vehicles which run on a petrol-ethanol blend (FAO 2008). The development of efficient bioethanol production over a period of three decades has resulted in petrol-ethanol blended fuel being cheaper that petroleum (Goldemberg et al. 2003).

In contrast to bioethanol, the biodiesel sector in Brazil is in a nascent stage. In 2005 a biodiesel law was passed which established a blending requirement of 2% and 5% by 2008 and 2013 respectively. The law also aimed at rural development and established incentives for the production of raw materials from small farms in the north and north-east regions of Brazil. The goal of the Brazilian biofuel policies additional to energy security includes social inclusion, rural development, and environmental sustainability (FAO 2008). The Brazilian success in producing biofuels, especially
bioethanol, is often presented as a model that other developing countries might follow (Goldemberg et al. 2003, Goldemberg 2006, UNEP 2009).

The United States of America produces biodiesel and bioethanol using corn as the main feedstock. The policy framework for the development of biofuels was laid down by the 1978 Energy Tax Act, which incorporated extensive tax exemptions for alcohol fuel blends (FAO 2008). Bioethanol production has been seriously pursued in the USA for around thirty years and despite Brazil’s early start the USA has overtaken Brazil to become the largest producer of bioethanol (Oxfam 2008). To encourage an enabling environment for the production of biofuels, recent steps have resulted in the 200 Biomass Research and Development Act; the 2002 Farm Bill; the 2004 American Jobs Creation Act; the 2005 Energy Policy Act; and the 2007 Energy Independence and Security Act. Collectively, these acts constituted a policy framework which in 2007 supported and sponsored the production of 30 billion litres of bioethanol from maize and 2 billion litres of biodiesel form soybean (FAO 2008).

Production of bioethanol in the USA is successful due to sustained subsidisation and import protection (Tyner 2008) and since 2007 the bioethanol production has continued to grow. USA is also making significant investments in the research on production of biofuels from next-generation feedstock. Quoting the same reasons as Brazil, the USA has justified its pursuit for biofuels as means of advancing its energy security, boosting employment opportunities, and contributing towards environmental sustainability. However, it has been contested that the biofuel targets in the USA are not driven by environmental agendas; instead they are driven by a desire to accelerate the growth of the economy, to sustain grain belts of the US Midwest, and to secure a little bit more of the USA’s energy security domestically (Smith 2010).

The European Union (EU) did not follow on the same lines as Brazil and the USA and has instead stressed more on the production of biodiesel instead of bioethanol. In 2007, 9 billion litres of biofuel were produced in the EU with biodiesel accounting to 6 million litres. The main feedstock for biodiesel is rapeseed, followed by sunflower and soybean oil and bioethanol is produced from sugar beet and cereals. The biofuel
legislation in the EU comprises three directives; the first (Directive 2003/30/EC) is a mechanism supporting a biofuel market in the EU by encouraging the member countries to set a ‘reference target’ of blending requirements. The second (Directive 2003/96/EC) permits tax incentives for biofuel production and use. The third (Directive 2003/17/EC) pertains to the legislation concerning environmental specifications of biofuels. The reforms in the Common Agricultural Policy in 2003 and the new EU rural development policy further stimulate the development of biofuels by encouraging farmers to diversify into biofuel feedstock and by including measures to support renewable energies coupled with grants and capital costs for the production of biomass. In 2007 ‘An Energy Policy for Europe’ endorsed a 20% share of renewable energies in the overall EU energy consumption by 2020 with a 10% renewable content in transport fuel (Fulton et al. 2004, FAO 2008). However, recently it was argued that the EU biofuel targets are unethical and the targets should be repealed temporarily until new safeguards are put in place for the production of biofuels in EU (Nuffield Council on Bioethics 2011).

In the UK, following the EU policy the Renewable Transport Fuel Obligations (RTFO) Order 2007 was introduced in April 2008 which stated that 5% of road vehicle fuel supplied in the UK must come from renewable sources by 2010 and in 2009 a new RTFO mandate moved the timeline to achieve the target from 2010 to 2013 (REN21 2008, 2009). Support for biofuels manufacturers in the UK has led to stimulation of biofuels production (Nuffield Council on Bioethics 2011).

According to Keeley and Scoones:

> Knowledge finds its way into policy through the prolonged reiteration of these programmatic tales of cause and effect. Such messages are easily communicated; they make for good sound-bite political marketing, and they fit well with the demands for clarity and measurable manageability of large-scale bureaucratic organization. Given these selling points, the reasons for their persistence seem all too clear (Keeley and Scoones 2003, p.55).
Mol (2007) argues that the global narratives supporting the development and production of biofuels were supported by a global integrated biofuel network (GIBN) that reiterated the importance and benefits of developing biofuels world over. The GIBN comprises developed and developing countries, actors from global energy markets, non-governmental organisation, and government agencies. Initially biofuel narratives and networks were local but with the emergence of the GIBN the narrative and networks were not bound by region and resulted in an increase in the transboundary flow of biofuels. Actor Network Theory (ANT) proposes that for prevailing narratives to be incorporated into policy discourse, networks of actors or coalitions of stakeholders must be constructed and maintained (Latour 1987). The dominant global biofuel narratives were supported and diffused through the network of actors across the GIBN and they formed ‘blueprints’ to address policy challenges.

According to studies carried out by various organisations and published reports14, biofuel policies are being pursued with the apparent ability to meet three policy objectives with a single solution – energy security, economic development, and climate change mitigation. The development of biofuels is said to have the ability to address high and volatile petroleum prices; to act as a substitute for fossil fuels and thereby mitigate global climate change; and to promote economic revitalisation in rural areas. Indeed these rationales and support for biofuels have been emphasised:

All of a sudden, you know, we may be in the energy business by being able to grow grass on the ranch! And have it harvested and converted into energy. That’s what’s close to happening (George W. Bush 2006 cited in MacKay 2008, p.42).

The gradual move away from oil has begun. Over the next 15 to 20 years we may see biofuels providing a full 25 % of the world’s energy needs (Alexander Muller, assistant Director-


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The EU is supporting biofuels with the objectives of reducing greenhouse gas emissions, boosting the decarbonisation of transport fuels, diversifying fuel supply sources and developing long-term replacements for fossil oil. The development of biofuel production is expected to offer new opportunities to diversify income and employment in rural areas (Commission of the European Communities 2006, p.3).

India’s energy security would remain vulnerable until alternative fuels to substitute/supplement petro-based fuels are developed based on indigenously produced renewable feedstocks. In biofuels, the country has a ray of hope in providing energy security (GoI 2009, p.3).

It is evident that biofuels as a policy solution did not emerge in isolation; the biofuel narratives were sustained ‘socially’ by a range of actors. For example, Keeley and Scoones (2003) speak about the creation of the story on African deforestation and savannization, they assert that a narrative of potential crises and disaster for the soil resources of Africa was created and sustained because it was buttressed by the interests of various actors. Similarly the biofuel narratives were created and supported by a range of actors. The dominant global narratives backing the promotion of biofuel policies and initiatives emphasised on energy security, agriculture and rural development, mitigation of climate change, and trade opportunities.

5.3 The National Biofuel Scenario in India

The global consumption of marketed energy is projected to increase by 56% from 2010 to 2040; the largest projected increase in energy demand arising from the non-OECD economies with China and India at the forefront (IEA 2013). After a chronic water shortage, the deficit in energy is said to be India’s greatest economic vulnerability. Economic growth rate has risen past 7.5 to 8%; the accelerating economic growth, increasing population, and expanding cohort of high-energy consuming middle class with rising incomes is expected to push the energy demand of India in the coming decade among the highest in the world (Ahuja 2008). Hence
India is aggressively developing alternative environmental-friendly sources of energy to try and contribute to its ever increasing demand. Indian attempts to develop biofuels have been based on the same assumptions promoted by the global narratives. Based on global justifications, the biofuel initiative in India also seeks to prompt energy security by reducing oil imports, rural development by creating a renewed interest in agriculture, climate change mitigation by reduction of greenhouse gas emissions, and economic growth and trade by reducing oil imports and generating a biofuel industry.

Ferguson and Escobar (1994, 1995 cited in Shore and Wright 1997) reason that global narratives especially those pertaining to science and development provide valuable insights into the interactions between knowledge, power, and policy, however they are extremely hegemonic masking local realities. They grant power to science and associated institutions and fail to credit the agency that exists in localities (Keeley and Scoones 1999). The national narratives promoting biofuels in India were influenced by the global narratives; however the national narratives underlying the biofuel discourse particularly those around the National Mission on Biodiesel (NMB) displayed distinct features which were unique to the circumstances and policy-making processes of the country.

Godin (2009) alleges that narratives employ statistics and “buzzwords” to incorporate the interests of a wide range of actors. The NMB was advocated as a “major ‘pro-poor’ initiative generating massive income and employment for the poor and thus an effective instrument of poverty alleviation” (GoI 2003, p.xvii). The pro-poor narrative emphasised the cultivation of *Jatropha curcas* and the production of straight vegetable oil (SVO) at a local level. The national narratives also centralised on the cultivation of Jatropha on “wastelands”, it was said that “among the non-edible crops, Jatropha is pioneer to green ‘wastelands’ and ‘marginal’ areas” (GoI 2003, p.110).

Latour (1996) posits that the greater the number of people invited to the party the more the energy is spent taking care of their needs, and their needs shape a project.
The national narratives supporting the NMB tied the interests of numerous stakeholders involved in the development initiative. These actors played an important role in publicising biofuels; they defined the urgency of being energy secure and offered possible solutions through biofuels, which they said was within the reach of India. Chapters 6 and 7 will discuss in detail the role of the various actors in the biofuel policy-making process and how they formed networks to take this initiative forward. The subsequent sub-sections will explain the key national narratives that upheld and supported the biofuel discourse in India.

5.3.1 Energy Security in India

India is among the top five energy consumers in the world (IEA 2013) and with China overtaking the USA to become the highest energy consuming country due to its high population and demand in the world, it is inevitable that India with its ever increasing population and demand for energy will soon be the third highest consumer of energy by 2030. India ranks fourth in global oil consumption and fifth in oil imports (IEA 2011) and the oil bill is costing the GoI over 30% in foreign exchange reserves. There are no prospects of prices falling in the short to medium term which has resulted in the search and development of alternatives sources of fuel (Ahuja 2008).

Many developing countries are vying to develop renewable energy as it is clean, environmental friendly and the countries can gain from carbon trading. Apart from solar and wind energy India is trying to develop biofuels and the rationale for it in the biofuel policy is:

India’s energy security would remain vulnerable until alternative fuels to substitute/supplement petro-based fuels are developed based on indigenously produced renewable feedstocks. In biofuels, the country has a ray of hope in providing energy security. Biofuels are environment friendly fuels and their utilization would address global concerns about containment of carbon emissions. The transportation sector has been identified as a major polluting sector. Use of biofuels have, therefore, become compelling in view of the
tightening automotive vehicle emission standards to curb air pollution (GoI 2009, p.3).

According to the Planning Commission’s Report on Biofuel:

India ranks sixth in the world in terms of energy demand accounting for 3.5% of world commercial energy demand in 2001. The energy demand is expected to grow @ of 4.8% per annum. A large part of India’s population, mostly in the rural areas, does not have access to it... Hence a programme for the development of energy from raw material which grows in the rural areas will go a long way in providing energy security to the rural people (GoI 2003, p.4).

The energy security narrative is a significant concern for the policymakers of the country and it was easily embedded in the discourse. India is the only country which has a ministry exclusive for the development of renewable sources known as the Ministry of Non-Renewable Energy Sources (MNRES) and it is the nodal agency entrusted with the development of efficient renewable technologies and policies advocating the development of renewable sources of energy. Pachauri (2004, p.703) states that India need not follow the same path of industrialisation as developed countries and “in the matter of energy use, for instance, proactive policies—such as stress on renewable sources and the rationalisation of subsidies—are needed to decrease the dependence on unsustainable imports and to create the conditions under which the dispossessed and poor sections of society are able to meet their basic energy needs”. Thus the narrative of meeting the energy demand of India was important in the uptake and development of renewable sources of energy like biofuels.

5.3.2 Creation of Employment and Improving the Agricultural Sector

Among the narratives which upheld the biofuel initiative the main one was the rural development story which entailed that the production of biofuels from plants would lead to creation of employment and would renew interest in the agricultural sector. This assumption is directly reflected from statements in the NMB:

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Every component of the programme will generate massive employment for the poor belonging to the Scheduled Tribes, Scheduled castes and other under privileged categories living mostly in backward areas which have experienced the adverse impact of forest degradation, and loss of natural resources (GoI 2003, p.149).

Despite recent urban development, the crisis of the agrarian (more broadly, rural) economy has increased in India (Athreya 2009). The agrarian crisis is multifaceted; it includes the crisis of the ever-increasing rural and urban employment; crisis of food and nutrition security; and large scale displacement of people or migration combined with degradation of land and rapidly declining water tables. These insecurities impinge with even greater severity on the more vulnerable segments of the population – the landless labourers, the marginal and small farmers, tribals, dalits and women (ibid.). The NMB was promoted as a rural development programme which would seek to address some of the issues affecting the agrarian sector (GoI 2003).

The National Rural Employment Guarantee Act (NREGA) is a key poverty-alleviation and employment creation initiative of the Government of India (GoI). The overall aim of the programme is; to provide employment to the villagers; stabilise agricultural production and reduce migration from rural to urban areas; to ensure that there are fewer deaths from starvation; and to strengthen the livelihood resource base, boost the rural economy and to enhance the capacity of the villages to sustain themselves (GoI 2005). According to the NREGA; at least one adult member in each rural household is entitled to 100 days of guaranteed employment in a year; only productive work which creates long-term assets will be taken up; employment will be provided within 5 km radius of the village and if the distance is more transportation charges will be paid; an equal wage of ₹60 would be paid to men and women; and training skills would be available along with childcare facilities if there are more than 20 women (ibid.). The scheme would focus on: water conservation and water harvesting, drought proofing by afforestation and tree plantation, irrigation canals and provision of irrigation facilities to land owned by households belonging to Scheduled Tribes and Scheduled Castes, renovation of traditional water bodies,
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development of land, flood control, and rural connectivity to provide information about the weather (ibid.).

The policy-makers and government officials said that the cultivation of Jatropha would fit the objectives of land development, creation of employment, and durable assets under the NREGA. It would also provide labour opportunities for the poor and landless and if they were enrolled under the NREGA scheme they would receive wages for their labour irrespective of the output, in this way they did not have to undertake contract farming and neither did they have to invest any money. Based on the guidelines of the NREGA many states especially Chhattisgarh, actively invested in Jatropha plantation and received funds from the central government. The biofuel development narrative along with targeting creation of employment also emphasised reviving the agricultural sector. The term ‘agrarian distress’ has become shorthand for the perilous condition in which many Indian farmers find themselves (Suri 2006) and its most dramatic and tragic manifestation is, the tens of thousands of suicides of Indian peasants across several states (Athreya 2009). The Ministry of Agriculture (MoA) in the Annual Report of 2010 have acknowledged that:

The sector remains the principal source of livelihood for more than 58% of the population though its contribution to the national GDP has declined to 14.2% due to high growth experienced in industries and services sectors. Compared to other countries, India faces a greater challenge, since with only 2.3% share in world’s total land area, it has to ensure food security of its population which is about 17.5% of world population (MoA 2011, p.3).

Farmers are increasingly burdened by debts due to agricultural expenses coupled with low yields, land degradation, and varying rainfall patterns. Inequality between rural and urban households and between cultivators and non-cultivators is increasing and this was observed through-out the fieldwork at the rural areas. Families where the man of the household lived in the city or undertook construction work nearby the village were better off in comparison to poor farmers who entirely depended on agricultural outputs. Among the solutions which have been proposed, the diversification to mixed cropping with Jatropha or only Jatropha plantations on
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wastelands has been one of them. Jatropha plantations under the NREGA has been claimed to be conducive because the gestation period of the plant is from three to five years and requires pruning at intermittent time intervals. Additionally labour can be employed to pluck the oilseeds once they are ready to be harvested. This is evident from the report of the committee of biofuel:

Employment generated will be 311 man days per hectare of plantation by the time seed production starts. Seed collection is again labour intensive and after the plantation has been established it will need 40 person days of labour per hectare. As such one hectare of plantation will create employment during the implementation of the project (first three years) of 311 person days and of 40 man days per year on a long term basis (GoI 2003, p115).

Hence the NMB was supported by the narrative of it being a rural development initiative which would enhance rural livelihoods and boost the agricultural sector.

5.3.3 Biofuel as a Business Opportunity for Small-scale Farmers, NGOs, and Private Enterprises

An additional narrative underlying the NMB was that the production of biofuels would attract investment by a range of private companies and their interest in the biofuel sector would involve the association of NGOs and confer livelihood benefits to small-scale farmers (GoI 2003). The proclamation of interest in biofuels by India attracted a multitude of companies both local and international vying to invest in the biofuel industry. Initially many of the interviewees especially government officials said the presence of these companies was good as they would invest in the nascent biofuel industry and encourage the production of biofuels. As many of the companies did not own large tracts of land they would encourage small-scale farmers to plant Jatropha. Companies like D1 Oils Plc, Mission Biofuels, Emami, Reliance Ltd did indeed invest actively and according to many interviewees these companies followed a strategy referred as ‘the closed loop mechanism’. According to this the companies entered into a contractual farming agreement with the farmers and procured feedstock from the farmers and set up processing facilities in the vicinity of the feedstock sources in order to process raw materials. In this manner the companies

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stimulated the local economies by generating employment and hence were given leeway to expand their operations. However the contract farming did not turn out to be as beneficial as expected and many of the international companies did not bother to set up processing facilities in India.

The prospect of private enterprises investing and creating job opportunities was reckoned as a key process in the NMB and it was envisaged that phase II which was the self – sustaining phase of the mission would be undertaken by the key stakeholders of which the private companies formed a majority (GoI 2003). The Planning Commission’s Report (2003) also expressed that NGOs would play an important part in the various activities such as informing the farmers about cultivation techniques, forming a link between the farmers and private companies, capacity building of pruning and farming techniques and other related activities involved in the biodiesel production chain. According to the NMB mandatory blending of biodiesel would be implemented across the states; hence the production of biodiesel was an attractive venture for the private companies who could later sell biodiesel to oil companies or export it (ibid.). The private companies involved small-scale farmers by agreeing on contract farming and it was considered that it was a win-win situation for the company and the farmers. One of the representatives of a major company investing in biofuels said that:

The farmers don’t have to worry; we will give them the raw materials and the money. All they have to do is grow the crop and they don’t have to bother about marketing it. We are helping them out.

A NGO representative at the field level said that:

We are there to guide them on everything. We provide good quality seeds and periodically keep checking on their work. So they get help from us and definitely the output will be good.

Officials from many companies and NGOs took pride over the fact that they made sure women were also employed and given equal wages. In many cases in India...
contract farming does offer a means for women to gain income but the rate of pay is not the same for men and women. However the NMB and NREGA mandated that the rate of pay should be equal for men and women and this further exemplified the narrative of creating employment along with equal rate of pay.

Many small-scale farmers could also invest in mixed cropping on their fertile lands. From the NMB it was evident that if the biodiesel blending standards were implemented across the country there would be a steady demand for Jatropha seeds and new plantations. Hence small-scale farmers who grew leguminous crops could also grow Jatropha on their land and while they were getting returns from their staple crop they could get extra cash from harvesting Jatropha seeds.

Despite contract farming having its shortcomings and the lack of regulatory measures (Singh 2002) the narrative of private companies, NGOs, and small-scale farmers benefiting from the biofuel initiative was embedded in the biofuel discourse in India and was supported by the private companies and NGO representatives who along with the key government officials took the initiative further.

5.3.4 Jatropha the wonder crop

The NMB advocating the production of biodiesel was publicised on the viability of the chosen oilseed and its numerous benefits. In India the demand for edible oil is higher than the domestic consumption, entailing that, there is no scope to divert edible oilseeds for the production of biodiesel. Among the viable options *Jatropha curcas* was supported as the most suitable alternative oilseed to produce biodiesel. Jatropha curcas L. also known as physic nut is a small bush/tree belonging to the genus *Euphorbiaceae*. It is native to South America but is well established across certain parts of India. According to the GoI (2003) there are various oilseeds that can be used to produce biodiesel however the main concern was to select an oilseed that did not lead to food security issues. Hence Jatropha was chosen and promoted as a ‘wonder crop’ by the GoI (2003). Jatropha was chosen as the ideal oilseed to produce biodiesel because:

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It can be grown in areas of low rainfall and in problematic soils. Jatropha is easy to establish, grows relatively quickly and is hardy. Jatropha can grow on… low fertility marginal, degraded, fallow, waste and other lands such as along the canals, roads railway tracks, on borders of farmers’ fields as a boundary fence or live hedge in the arid/semi-arid areas and even on alkaline soils. As such it can be used to reclaim waste lands in the forests and outside. Jatropha seeds are easy to collect… Jatropha is not browsed by animals. Being rich in nitrogen, the seed cake is an excellent source of plant nutrients. Seed production ranges from about 0.4 tons per hectare per year to over 12 t/ha (GoI 2003, p.111).

The Jatropha narrative further added that it yields seeds “in a maximum period of two years after planting…various parts of the plant are of medicinal value”; the plant can grow on a range of soil types, requires minimum or no irrigation, is resistant to attacks by pests, and does not require tillage (ibid., p.111-112). In addition to the above qualities it was said that Jatropha was toxic hence it would not be browsed by animals (ibid.). Hence the Jatropha narrative was portrayed as a win-win narrative that could result in manifold benefits.

5.3.5 Utilisation of wastelands

One of the key narratives supporting the development of the NMB was the ‘pro-wasteland’ or utilisation of ‘unused’, ‘dry’, and ‘marginal’ land. There are numerous references to the utilisation of wastelands for the cultivation of Jatropha in the Report of the Committee on Development of Biofuel. According to the report:

… plantation, seed collection, oil extraction etc. will create employment opportunities for a large number of people, particularly the tribals and the poor, and will help rehabilitate unproductive and wastelands (Dr D.N.Tewari 2003, preface of Planning Commission Report, GoI 2003).

Jatropha Plantation … On wastelands under Integrated Watershed Development and other poverty alleviation programmes (ibid., p. xi)

The Ministry of Rural Development …may be made responsible for plantation in degraded and wastelands, and other areas (ibid., p. xvi)
From Green Revolution to Green Gold: The Evolution of the Indian National Mission on Biodiesel

According to the NMB, Jatropha cultivation would be carried out on wastelands. The ‘wasteland’ narrative in the report contends that these are dry, marginal land of limited ecological and economic benefit (GoI 2003). According to the Planning Commission’s report (GoI 2003) the total area under wastelands in India amounted to 197 million hectares of which 13.4 million hectares are suitable for the cultivation of Jatropha. The premise of the ample availability of unused wastelands was one of the key narratives triggering the biodiesel mission aiming at large and wide-scale plantations of Jatropha. The areas earmarked for cultivation were chiefly distributed within under-stocked forest lands and the land outside forest areas. The GoI and private companies targeted ‘marginal’, ‘unused’, ‘idle’ or ‘degraded’ land on the assumption that these areas are unsuitable for food production and are poor in biodiversity. The prevalent notion among policymakers was that, large areas within forests are wastelands and any land other than dense forests, including degraded forests and pastures can be used for Jatropha plantation, thereby avoiding large tracts of cultivable agricultural land. The report further ascertains that these are ‘unused wastelands’ and could and would be used for Jatropha plantations as Jatropha can successfully thrive on marginal lands. This was clearly reflected in the Planning Commission’s report:

It can be planted on under-stocked forest lands managed by the J.F.M. Committees, farmers field boundaries to provide protective hedge, fallow lands, on farmers’ holdings as agroforestry along with agricultural crops, public lands along railway tracks, highways, canals and community and government lands in villages. It can also be planted under the poverty alleviation programmes that deal with land improvement (GoI 2003, p.ix).

The win-win development narrative of Jatropha and availability of large tracts of wasteland for cultivation were promoted and reiterated by policy-makers and other actors involved in the biodiesel initiative and these narratives gained prominence in the policy discourse and ultimately resulted in the biofuel policy.

Biofuel Narratives
5.4 Local nature of narratives and their reliability

The global biofuel narratives portrayed energy security, rural development, climate change mitigation and environment sustainability, and economic growth through trade and revitalisation of the agricultural sector as the core objectives for the development of biofuels. The global biofuel discourse had an impact on national biofuel initiatives across the developed and developing nations. Keeley and Scoones (2003) state that “International initiatives do not exist in complete isolation from smaller scales; rather, there are always threads running from one to the other – localising the global and globalising the local”. In India the biofuel discourse pertaining to the National Mission on Biodiesel has been influenced by the global biofuel narratives; the NMB put forward energy security, creation of employment, and improvement of the agricultural sectors as the core objectives of the biodiesel initiative in India which aligned with the global narratives. The rising population, economic growth, and increasing demand for energy were publicised in India and created a suitable scenario for the introduction of biofuels, which were promoted as an environmentally sustainable development initiative.

The global biofuel narratives resulted in blueprint development because of the support from the GIBN of actors, however it is important to note that despite their global nature local contexts also played a key role in the emergence of local/national initiatives. Despite India’s willingness to promote a biodiesel policy the GoI was keen to avoid debates on food security and cultivable land being diverted for the production of oil crops. Hence irrespective of the references made to the experiences of Brazil, the USA, and the EU, in the Planning Commission’s Report (GoI 2003) the biodiesel initiative had an Indian character of its own. In India the NMB promoted the cultivation of ‘Jatropha’ a non-edible oil-seed on ‘wastelands’, whereas across the EU, and the USA edible oil-seeds were being used to produce biofuels. The policy processes and networks that supported and shaped the formulation of the NMB were representative of Indian characteristics of policy-making. Chapter 6 and 7 will unpick the biodiesel policy-process in India and the role and types of actor-networks at the central and state level.
5.4.1 Jatropha the wonder crop?

In section 5.3.4, I discussed how according to the narrative Jatropha was termed as a ‘wonder crop’ and chosen as the ideal oilseed for the production of biodiesel in India. However I argue that the claims exalting the various so-called wonder properties of Jatropha were based on shaky or no real scientific data. According to the Planning Commission’s Report (GoI 2003) the crop would start yielding seeds by the second year and the yield of seeds would range from 0.4-12t/ha/year. Jones and Miller (1992) projected this range in their work, however Jongschaap et al. (2007), and Ariza et al. (2010) have shown in their studies that a majority of Jatropha plants do not yield seeds till the 3rd year and the yield rates stated by the GoI do not correspond to the yield rates observed in the field. They argue that these yield rates do not take into account a range of parameters such as climate, type of soil, irrigation, rainfall patterns, and spacing of seeds. Achten et al. (2003) further add that very little research has been done on the germplasm of Jatropha and therefore there is no uniformity of seeds, they consider Jatropha as a wild plant as selective breeding has not been done and hence they argue that it is not possible to have constant yield rates with varying qualities of seeds. The Planning Commission’s Report (GoI 2003) cites just two examples of Jatropha plantation in Gujarat and Maharashtra before extrapolating the results and advocating these yield rates for India. This argument advances Roe’s (1991) claims that narratives are often based on shaky scientific facts. The GoI did not carry out sufficient research on the yield rates of Jatropha prior to claiming the yield rates published in the Planning Commission’s Biodiesel Report. The various actors just assumed that Jatropha was a high yielding crop under variable conditions and the report on biofuels does not cite or present reliable yield rates from different tests across India.

The Jatropha narrative also claimed that Jatropha can grow on dry degraded lands with minimum inputs of irrigation. Ariza et al. (2010) in their study said that yield rates reduced drastically when the plant was not irrigated and was grown on rain-fed conditions. In my fieldwork it was further observed that in areas with marginal rainfall the tap root extended further to tap the reserves of ground water, resulting in
a decrease in the ground water table level. Additionally it was observed that these plants in marginal lands with minimum rain withered and stopped producing seeds or the seeds had very low content of oil. Further studies done by Achten, et al. (2008) and Kumar (2009) back this argument.

According to the NMB, among the beneficial properties of Jatropha, lies its ability to reclaim waste degraded lands (GoI 2003). However this was not observed during various field visits. Farmers complained that Jatropha yields were dismal on low quality soil and required adequate management techniques to yield good quality seeds. This argument of management practices is further demonstrated in the study done by Ariza et al. (2010) where they compare the yield rates based on management practices such as soil quality, irrigation, pruning, and spacing. The Jatropha narrative also mentions how the Jatropha seed cake can be used as a fertiliser after the extraction of oil. This raises two important issues; one if Jatropha is toxic is it safe to use the seedcake as a fertiliser?; two, the extraction of oil is primarily carried out by oil producers and not farmers. This means that the farmers do not have direct access to the seedcake and they will have to buy it from the oil producers. Moreover, with the low yield rates the quality and quantity of seedcake produced would vary significantly.

Due to low yields, poor oil quality, additional requirements of irrigation, spacing, and fertilisers Jatropha was called the ‘blunder crop’ (Biofuel Digest 2009). The above argument on the reliability of the Jatropha development narrative extends Leach and Mearns (1996) statement that narratives tend to misrepresent a situation which results in decisions being formed based on false information. In this case the actors representing the Jatropha did not test the viability of the various claims and misrepresented Jatropha as a hardy crop that can grow on degraded land with minimum inputs and management techniques.

5.4.2 Wastelands?

The narrative to use wastelands for the cultivation of Jatropha primarily focused on concerns surrounding the debate on food vs. fuel. The narrative displayed the GoI’s
keen stance on using a non-edible oil crop on wastelands so that good arable land would not be diverted for the cultivation of oil crops. However the very term ‘wasteland’ is contested (Joshi 2007, Whitehead 2010, Baka 2011). Gadhil and Guha (2000) and Whitehead (2010) contend that the term ‘wasteland’ was used to construct artificial binaries to classify, or perhaps more appropriately, to divide, both people and lands in Indian colonial land settlement and forest policies. Lands were either classified as ‘wastelands’ or ‘value-producing’ and in the context of forest policy, the groups associated with these lands were either tribals or castes. Even till date these so called wastelands are associated with the scheduled tribes and scheduled castes and the use of wastelands for the cultivation of Jatropha affected them the most (ibid.).

The resolution of the government to use ‘marginal’, ‘unused’, ‘idle’ or ‘degraded’ land is based on the assumption these areas are unsuitable for food production and are poor in biodiversity. However, from the interviews conducted with members from NGOs, civil organisations, and rural actors (farmers and labourers) it emerged that, these lands are not unused degraded lands. The respondents said that the GoI had clearly neglected the fact that pastures and grazing lands categorised under wastelands, are often de facto village commons and Common Property Resources (CPRs), and a majority of them contribute to the larger forest landscapes and inherently augment the forest communities’ economy and livelihoods. Far from the government’s assumption of being unused, these lands convey a variety of livelihood options for users, including food, fuel, fodder, timber and building materials (Ravindranath and Hall 1995, Gundimeda 2005 cited in Rajagopal 2008). Currently there are no official estimates of CPRs in India, and the classification of land as ‘degraded’, ‘unused’ or ‘marginal’ is strongly contested and there is no accepted definition. Land that is unused or marginal, at least for agricultural purposes, can support significant levels of biodiversity besides playing a role in maintaining ecosystems by forming wildlife corridors and contributing to water resources (CFC 2007).
The rural users said the land termed as ‘wastelands’ by the GoI are not wastelands, the areas might not be suitable for agricultural purposes, but they are used as pastures, to grow woody crops to serve as fuel wood, are the means of procuring revenue by the landless farmers and labourers, and are intrinsically linked to communities’ livelihoods. The government officials and representative from the private companies represented the wastelands as land that is not economically viable, but the rural users said they depended on these lands as a source of livelihood.

Policy makers, bureaucrats, related government officials considered the wastelands fit for the cultivation of Jatropha but the rural communities did not want to use their CPRs for the same purpose. Hence there is an on-going dispute over the use of these so-called wastelands, which the government had disregarded or not taken into notice, before the swift decision to allocate them to cultivate Jatropha without consulting the rural people whose subsistence depends on them. To meet the biodiesel blending target the GoI has estimated that 13.4 million hectares of wasteland will be cultivated with Jatropha (GoI 2003); many social researchers and rural users expressed that this form of diversion of land can have profound implications on rural livelihoods and rural ecosystems. From this discussion it is evident that the wasteland narrative was not a reliable narrative based on true facts. The wasteland narrative misrepresented the CPRs as wastelands and decisions were formed on false information. The CPRs which were used as pasture lands and other sources of revenue were labelled as wastelands and did not take into account how their diversion for the cultivation of Jatropha would affect the rural communities who used these CPRs.

5.5 Conclusions
This chapter aimed to answer the first research question and reveal the role of narrative in promoting biofuels globally. The biofuel narratives have promoted biofuels as green fuels and portrayed them as a prime choice for the sustainable production of energy. The narratives have capitalised on how biofuel production can revitalise the agricultural sector and create employment, this in turn has captivated the interests of developing economies. Hence biofuels have been cast as a
multifaceted technology whose use brings a number of results: creation of jobs through the processes involved in the cultivation of feedstock for the production of biofuels; leading to climate change and environment sustainability; economic growth by reducing the oil import and increasing the chance to trade and ultimately resulting in energy security.

This chapter emphasised the role of narratives in creating an enabling environment for the introduction and promotion of biofuels globally. The chapter revealed the emergence of biofuels globally by citing examples from Brazil, the U.S.A, and the EU. One of the aims of this chapter was to emphasise the power of narratives in development policy-making and the discussion on the spread of biofuels globally proved how global biofuel narratives resulted in the creation of biofuel policies or policy mandates across different countries.

This chapter revealed that the global biofuel narratives played a key role in the emergence of national narratives supporting the biodiesel mission in India. However the chapter also revealed that despite the influence of global narratives the national narratives in India were strongly influenced by regional characteristics of the country. The GoI was keen to avoid debates on food security and land being diverted for oil crops and hence the national narratives promoting biodiesel production in India encouraged the cultivation of the non-edible oilseed Jatropha on wastelands.

While this chapter aimed to introduce the national narratives promoting the NMB, it also wanted to highlight the pervasive nature of development narratives in policy-making. The chapter argued that more than often narratives are based on shaky scientific facts and tend to misrepresent the actual facts. The discussion in this chapter contested the reliability of the two main national narratives promoting the NMB in India. I argued that Jatropha was not a ‘wonder crop’ as stated by the GoI and neither were the so called ‘wastelands’ idle, unused or marginal lands. The discussion on the reliability of these two narratives proved that they were not backed by adequate data, research, or statistics and how they were just used as a tool by the policy-makers to simplify complex issues in development policy-making pertaining to...
to the biodiesel mission. This chapter adds to the argument that narratives lead to blueprint development and are often used to mask the local interests and local complexities as evident form the diversion of CPRs and dismal yield rates of Jatropha.
Chapter 6: National and State Biofuel Networks

6.1 Introduction

In chapter 3, I introduced the various research themes, this chapter will focus on research theme two. The aim of this chapter is to trace to the role of networks at the policy level and state level in India and discuss their role in the creation, promotion, and uptake of NMB across India. The chapter focuses on the various actors, the linkages between them and how they added other actors to the network to support their initiative. In this thesis I argue that the NMB initially emerged and progressed rapidly across India as a result of national and regional networks comprising actors from the government (politicians, bureaucrats, policy-makers), research centres, private companies, and NGOs who actively supported its promotion. I contend that three types of networks namely government-led, research centre-led, and private company-NGO led network were pivotal in the promotion and uptake of the NMB across the different states in India. This chapter aims to discuss the creation and role of the policy network at the central level that supported the NMB as a policy option. It further aims to describe the manner in which the above mentioned three types of networks were established and how they played a key role in the adoption of the NMB across the three case studies.

The overall discussion in this chapter revolves around the creation of the national and state networks in India that introduced and promoted the biodiesel initiative. The networks at the national and state levels comprised a ‘primary’ and ‘secondary’ network. The chapter will discuss how actors were mobilised in the primary network, how they deliberated to introduce and persuade other actors to support the initiative of biodiesel as a technology to pursue the development of biofuels. In turn it will trace the creation of a negotiation space that resulted in the elaboration of a ‘secondary network’. The expansion and implementation of the activities of the

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15 Law and Callon (1992) use the terms ‘global’ and ‘local’ but I use ‘primary’ and ‘secondary’ so that they are not confused with the use of the word global employed in Chapter 5
NMB by the actors of the primary network resulted in the creation of a ‘secondary network’ (See Law and Callon 1992). The actors in the secondary network were chosen by the actors of the primary network and they continued the activities of the mission, and in turn introduced more actors to the network. The chapter will ultimately trace how the networks at the regional level stabilised the introduction and adoption of the NMB in India.

The discussion in this chapter draws from ANT and uses terminology from ANT which have been explained in Chapter 3. The first half of this chapter focuses on the national policy network at the central level that promoted the introduction of a biodiesel mission at the policy level. The second half uses three case studies to demonstrate the creation of three types of networks in Chhattisgarh, Tamil Nadu, and Maharashtra and their role in the promotion and uptake of the NMB in these states. The discussion points to the varying nature of networks across the three case studies and demonstrates how based on the alliances and type of actors involved in the networks the progress of biodiesel mission differed markedly across the three regions. The case studies compare and contrast the heterogeneous nature of alliances in networks and present the domains in which they were influential. In the literature dealing on biofuel networks there are general examples dealing with global biofuel networks but not the role of regional networks especially in developing countries (see chapters 1 and 3). The discussion in this chapter tries to address this gap by tracing the creation of three regional networks and discussing their role in promoting the NMB.

6.2 The National Mission on Bio-Diesel in India: narratives, networks, and actors/policy entrepreneurs

Roe (1991) describes rural development as an uncertain activity, which in turn entails that policy-makers, bureaucrats, and practitioners create stories to simplify the ambiguity of rural development. In Chapter 5, I discussed how the widespread emergence of global biofuel narratives, resulted in the emergence of biofuel narratives in India. The pro-poor, energy security, miracle-properties of Jatropha,
and wasteland narratives promoting the production and use of biodiesel as a rural development (energy) policy option in India gained purchase among a range of actors comprising representatives from the government (policy makers and technocrats), oil industry, agribusiness firms, private investors, NGOs, and academics. The interests of these lobbies resulted in the setting up of a ‘Committee for the Development of Biofuel’ and this Committee\textsuperscript{16} published the Report of the Committee on Development of Biofuel in April 2003, which promoted the development of ethanol and biodiesel (GoI 2003).

Chapter 2 discussed the role of science and technology and the strong presence of technocrats in development policy-making in India. After independence, major policy goals in India emerged through a consensus between the political leaders, industrial elite, and civil service intellectuals (Mathur and Mathur 2007). There is a strong culture of technocracy in the country’s policy making, comprising primarily scientific, technological, and business expertise (Scoones 2006). Scoones (2006, p.53) proposes that bureaucrats in India devise plans and schemes “to keep the government machinery oiled” to maintain the support of networks and politicians. To do so they employ “architects and promoters” who, due to their status, are “above reproach and beyond critique”. I cited examples of M.S. Swaminathan and Homi Bhaba to show how technocrats are considered beyond reproach in policy circles in India.

The production of biodiesel and the narratives associated with it gained popularity because they were promoted and supported by elites such as Dr. Abdul Kalam, Dr. Tewari, Dr. Paramathma and Mr Shukla\textsuperscript{17}. Dr. Abdul Kalam was the scientific adviser to the Prime Minister in India and actively promoted Jatropha as a feedstock for the production of biodiesel. When Dr. Abdul Kalam became the President of India, he advocated the benefits of biofuel in his Independence Day address in 2005.

\textsuperscript{16} Henceforth the term Committee refers to the Committee for the Development of Biofuel
\textsuperscript{17} The designations and roles of these actors will be discussed later
We have nearly 60 million hectares of wasteland, of which 30 million hectares are available for energy plantations like Jatropha. Once grown, the crop has a life of 50 years. Each acre will produce about 2 tonnes of biodiesel at about Rs. 20 per litre. Biodiesel is carbon neutral and many valuable by-products flow from this industry... India has a potential to produce nearly 60 million tonnes of bio-fuel annually, thus making a significant and important contribution to the goal of Energy Independence ... What is needed is a full economic chain from farming, harvesting, extraction to esterification, blending and marketing. Apart from employment generation, bio-fuel has a significant potential to lead our country towards energy independence ... By the year 2030, India should achieve energy independence ... and enhance the bio-fuel production through large scale energy plantations like jatropha (Kalam 2005).

Roberts and King (1991 cited in Fischer and Forester 1993, p. 35) state that “experts, often in the role of ‘policy entrepreneurs’, invent and broker policy solutions among competing elites, which in turn can be viewed as the power to reshape policy discourses and discourse coalitions”. In interviews with government officials and key scientists, many respondents referred to Dr. Tewari and highlighted his role in developing biofuels. Dr. Tewari was the chairperson of the Committee and held other key positions in the Planning Commission, Atomic Energy Committee, Indian Space Committee, and the State Planning Commission of Chhattisgarh. He has done extensive research on alternative fuels and, and one of the interviewees stated, “he actively pushed for the development of high yielding variety of Jatropha and biodiesel production as a clean and cheap energy and promoted the NMB as a key project of the Planning Commission”. Dr. Tewari was a key policy entrepreneur for biodiesel production from Jatropha and enrolled a range of actors to support the initiative and take the network further. For example, a bureaucrat from the Indian Forest Service said, “Tewari is not only powerful, he is also extremely persuasive.”

Enrolling of actors is important to advance a policy or project, but “the constant work of translation (of policy goals into practical interest; practical interests back into policy goals) is also required (Mosse 2004, p. 647). This is the task of skilled brokers (managers, consultants, fieldworkers, community leaders), who translate the work of
the project into the language of the stakeholders supporting it. In addition to Dr. Abdul Kalam and Dr. Tewari, elite technocrats and policy makers popularised the biodiesel narratives in various conferences, public meetings, and radio shows across various states. For example, Chhattisgarh grabbed the attention of the central government and other state governments when the Chief Minister, Raman Singh, became the first head of a state government to use biodiesel in his official vehicle and promised that he would switch all state-owned vehicles using diesel and petrol to biofuels. Labelled the “poster boy of biofuels” (Jain 2006), he was an ardent supporter of biodiesel production saying

This is just the start of the bio-fuel energy revolution in Chhattisgarh. Jatropha diesel will power all government vehicles within three months … .The state is tipped to cultivate 80 million Jatropha seedlings in rural areas to make Chhattisgarh a bio-fuel self-reliant state by 2015.”

Similarly, in Tamil Nadu a Centre of Excellence in Biofuel was set up in the Tamil Nadu Agricultural University and Dr. Paramathma, the principal officer of this centre, was instrumental in enrolling assistant researchers, representatives from the industry, and farmers who in turn formed networks to take the initiative further. Hence the role played by these and other influential actors and their successful campaigning soon entrenched narratives supporting biodiesel production within the Indian policy discourse, followed by the establishment of a ‘Committee on Development of Bio-Fuel’.

6.3 Constitution of the NMB- National Policy Network

The members of the Committee published the ‘Report of the Committee on Development of Biofuel’ which states that:

the rationale of taking up a major programme for the production of bio-fuels for blending with gasoline and diesel in our country emanates from a variety of factors. First, there

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18 The role of state level technocrats and actors will be discussed in the second half of this chapter.
is no alternative to the petroleum based fuels i.e., motor spirit or gasoline and High Speed Diesel (HSD) for the transport sector which is the major consumer of petroleum products. Secondly, biofuels are environmentally superior fuels and their use becomes compelling if the prescribed emission norms are to be achieved. Thirdly, there is need to meet the global environmental concern about climate change, ensure energy security, reduce imports, generate employment for the poor and achieve a number of other objectives of the Tenth Plan (GoI 2003, p.ii).

The Committee was constituted in 2002 by the Planning Commission of India, and the members were entrusted with the responsibility of devising detailed recommendations on how to develop biodiesel in India as a solution to address the challenges concerned with energy security, environmental sustainability, and rural poverty. The report consisted of inputs from policy-makers, bureaucrats and technocrats from important ministries and research organizations, the reputation of these actors and their suggestions fostered a prompt response from the government to devise the National Mission on Biodiesel (NMB), that would lay down the blueprint for the necessary institutional infrastructure, financial incentives, and identify the appropriate biodiesel feedstock and areas of cultivation (GoI 2003).

In April 2003, the Government of India (GoI) launched the National Mission on Biodiesel that identified *Jatropha curcas* as the most suitable tree-borne oilseed for the production of biodiesel, and focused on promoting plantations of Jatropha on wastelands, and consequently the scheme quickly became a flagship of India’s overall biofuel ambitions.

The Committee comprised senior officials from the Planning Commission, Ministries of Petroleum and Natural Gas, Environment and Forests, Rural Development, Road Transport and Highways, Science and Technology, and Railways and Agriculture. Apart from officials from the various ministries the Committee also comprised high level representatives from the Council of Scientific and Industrial Research (CSIR), the Indian Council of Agricultural Research (ICAR), Indian Institute of Petroleum (IIP), and the Indian Council of Forestry Research and the Environment (ICFRE).
Likewise the Committee also had representatives from the Central Pollution Control Board, The Bureau of Indian Standards (BIS), All India Distiller Association, and the National Oilseeds and Vegetable Oils Development (NOVOD) Board. Additionally senior scholars from the Indian Institute of Technology (IIT), and the director of the All India Automobile Manufacturer’s Association were also involved. The Planning Commission justified the selection of members of the Committee by saying that, the members from diverse backgrounds along with their expertise would contribute on varying issues related to the development of a biofuel policy (GoI 2003).

According to Law and Callon (1992) the success of a project/initiative, depends on the creation of two networks, the ‘global’ and ‘local’ network and the exchange of intermediaries between these two networks. In my discussion I use the terms ‘primary’ and ‘secondary’ instead of ‘global’ and ‘local’ networks; I do so to prevent confusion between global narratives and global networks. Law and Callon (1992) explain that a primary network is a set of relations between an actor and its neighbours on one hand and between those neighbours on the other. It is a network that is built to generate a space, a period of time, and set of resources in which innovation may take place. The space generated by the actors in the primary network is called the ‘negotiation space’, and a range of resources - finance, political, technical specifications, support are made available by the primary network in this space. The elaboration of the project in this space leads to the creation of a secondary network that in turn will generate a range of intermediaries that will be passed back to the actors in the primary network. Hence any network comprises a primary network, a negotiation space, and the secondary network (ibid.).

The NMB was put forward by the members of the Committee and it was promoted by the creation of networks at the national and state-level in India. The national network (policy-network at the national level) comprised a primary and secondary network, and a negotiation space. The members of the Committee were the actors who formed the primary network of the national network. The structure and initiatives of the mission were conceived in the course of negotiations within them and the neighbouring actors. Latour (1996) states that the success of policy ideas arises from
their “ability to continue recruiting support”. To ensure the NMB was introduced as a policy mission in India, these actors enrolled others, who formed various subcommittees to take the development initiative forward.

The actors who advanced this mission sought to establish a shape that would allow it to survive; which was a question of securing sufficient resources from the actors and ensuring their acceptance or neutrality towards the mission. Members from different ministries were enrolled as actors in the primary network, and each actor and ministry had a special significance. The Ministry of Railways was involved because “large scale plantations of Jatropha were to be grown on vast stretches of public land along railways tracks” (GoI 2003, p.xi). As long as the finance department was concerned they had to support the initiative by funding it and they were keen on promoting a mission which would not be too expensive. The Ministry of Environment and Forests (MoEF) had to monitor the cultivation on joint forest lands. The councils of scientific and industrial research, and agricultural research had to explore the viability of Jatropha as a suitable oil seed and the production of biodiesel as a fuel. The Ministry of Rural Development (MoRD) was in charge of the cultivation of Jatropha under poverty alleviation schemes while the Ministry of Petroleum and Natural Gas (MoP&NG) had to test the viability of biodiesel as a fuel and ensure blending was done in collaboration with the ministry of surface transport. Ultimately the Bureau of Indian standards (BIS) had the check that the quality of biodiesel being produced across the country met the specified norms (GoI 2003).

The transactions between the various ministries helped define the NMB, and it represented various things to different actors. In other words it possessed a high degree of ‘interpretative flexibility’ (Collins 1981). The transactions not only shaped the mission but also the actors that entered into transaction with it. The interests of different actors were redefined and stabilised as the objectives of the National Mission on Biodiesel. The actors in the primary network especially those from the Planning Commission were very powerful, and power plays and bureaucratic stratagems gained the consent of the actors who were reluctant towards the NMB. Hence by the process of mutual shaping the actors were not only shaped by the
networks in which they were located, they also influenced the actors they interacted with.

The NMB identified *Jatropha curcas* as the most suitable tree-borne oilseed for the production of biodiesel, and focused on promoting plantations of Jatropha on wastelands. The mission announced that 11 million hectares of land would be planted with Jatropha to produce adequate biodiesel to be blended at 20% ratio with High Speed Diesel (HSD) by 2012 (GoI 2003). Ahead of turning into a mass movement, it was proposed that the government should demonstrate the viability of the programme with all its linkages in different parts of the country and widely inform and educate the potential participants and stakeholders (*ibid.*). Consequently, the actors in the primary network proposed the NMB in two phases; phase I consisting of a demonstration project and phase II comprising a self-sustaining expansion of the programme leading to the production of biodiesel required by 2011-12.

Phase I would demonstrate the viability of activities such as plantation, seed collection, oil extraction, transesterification, blending and marketing, acceptance of biodiesel as automotive fuel and the institutional arrangements would be put in place for effective implementation of the various components of the mission. According to the Planning Commission’s Report (GoI 2003) this phase would commence by 2003 and would be completed by 2007, while phase II would commence in 2007 with the objective of producing a sufficient quantity of biodiesel to reach the blending target of 20% by 2012. It would involve acceleration of the activities initiated during the demonstration period, converting Jatropha plantations into a mass movement and result in the expansion of plantations and other connected activities across the country (*ibid.*).

The actors in the primary network proposed that the Mission could succeed if they involved stakeholders who would co-ordinate their efforts in the planning and implementation of it. The first step was the elaboration of the primary network by creating a Coordination Committee at the political level. The members of this committee were headed by the Deputy Chairman of the Planning Commission and
their role was to oversee the programme, formulate policy, provide necessary guidance on raising resources and effective implementation, and deal with issues of coordination and monitoring of the programme (*ibid*). The composition of this committee is given in Appendix 5.

*Jatropha curcas* was chosen as the viable feedstock, different ministries had been enrolled, resources were made available and thereby the negotiation space had been created. The next step was to create a secondary network that would take the initiative further. The key actors in the primary network mobilised actors to form a secondary network. A Steering Committee was set up at the official level and a special cell was established in the Planning Commission with the aim of serving both the committees. The actors in the Steering Committee formed the secondary network and comprised officials who were entrusted with the responsibility of implementing the programme; by overseeing, monitoring, identifying, and solving the problems during implementation. They had to implement the decisions made by the Coordination Committee and subsequently keep them informed about the progress achieved and turn to them for guidance. Their key role was to advise participating ministries and organisations so as to engage effectively and efficiently (GoI 2003). The actors from different ministries involved in the Steering Committee are given in Appendix 6.

Once the members of the Steering Committee had been mobilised, the second stage in the elaboration of the secondary network commenced. The role of the actors in the secondary network was to enrol additional stakeholders to pursue the initiative further. They envisaged the creation of four sub-committees to engage in the principal sectors of Plantation, Production, Marketing and Trade, and Research and Development. Figure 6 is a schematic representation of the primary institutional networking of the NMB.

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19 Coordination and Steering committee
The actors in the primary network had agreed that the Demonstration phase would be carried out in a mission (trial) mode. It entailed that there would be six micro-missions that would undertake activities such as plantation, procurement of seed and extraction of oil, processing of seed oil into biodiesel (trans-esterification), blending and marketing, and research and development (GoI 2003). These six missions had to be implemented and carried out by the actors of the four sub-committees responsible for plantation, production, marketing and trade, and research and development (as shown in Figure 6).

The sub-committee on plantation was entrusted with four micro-missions. The first micro-mission involved cultivation of Jatropha on forest land. After deliberations
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among the actors it was agreed that plantation would be carried out initially across four states covering a total area of 2 lakh\textsuperscript{20} hectares with the collaboration of the Joint Forestry Management (JFM) Committees and Forest Department Agencies (FDA), the MoEF, and the State Governments acting as the nodal agencies to oversee the activities.

The second micro-mission dealt with plantations on non-forest lands across four other states covering an area of 2 lakh hectares. It included plantations on marginal lands of farmers, public lands along roads and highways, and canals and railway tracks, which would be undertaken by NGOs, self-help and user groups, cooperatives, public and private sector corporations, and other bodies. The National Oilseeds and Vegetable Oil Development Board (NOVOD) being the nodal agency would implement the activities of this mission with the help of voluntary organisations (VO), state agricultural universities, public undertakings, government departments and the Indian Council of Agricultural Research (ICAR) institutions, while the entire micro-mission was overseen by the Ministry of Agriculture (MoA) (\textit{ibid.}).

The third micro-mission covered plantation on other lands – degraded and wastelands across the country. The MoRD was entrusted with this mission as Jatropha plantations assured positive significances towards poverty alleviation and ameliorating land resources. The Department of Rural Development (DORD), Department of Land Resources (DOLR), and Council for the Advancement of People’s Action and Rural Technology (CAPART) were the main departments under the MoRD entrusted with the implementation of this mission. It was concurred that Jatropha plantations would be placed under various programmes of the MoRD that were already being undertaken to help farmers enhance their livelihoods (\textit{ibid.}). The fourth micro-mission to be implemented by the Khadi and Village Industries Commission (KVIC) encompassed seed procurement and oil production. KVIC

\textsuperscript{20} 1 lakh = 100000

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would collaborate with small-scale industries and rural agro-industries in setting up seed procurement centres and installing oil expelling units. The nodal agencies of these micro-missions were the key actors who reported to the sub-committee on plantation and acted as spokespersons for the principal actors.

![Diagram](image)

**Figure 7 Institutional Network of the Plantation Sector (GoI 2003)**

Figure 7 is a representation of the institutional networking under the plantation sector. The arrows in the diagram begin from the plantation sector and are linked to the three sectors below and then each sector has a uni-directional arrow linking it to its constituent agency. The exchange of intermediaries between the actors was complex and messy as shown by the bent, flexible dotted arrows. While deliberating and resolving the areas under forest, non-forest, and other land to be planted with Jatropha at the planning stage, it appeared that each organisation could do it independently without interfering with the other. However it was not as easy as it appeared, most of the time the areas under different categories overlapped. Hence the nodal agencies and the organisations associated with one area interacted with other nodal agencies and their organisations which resulted in new linkages being
formed. In this manner a simple linear institutional network transformed into a conjoined complex web as depicted in Figure 7.

The first four micro-missions were addressed by the sub-committee members of the plantation sector. The fifth micro-mission which covered Transesterification, Blending and Trade of Biodiesel was administered by the sub-committees on production, and marketing and trade. The processes dealing with the production of biodiesel and ensuring blending with HSD were pursued by the Ministry of Petroleum and Natural Gases (MoP&NG). The oil companies were the key actors who had to ensure that biodiesel was being blended with HSD and their activities were monitored by the MoP&NG. The oil companies had to establish facilities that would ensure blending processes were in place or had to encourage private enterprises to do so. Once blending had been achieved the second part of the micro-mission covered the aspect of marketing biodiesel blended diesel. This activity was proposed as an organised trade activity to be implemented by the oil companies in conjunction with the Bureau of Indian Standards (BIS) which had to check the standard of the biodiesel being sold. As this micro-mission encompassed two sub-committees to impart the activities under it, two different institutional networks were set up as depicted in Figures 8 and 9.
As depicted in Figure 8 the Production Sector was primarily involved in transesterification of oil and blending. However the network of the sub-committee on Marketing and Trade involved the creation of another level with smaller committees which handled issues of – supply and distribution, legal issues and legislations, finances and pricing, quality standards, vehicle manufacturers and approval guarantee and education and awareness (see figure 9) (GoI 2003).

**Figure 9 Institutional Network of the Marketing and Trade Sector** (GoI 2003).

Bio-diesel has been produced in the EU and the USA from edible oilseeds whereas India was going to produce it from a non-edible oilseed, hence the sixth micro-mission was committed to carrying out Research and Development (R&D) on Jatropha as a viable oilseed for the production of biodiesel. The CSIR was the nodal agency to co-ordinate the R&D institutions at an academic and industrial level. The key R&D issues to be addressed related to raw material, production technology, and utilisation as fuel. The Department of Biotechnology (DBT), ICAR, and NOVOD directed the research on producing improved quality of feedstock, developing agro-technologies for varying agro-climatic regions, and analysing potential non-edible
oilseeds. CSIR, the Indian Institute of Petroleum (IIP), and private sector conducted research on efficient chemical and bio-chemical processes of oil production and utilisation of by-products generated during the production process.

Utilisation of biodiesel as a blended and straight oil involved setting up committees on engine/emission testing; stability/toxicology studies, life cycle analysis (LCA), use of alternate devices, and adulteration checks which involved actors from Ministry of Non-Conventional Energy Sources (MNES), Institute of Toxicology, Indian Oil Corporation (IOC), Central Pollution Control Board (CPCB), CSIR, and IIP. Figure 10 illustrates the institutions involved under the sub-committee on Research and Development.

The six micro-missions mentioned above constituted the demonstration phase that aimed to establish the feasibility of producing and blending biodiesel in India. The second phase was a self-expansion of the activities initiated in phase I to produce sufficient quantity of biodiesel to be blended at 20% by 2012. It was reckoned that as
the necessary networks were already in place the second phase would be easier to implement and would turn into a mass movement to produce biodiesel.

The actors in a primary and secondary network are heterogeneous and the way they relate or exchange intermediaries can be problematic and the manner in which they are connected determines the trajectory and success of a project (Latour 2005). The preceding discussion used data from the official documentation of the Planning Commission’s Report on Biofuel (GoI 2003) to describe the creation of the networks that resulted in the implementation of the NMB. The discussion traced the creation of the policy networks at the central level, introduced the actors, highlighted how the primary actors enrolled a range of actors and mobilised them into the NMB. The section drew from Law, Callon, and Latour’s work on networks to explain the creation of primary and secondary networks, how information was exchanged between the actors, how the key actors tied in the interests of other actors, enrolled them successfully into the NMB and in turn stabilised their interests.

The above section focused on the creation of the national policy network and its vital role in the introduction of the NMB as a policy option. As stated earlier, I contend that the NMB could not have progressed rapidly across the states in India without the creation of regional networks. I further argue that the regional networks across the states differed in their nature and role in promoting the NMB. Hence the next section will discuss the creation of three types of regional networks; the government-led network in Chhattisgarh, the research organisation-led network in Tamil Nadu, and private company-NGO led network in Maharashtra. The section will trace the strategies and contingencies which led to the creation of primary and secondary networks in the regional networks of Chhattisgarh, Tamil Nadu, Maharashtra, and how the actors tried to shape both the networks and control the relationships between them.

6.4 Chhattisgarh: Government-led Network
Chhattisgarh was the one of the first states to express an active interest in the biodiesel mission and the state government was keen to accept and promote the
NMB. The discussion in the following section draws from data collected during fieldwork carried out in Chhattisgarh in 2009.

The Government of Chhattisgarh was keen to attain the status of a biofuel-reliant state by 2015 and aimed to plant 160 million saplings of Jatropha in 16 districts. To achieve this status many actors had to be enrolled and the negotiations between them resulted in a mandate to cultivate Jatropha in mass quantities to produce biodiesel. On 26 January 2005 the state government of Chhattisgarh established the Chhattisgarh Biofuel Development Authority (CBDA), which was designated as the primary organisation entrusted with the responsibility of promoting widespread plantations of Jatropha in the state and producing biodiesel subsequently. This chapter has stressed the creation of a primary and secondary network, and the exchange of intermediaries between them for the progress of a project (Law and Callon 1992). In the state level government led network in Chhattisgarh, the primary network was created with the CBDA as the principal agency; members of the CBDA expanded this network by enrolling actors from related government institutions and research centres. The CBDA established linkages with the Forest Department, Department of Agriculture, Forest Corporation, Minor Forest Produce Federation, Chhattisgarh Renewable Energy Development Agency (CREDA) and the Agriculture Universities. Hence, members from these organisations and the CBDA formed the primary network of the Chhattisgarh government led biodiesel network.

As the benefits of the NMB as a rural development initiative had already been promoted in the Planning Commission’s Report on Biofuel (GoI 2003) it was easy for the actors in the primary network to interest other actors to join and promote this initiative. The key strength of the biodiesel initiative was its degree of interpretative flexibility, even though the final goal was to produce biodiesel to blend with HSD, the biodiesel programme encompassed a gamut of activities ranging from plantation, research on oil-seeds, management of wastelands, oil-processing, and checking the standards of biodiesel produced before it was blended with HSD. Hence the Programme covered a range of interests of the numerous actors involved.
For example, the agricultural universities were keen on primarily experimenting, identifying, and developing the appropriate genotype. Research scientists stated that

We are hoping to identify the right type of genotype which can then be used by the state government to grow Jatropha.

We are conducting trials and have given seeds to the CBDA officials which they will distribute to the farmers. In this way we can check the viability of the seed under natural conditions.

CREDA was keen to produce biodiesel to offset the usage of non-renewable fuels. As the official renewable energy department in the state they actively invested in the biodiesel programme. Despite each actor having varying expectations and roles towards the initiative they had to collaborate amidst themselves and appropriately define their relationship to the biodiesel programme and their corresponding responsibilities. While interviewing Shri S.K. Shukla the Executive Director of CBDA he said that the “key strategy in making the biodiesel programme a success is to ensure that the roles of the different organisations are clearly defined and they should work together”, implying that despite diverse expectations and roles of various actors involved it was crucial that the actors clearly defined their roles and collaborated amidst themselves.

Once the actors in the primary network were stabilised they undertook a range of activities. 210 million Jatropha saplings; either provided by the agricultural universities or bought from neighbouring areas and states were planted on 8400 hectares of land across sixteen districts. The assistant project officer Mr J.L. Gupta said that

In the sixteen districts, Jatropha was only planted on fallow or wastelands. The majority of the land belonged to the government while in some cases it belonged to farmers who were willing to grow Jatropha on their soils which were unproductive. I can guarantee you that we never encourage or grow Jatropha on agricultural land, that would be very silly. Why grow Jatropha when you can grow something edible and earn more.
To ensure that the plantations were carried out successfully, a secondary network was established comprising a task force. There was a task force in each district under the chairmanship of the collector and included representatives from NGOs, regional universities, private firms, and farming communities. The two networks; primary network comprising the CBDA and its allies; and the secondary network comprising a task force in each district were interdependent. The two networks mutually supported each other, from the primary network stemmed a range of resources – finance, political support, legal support, access and, procurement of seeds. The availability of these resources led to the generation of the negotiation space within which the actors from the secondary network could generate a range of intermediaries, the most significant of which would be the mass production of Jatropha seeds that could be passed back to the actors in the primary network to produce biodiesel from it.

The actors in the primary network were entrusted with the task of procuring and providing Jatropha saplings to the actors in the secondary network, who would ensure that the saplings were planted in the regional districts. Jatropha saplings were effectively planted on 8400 hectares by the actors between 2005 and 2006, and additional 6800 hectares of land was devoted to the plantation of 170 million saplings during 2007 to 2009. As stated earlier, the progress of a project requires the constant work of “translation (of policy goals into practical interest; practical interests back into policy goals), which is the task of skilled brokers (managers, consultants, fieldworkers, community leaders)” who translate the work of the project into the language of the stakeholders supporting it (Mosse 2004, p.647). The wide-scale plantations in Chhattisgarh were possible due to the awareness created, and information (knowledge) disseminated by the actors through the medium of local community forums, folk programmes, songs, circularising pamphlets, and to the extent of providing free seeds to farmers. Actors from the CBDA also set up demonstration plantations in various districts to foster investments from the private sector. The state government of Chhattisgarh aims to generate revenue of 40 billion
rupees by 2010 and till now the central government has assisted the state with an amount of 135 million rupees (www.cbda.org). The actors in the state level network translated the goals of the biodiesel initiative into the local language of the various actors involved in the initiative.

The discussion on policy entrepreneurs has already highlighted how the chief minister of Chhattisgarh was the first chief minister in India to use biodiesel in his official car and he promised that he would switch all state-owned vehicles using diesel and petrol to biofuels. Based on the state’s aim to become self-reliant in biofuels and anticipating the target output yield of seeds would be achieved, a transesterification unit capable of producing one kilolitre of biodiesel per day was set up by the CBDA in Raipur. From this section it is evident that in Chhattisgarh the state government played a key role in promoting the uptake of NMB by recruiting and constructing strong chains of allies that supported the NMB. The different actors involved in this network expressed varying interpretations about the viability and success of the Programme. For instance Shri S.K. Shukla, the executive director of CBDA had an optimistic outlook towards the initiative of developing biodiesel. However he was sceptical about the pace at which biofuel blending targets were being set and in his speech at the 4th International Conference on Biofuel in Delhi, 2008 he said, “The experience of Jatropha plantation and its commercial production is still limited, even then the Indian Government is taking a large step into the unknown” (Shukla 2008). He further reiterated it when I interviewed him in 2009 and said that

Jatropha plantations across the various districts has been promising and it is possible that in the long run the benefits of it will add up with a high potential of generating income for the poor. But now the private firms are the ones doing more research than us and they might take this initiative further.

21 June 2009
Mr J.L. Gupta the assistant project officer at CBDA firmly believed in the ‘pro-poor’ narrative of the development initiative to improve the livelihoods of the poor. He was actively involved in cultivation of Jatropha by farmers and landless labourers in Chhattisgarh and was keen to impart information regarding Jatropha – cultivation and pruning techniques to the farmers. He said that

Farmers should not cultivate Jatropha as the first main crop. They should do mixed farming. They have to change the way they think. Jatropha is not going to make them rich instantly. They should give second preference to it and concentrate on their staple crops. In their free time they should harvest the Jatropha seeds then they will see the money coming, instead of hoping that only Jatropha will be their main crop.

He reckoned that rural farmers should not conceive Jatropha cultivation as the sole source of income generation; instead he advocated mixed farming wherein they grew other crops along with Jatropha. He endlessly repeated that we have to change our outlook towards biofuels, he said it would be wishful thinking if we perceived that one would gain all the benefits from Jatropha as acclaimed at various forums, he did not deny that it was possible but stated that it would take longer than anticipated and said

Come on, think and act smartly. Enough research has not been done on Jatropha. If you are foolish enough to spend all your man hours cultivating Jatropha which yields after three years then not only will you be poor you will also lose interest in growing Jatropha again.

He expressed that if the farmers devoted a great deal of time and manpower on Jatropha cultivation then they would have high expectations from it. He also added that the plantations carried out have proved that Jatropha needed minimum inputs of water and fertilisers. The main activity which required additional labour was “plucking the seeds and crushing it”. Hence he recommended that activities like plucking and pruning be carried out in the spare time of farmers and the money earned from it would be an additional incentive for them to invest again. He assured that over a period of time the plantations would be successful and the demand for
Jatropha seeds would have increased which would then make it a viable source of income for the rural people. He was one of the key actors who supported the NMB and played an important part in the cultivation of Jatropha across Chhattisgarh.

Reflecting on Law and Callon’s (1992) analysis of the development of a technology/initiative it can be affirmed that appropriate actors had formed the necessary networks in Chhattisgarh to promote the cultivation of Jatropha under the NMB. However, on mapping the trajectory of this initiative certain nuances were spotted which hindered the progress of the NMB and led to a stasis for intermittent periods of time. It was observed that the entire Programme, its planning, impacts, technology of cultivation, production of oil, dissemination of information was contrived entirely amidst the key actors of the primary network. Once the objectives were set the secondary network was created to take the initiative further and then the farmers were involved. The main actors in the networks were bureaucrats and their role was to ensure that the local people believed in the credibility of the biodiesel mission. Hence, after the CBDA was set up it launched a mass awareness programme to convince the rural people that this initiative was being promoted to augment their efforts in seeking better sources of revenue. The apparent support exhibited by the chief minister who had already introduced other successful programmes was conducive to the propagation and acceptance of this program. This proved that “policy primarily functions to mobilise and maintain support” (Mosse 2004, p.648) irrespective of the viability of the policy/project design.

In more than 10 districts, large tracts of land, reported as unused or wastelands by the government were planted with Jatropha. The farmers interviewed were expecting a good yield within a few years and said “the government officials told us they will buy back the seeds at the rate of six to seven rupees; we don’t have to worry about searching for buyers”. However the farmers had not been trained with the appropriate

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22 Providing rice at the rate of ₹2/ kg, has made the chief minister popular among the rural population
farming, pruning, and spacing techniques and hence within the first year, the plants
grew too tall\textsuperscript{23}, were overcrowded or neglected. Many farmers said that

They told us that Jatropha is a hardy crop. We don’t have to
add fertilisers or irrigate it. Hence we were happy and did not
tend it properly. Do you know what happened? All the plants
died!

As the farmers had been told that Jatropha is a hardy crop and does not require any
inputs, they did not tend the crop and the yield rates were low across many districts.
This was the first hurdle the programme faced. Mr J.L Gupta and his team members
accepted that “they had made a mistake” and then they consulted with the research
scientists at the agricultural universities and research labs set up by private
companies. He said that the second time they went back to the field they had a new
strategy.

This time we asked the agricultural experts to speak to the
farmers and educate them on farming practices,
intercropping, pruning and additional inputs for the plant.

Once this was done, he noticed that farmers who had had a bad yield the first time
were hesitant to try again. However seeing others adopting it they were willing to
venture again and this time they faced positive and negative results. The principal
concern of the CBDA members and farmers was the varying yield rates which were
attributed to the unavailability of the appropriate genotype of Jatropha. Farmers
across different regions were provided with seeds of varying genotypes which had a
direct effect on the output and led to major misunderstanding among the farmers.
The farmers and landless labourers said that “they were cheated; one farmer woul
d成就 a high yield and another a dismal output even though they followed the same
procedures”. The members of CBDA said that varying yield rates based on the soil
type, inputs of fertilisers and irrigation led to contempt in some areas and success in
other places and consequently the rural people viewed the same initiative in a
different light in comparison to the personnel at CBDA.

\textsuperscript{23} If the plant is not pruned it grows too tall and reduces the output of the seeds
The state government realised that research on high yielding genotypes had to be intensified and this desire was expressed to the Central Government and other important actors.

At the end of the fieldwork in December 2009 Jatropha was still being planted widely across Chhattisgarh on forest lands, fallow unused government lands, common property land and private property. Many contentious issues relating to use of CPRS, rural development, presence of markets, and contract farming will be discussed in the chapter 8 while dealing with the consequences of the initiative.

6.5 Coimbatore (Tamil Nadu): Research Centre-led Network

The origin of the Tamil Nadu Agricultural University (TNAU) dates back to 1968 as an agricultural school in Chennai. It was later relocated to Coimbatore in 1971. TNAU is recognised as the pioneer agricultural research body in the state and a symbiotic relationship exists between the university and the State Government. TNAU has conducted research and delivered products to the state which in turn has acted as a steady source of funding for the university. When the need for conducting research on Jatropha was expressed, various agricultural universities across the country initiated an interest, however due to TNAU’s long standing commitment to research and development, the ‘Centre of Excellence in Biofuels’ was established as a multidisciplinary research facility in June 2006 at TNAU.

Hence in this network a government agency was not established or identified as a prime actor, instead a research body was specifically set up to develop appropriate genotypes of Jatropha, to identify standard cultivation practices and biodiesel production processes, and be actively involved in large-scale dissemination of the initiative across rural actors(farmers and landless labourers). The actors involved in the networks established in Chhattisgarh were primarily entrusted in promoting awareness of Jatropha and encouraging the farmers to plant it. Whereas the actors in the network created in Coimbatore were committed to conducting research and
identifying the appropriate genotype that would be passed on to farmers to cultivate on their land.

To map how the NMB developed in Coimbatore and the roles played by actors, interviews were carried out with the various actors who were part of the research-led biodiesel network in Tamil Nadu. Key interviewees were Dr. Paramathma the nodal officer (head) of the centre of centre of excellence in biofuels, Dr. Venkatachalam the head of the department of bioenergy at TNAU, research fellows in the biofuel centre, representatives from the industry, and farmers. The actors from the Centre were the key actors in the primary network and they expressed that to accomplish the objectives of the NMB, they had to invest primarily on identifying and developing the right species of Jatropha. Dr Paramathma mentioned that Jatropha is not a new crop in India but it has been ‘underutilised’ and now with the sudden rush to grow Jatropha, seeds from various areas are being used for plantations. He said that they were not doing the same, instead,

they first sourced Jatropha seeds from fifty-two different areas and after several trials they assembled eleven species of Jatropha as germplasm for improvement.

The visit to the labs and ensuing discussions revealed that six hybrids were being cultivated under Multi Locational Trials (MLTs). Dr. Nelson a research fellow at the Centre said that the trials were being carried out chiefly on the land owned by the TNAU under supervised conditions. However they had to carry out trials under natural conditions too. To do that they had to enrol actors who would form the secondary network, these actors consisted of farmers and representatives from the private companies.

In Coimbatore many private companies played a key role in promoting biofuels and the actors formed a part of the primary and secondary network. Some of the companies involved were D1-Mohan Bio Oils Ltd, MGR Jatropha biodiesel, KCP

24 Centre henceforth refers to the Centre of Excellence in Biofuels at TNAU
sugars, and Satanpura biofuels Ltd and they actively promoted Jatropha cultivation. Dr. Parmathma, Dr. Nelsen, and Dr. Siva Prakash a research fellow at the Centre expressed that the companies were being extremely proactive in promoting Jatropha. Some of the key players’ from these companies collaborated with the actors from the Centre, while others built their own chain of alliances and were keen to promote the cultivation of the crop and set up contracts with the farmers.

The members of the Centre closely followed the developments in the various hybrid trials. Dr. Nelsen said that

The breeding programme under different conditions exhibited varying yields. Under rain-fed conditions the output of Jatropha seeds was 1 tonne/hectare and if the plot was irrigated the output was 3 tonnes/hectare

Dr. Parmathma stated that

If you want a good yield then you have to treat Jatropha as an agricultural crop with adequate plant management technique being applied

When it was suggested that this viewpoint contrives Jatropha as a labour intensive plant which is contradictory to the claims of it being a hardy crop, he argued that the life span and yield rate of any crop increases substantially if it is nurtured and in this instance it implied complementing Jatropha cultivation with irrigation facilities and preferably cultivating it on good soil. He maintained that the rate and quality of inputs is directly proportional to the output of seeds. Dr. Nelson consented with Dr. Parmathma and confirmed that the yield was higher under good management practices. If good yield was to be achieved then the crop should be treated as an ‘agricultural crop’ with adequate inputs of water and fertiliser. Trials also had to be carried out under normal conditions to compare the yield under varying parameters like soil condition, rainfall, irrigation, fertiliser, and pesticide used. Dr. Siva Prakash explained that they had to involve local farmers who would cultivate the crop in their land. He said that
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We did not force them to grow Jatropha, instead on many occasions we paid them for the man hours spent on Jatropha cultivation. Our goal is first to identify the right genotype only then will we distribute it for wide-scale plantation.

He further added that

It was during the plantations carried out by the farmers that we realised that Jatropha is not actually pest-resistant as claimed by key people supporting the cultivation of Jatropha. To ensure a good yield pesticides have to be sprayed.

The striking difference between the development and progress of the initiative in Chhattisgarh and Coimbatore was that in the previous case, few trials were carried out before wide scale plantation was advocated, whereas in TNAU several researchers were closely following the developments in the various hybrid trials. The Centre which is funded by the Tamil Nadu government seeks to plant Jatropha on 20,000 hectares of land per year and is coordinating the production of seedlings through fifteen TNAU centres across Tamil Nadu. To ensure that other actors aligned with them the centre further promoted this initiative by associating with eleven biofuel companies identified by the government and supplied them with seeds.

Hence the primary network in addition to comprising actors from the TNAU network consisted of actors from eleven private companies and the presence of these actors led to a power struggle, with each one trying to prove its supremacy. The actors from the private companies wanted to become self-reliant and produce biodiesel on their premises and sell it at a higher rate, due to which until now sufficient information about the appropriate germplasm is still not being widely distributed. As of now the Centre has standardised a code of practice for Jatropha cultivation and this information has been disseminated to farmers, representatives of biofuel companies, scientists and interested personnel from across the country by conducting training programmes.

The Centre is also equipped with a transesterification unit having a capacity of producing 250 litres of biodiesel per day. The production of biodiesel was the
ultimate aim of the programme in this case study too, despite that there existed a high
degree of interpretative flexibility in this case. The Centre was funded to carry out
four different projects namely, ‘improvement and popularisation of biofuels’,
‘promotion of cultivation of Jatropha in Tamil Nadu’, ‘production and sale of seeds,
seedlings of major Tree Borne Oilseeds (TBOs)’ and ‘development of elite planting
material and model plantation in major TBOs’. Hence various actors had different
roles to play and despite having different goals all the projects contributed to the
development goals of the NMB.

In this case study it was noticed that wide-scale cultivation had not been deployed by
the Centre because it was still experimenting on the hybrids, however this did not
deter the other actors from being proactive. Despite the cautious attitude of the actors
from the Centre the actors from the industry formed their own networks and carried
the project forward. They established linkages with actors from the secondary
network and formed contracts and advertised the benefits of cultivating Jatropha. The
contracts between actors from the local and international companies with the farmers
led to harmful consequences which will discussed in Chapter 8.

Dr Parmathma said that “he was aware of what the people from different companies
were up to”. He stressed the need to formulate a policy that would bind the actors to
behave in a certain manner and develop the technology on the lines of achieving
rural development and energy security instead of it being developed exclusively to
produce seeds which could then be exported abroad, processed into biodiesel, and
sold offshore or exported back at a higher rate. He claimed that hopes were being
pinned on the development of this initiative to revive the agricultural sector and
affirmed that it was necessary to develop this technology and disseminate it in a
manner that would benefit all the actors involved and warned that minor
shortcomings could be handled but a major failure of this technology would lead to a
setback in the government investing in initiatives aiming to promote socio-
agronomic ventures in the future.
6.6 Pune (Maharashtra): Private Company-NGO led Network

The government of Maharashtra announced a policy for Jatropha plantation through the horticulture program of state’s Employment Guarantee Scheme (EGS) (Government of Maharashtra 2007) and aimed to develop Jatropha-specific cultivation practices and promote the cultivation of Jatropha across different districts. Pune is the second largest city in Maharashtra and NGOs and private companies played an important role in promoting the NMB in this region. As discussed in Chapter 2 along with bureaucrats, policy-makers, technocrats, NGOs and private companies also expressed an active interest in the NMB in India.

The major company investing in Jatropha cultivation in Pune was Mission Biofuels Limited and they aligned with a local company known as Purandhar agrofuels in Pune. Purandhar agrofuels had a small NGO unit and the members of the NGO were entrusted by the international company to undertake massive plantations of Jatropha. Mission Biofuels Limited was set up on 4 May 2006 as an Australian Securities Exchange listed company. The slogan of the company in its first annual report was “One Mission: One Fuel: Biofuel” (Mission Biofuels Limited 2006, p.1). When it was set up in 2006 the company aimed to produce biodiesel from abundant feedstock of crude palm oil (CPO) and sell it in the European market. The company initially intended to become a “large producer within the biodiesel market in South East Asia” (ibid., p.7) but it soon invested in sourcing cheap feedstock from South Asia. The company was keen to invest in the production of biodiesel from *Jatropha curcas*, and it carried out a feasibility study on the cultivation of Jatropha as an alternative feedstock for the production of biodiesel. The study was undertaken by The Energy Research Institute (TERI) of India and it concluded that Jatropha is a feasible and viable feedstock for the production of biodiesel (ibid.).

By March 2007 Mission Agro Energy Ltd a subsidiary of Mission Biofuels Ltd acquired 70% interest in Mission Biofuels India Private Limited (MBIPL). MBIPL acquired 51% of Agro Diesel India Pvt Limited (ADIPL) (now known as Mission
Agro Diesel India Pvt Ltd). ADIPL had carried out Jatropha plantations on 17000-22000 acres of land through contract farming with more than 5000 farmers in the states of Karnataka and Maharashtra; the company also had 2 Jatropha nurseries. With the acquisition of ADIPL, MBIPL could access the existing 22,000 acres of land cultivated with Jatropha and by the end of 2007 the company had expanded the area under Jatropha cultivation to 66,000 acres and had set up two nurseries; one in Tamil Nadu, and one in Maharashtra (Mission Biofuels Limited 2007).

In Pune representatives of this company (MBIPL) formed the primary network and they followed a two-step process to cultivate Jatropha in Pune. MBIPL leased or bought large tracts of land and planted Jatropha by employing people, or they entered into contract farming with the local farmers. Initially MBIPL tried to form contracts directly with the farmers but the farmers were sceptical of this new company and were not eager to align with this company.

MBIPL could not easily form contracts because the farmers did not trust representatives from this new/unknown company. Representatives from MBIPL realised that they would need to align with a local company/NGO that would be trusted by the farmers. Hence the representatives from this company enrolled actors from Purandhar agrofuels and actors from this company played a key role in convincing the farmers to form contracts with MBIPL to cultivate Jatropha. Hence only after representatives from MBIPL enrolled actors from a local company they were able to form contracts with the farmers. Initially MBIPL commenced with the contract model of farming, in which Jatropha seedlings were sold to the contract farmer after a detailed review of the suitability of the contract farmer and the proposed land to be used for contract farming. The farmers had to incur considerable expenses to prepare their land to be fit for Jatropha cultivation prior to the delivery of saplings, MBIPL promised loans to the farmers ranging in the range of ₹3000 to ₹5000, and agreed to purchase Jatropha seeds from the contract farmers. The officials from Purandhar agrofuels spoke to the farmers about the benefits of Jatropha, the ease of cultivation, low maintenance requirements, availability of seeds.
at a low cost from MBIPL and a buy back guarantee. Mr Murali Kamte, the key person at Purandhar agrofuels said that

We are not like the government officials who come once in few months and then disappear. We are here to help these people and tell them how to grow Jatropha. You have to realise that we want to help the poor farmers and there is nothing wrong if we earn something out of it

He further added

We know how things work in the villages. The villagers don’t like it when outsiders approach them about new ideas. So we recruited someone they trusted and asked him to speak to them about Jatropha

They recruited Mr Deepak Patil a lecturer in the local college of that region and he in turn recruited two other research associates from the college. Deepak Patil and his associates formed the secondary network of this private company-NGO led network. They played an important part in convincing the farmers about the benefits of cultivating Jatropha and how MBIPL was a good company to form contracts with. In this manner MBIPL and Purandhar agrofuels enrolled actors to influence the farmers to cultivate Jatropha. The network in Pune differed from the network in Chhattisgarh and Tamil Nadu. The network did not comprise government officials who could force the farmers to grow Jatropha on CPRs neither did it have research scientists who could provide the farmers with the appropriate type of seeds and guide them on suitable cultivation techniques. Rather this network functioned more as a business model where the farmers were willing to form contracts in exchange for money and promise to buyback the seeds. The representatives from the local company were keen to promote the cultivation of Jatropha and they actively encouraged it, they also set up nurseries in Pune to test the viability of Jatropha. Prior to sufficient research being done on Jatropha the actors from the local company and MBIPL actively encouraged the farmers to cultivate Jatropha and they succeeded in doing it by giving the farmers money. Hence the actors in this network did not associate with a range of
organisations but they rather used local actors at the village level to promote the NMB.

6.7 The networks across Chhattisgarh, Tamil Nadu, Maharashtra

The networks across the three research sites aimed at promoting the biodiesel initiative in India, despite sharing the same objective the various actors in the networks associated with the initiative and its implementation differently. This was the “interpretative flexibility” of the initiative. According to Collins (1981) scientific data, experiments, or results cannot admit only one interpretation. He has spoken about the dispute between Pasteur and Pouchet over the reproduction and emergence of spores. Pasteur said spores or any form of life arose from reproduction, while Pouchet believed in the theory of spontaneous generation. Their debate continued for years and Collins refers to the presence of this type of openness or interpretative flexibility in science. Development in science and technology are supported and contested implying that various people associate with the same type of technology or innovation differently.

The discussion in this chapter has revealed the 3 different types of networks across the three research sites, it introduced the types of actors in each network and how they followed different methods to promote the NMB. The policy network at the national level played an important role in stabilising the introduction of the NMB as a policy option, however I argue that these regional networks were pivotal in the promotion and uptake of the NMB across the states in India.

For example the key actors in the research led network in Tamil Nadu were scientists who were entrusted with identifying the appropriate germplasm. They followed a process of conducting trials and ensuring that they developed high yielding variety of seeds. Their scientific approach helped in winning over the trust of other actors namely representatives from the industry and farmers. In the state level network in Chhattisgarh, the CBDA members and related government officials were the key actors in the network. The actors in this network supported the political interests of
the state government and did not stress on developing the appropriate genotype of Jatropha. They actively promoted the actors in the secondary network to advance the cultivation of Jatropha across various districts. In the network in Maharashtra the private company and NGO actors along with local representatives were the main actors involved in promoting the cultivation of NMB. The actors from the NGO believed in the pro-poor narrative of Jatropha based on the planning Commission’s report and did not have scientific data to back their claims despite that they encouraged the farmers to form contracts with a private company. The various actors across the three networks had varying interpretations and expectations from the NMB despite them promoting the same rural development initiative.

Mosse (2004, p.651) states that “development interventions…need to maintain relationships” he argues that the relationships between the various actors shape the practice in the project. From the discussion on the three networks it is evident that the relationships and interests of the actors across the various networks varied; and the role of these actors and their actions had an impact on how the biodiesel initiative progressed differently across the three states.

6.8 Conclusions

The aim of this chapter was to illustrate that for any new technology/initiative to be introduced in a country it has to be supported. The chapter drew from ANT to outline the development of the biofuel initiative in India. The first half of the chapter stressed the emergence of the biofuel network at the central level where the key actors were bureaucrats, politicians, scientists and representatives from the industry. The discussion revealed the role played by actors from different ministries in supporting the biodiesel initiative and actively promoting it. The NMB targeted the development of biodiesel as a viable technology and cast *Jatropha curcas* as the most suitable oilseed for the production of biodiesel. The discourse revealed the interpretative flexibility of promoting this initiative and how actors aligned themselves with it.
The chapter focused on the creation of primary and secondary networks within the policy network and how the actors were instrumental in supporting the introduction of the NMB as a development policy option. The chapter highlighted the importance of policy entrepreneurs and their role in popularising the NMB. After tracing the creation of various networks within the policy network the chapter then focused on the creation of regional networks.

The chapter traced the creation of a government-led network in Chhattisgarh, research organisation-led network in Tamil Nadu, and a private company-NGO led network in Maharashtra. The discussion revealed how networks are unique based on the actors, types of linkages and the role played by them. In Chhattisgarh the networks created aimed at large-scale promotion of Jatropha cultivation across the state. The key actors were state government employees who took it upon themselves to prove to the other states that biodiesel can be effectively produced in mass quantities and used in cars. The actors in this network were keen to advance the initiative and used political force, money, and influence to do so. Despite the interest exhibited by the actors the lack of scientific research resulted in crop failure and dissent among the farmers cultivating Jatropha. However the presence of powerful actors supporting Jatropha cultivation ensured that despite setbacks Jatropha was again cultivated across the state. This proved that irrespective of the viability of a particular technology or initiative if it has garnered support then it can be promoted.

In Coimbatore the, nature of actors and role played by them varied from Chhattisgarh. In this case the actors were keen on conducting research and identifying the suitable variety of Jatropha for wide-scale cultivation. Even though production of biodiesel was the final aim of the actors in this network, they were wary and did not use political force to promote cultivation of Jatropha. As the key players were scientists they were not as powerful as bureaucrats, this in turn resulted in other actors trying to follow their own goals. In Maharashtra the main actors were representatives from a private company and a local NGO. The actors in this network promised the farmers loans to cultivate Jatropha and assured them of a buyback mechanism. The discussion in this chapter emphasised the relevance of networks in
supporting and promoting the NMB at the policy and state level and the varying nature of the regional networks.
Chapter 7: The Role of Rural users (farmers and landless labourers) in adopting the NMB

7.1 Introduction

The main aim of this thesis is to analyse the emergence of the NMB as a rural development policy option and assess how it performed as a test policy mission in India. As discussed earlier the NMB was introduced as a rural development initiative to improve the livelihoods of the rural people, hence one of the objective of this thesis is to analyse why the rural actors adopted the NMB and in turn how did it affect them. Chapter 3 discussed the three main research themes, the third research theme focuses on the role of rural users (farmers and landless labourers) and this chapter draws from SCOT and anthropology of technology to introduce the rural users across the three sites and discuss why they started cultivating Jatropha. In the introduction chapter and in chapter 3 I have already discussed why the farmers and landless labourers are considered as rural users and not producers in this thesis.

This chapter aims to introduce the two types of rural actors; farmers and landless labourers across the three research sites. The previous chapter focused on the creation of the three types of networks, emphasising on the role of the state-government, research organisation, and private companies and NGOs. This chapter will extend the discussion by introducing the farmers and landless labourers across the three networks, their cultural practices, social structure and how it impacted their decision to grow Jatropha. Ultimately the chapter will differentiate the differences among these rural users prior to discussing the consequences of the NMB in the next chapter.

7.2 Introducing the Users

As discussed in chapter 5 biofuels were introduced in India to achieve manifold goals of energy security, climate change mitigation, rural development, economic growth, and trade. The NMB aimed to produce biodiesel from Jatropha. The Jatropha value chain consists of various activities which can be broadly categorised into four categories - farm production of seeds, marketing of seeds, biodiesel production, and
biodiesel distribution. Figure 11 is a schematic representation of a typical Jatropha value chain.

<table>
<thead>
<tr>
<th>Cultivation</th>
<th>Marketing</th>
<th>Processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nursery</td>
<td>Biofuel board</td>
<td>Biodiesel processing plant</td>
</tr>
<tr>
<td>Seedlings</td>
<td>Beneficiaries</td>
<td>Govt/Private</td>
</tr>
<tr>
<td>Plantation</td>
<td>Intermediaries</td>
<td>Oil extraction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SVO</td>
</tr>
<tr>
<td>Owned wasteland</td>
<td>Community wasteland</td>
<td>Forest land</td>
</tr>
<tr>
<td>Harvesting and hulling of fruits</td>
<td>Seeds</td>
<td>DRDO</td>
</tr>
<tr>
<td></td>
<td>Intermediaries</td>
<td>Railway</td>
</tr>
<tr>
<td></td>
<td>Oil extraction</td>
<td>Transport companies</td>
</tr>
<tr>
<td></td>
<td>SVO</td>
<td>Oil marketing companies</td>
</tr>
<tr>
<td></td>
<td>Transesterification</td>
<td>Local use in fuel, etc.</td>
</tr>
</tbody>
</table>

DRDO: Defence Research and Development Organization; SVO: Straight Vegetable Oil

**Figure 11 Schematic representation of Jatropha based biodiesel production** (Shinoj et al. 2010)

The biodiesel production value chain encompassed a wide range of users comprising scientists, bureaucrats, private companies, farmers, NGO personnel, researchers, landless labourers, government agencies, and other users. The previous chapter traced the role of government officials, scientists, and representatives from private companies and NGOs in promoting the NMB across the three research sites. This chapter will focus on the rural users- farmers and landless labourers and their role in agreeing to cultivate Jatropha and its associated farming practices. The empirical data was collected from three research sites: Chhattisgarh, Tamil Nadu, and Maharashtra. In the research sites two classes of users were identified; farmers comprising small, semi-medium, medium, and large land owners; and the labourers...
who worked on land owned by somebody else. The users across the sites exhibited different cultural practices and usage patterns. The farmers had the choice to decide what to grow on their land, while the landless labourers did or did not have a choice depending on the research area. The farmers were wealthier in comparison to the labourers but they had the disadvantage of facing larger losses. The characteristics of the users, usage patterns, issues affecting them, and their perception of Jatropha plantation will be explained in this section.

7.3 Farmers
The first category of users was the farmers who cultivated Jatropha on their land in Chhattisgarh, Maharashtra, and Tamil Nadu. In Chhattisgarh farmers were interviewed across different districts, in Maharashtra fieldwork was carried out mainly in regions near Pune, and in Tamil Nadu interviews were conducted in Chennai and Coimbatore. The majority of the farmers had marginal, small or semi-medium size land holdings. Appendix 7 lists the classification of land holdings based on size. In India, the agricultural sector is vital for food and nutritional security and this sector is the principal source of livelihood for more than 58% of the population. In recent years the contribution of the agricultural sector to the national GDP has declined to 14.2% due to high growth in industries and services sectors, especially IT sector. India has to ensure food security to a population of 1.21 billion which is about 17.5% of world population (MoA 2011). To meet the rising demand there is excessive pressure on the available arable land and has led to fragmentation of land holdings. The Ministry of Agriculture (MoA) is focusing on mobilising higher investment in agriculture, bridging yield gaps, providing adequate supplies to farmers, and support services to make agriculture a remunerative vocation on a sustainable basis. Among the various rural development programmes, Jatropha plantation was introduced on the basis of it being a hardy crop capable of growing on non-arable land.

Across the research sites different models of farming were observed and are represented in Table 2.
The Role of Rural users (farmers and landless labourers) in adopting the NMB

<table>
<thead>
<tr>
<th>OPERATOR</th>
<th>OWNERSHIP OF LAND</th>
<th>OWNERSHIP OF HARVEST</th>
<th>ROLE OF GOVERNMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer</td>
<td>Farmer</td>
<td>Farmer</td>
<td>Subsidy on seedlings/subsidy on irrigation/Loans</td>
</tr>
<tr>
<td>Farmer/Landless Labourer (NGOs/JFMC/SHG)</td>
<td>Government/Community</td>
<td>Government</td>
<td>Free seedlings/lease on land/subsidy on inputs/guarantee of employment</td>
</tr>
<tr>
<td>Corporate</td>
<td>Corporate/Community</td>
<td>Corporate</td>
<td>Subsidy to set up biodiesel production plants</td>
</tr>
</tbody>
</table>

Table 2 Models of Jatropha cultivation

The most commonly observed model was the farmer centric one, where the farmer owned land and was provided seeds at reduced costs from the government. The farmer planted Jatropha and could sell his harvest to whoever he/she wanted. The second model involved plantations on government land managed by rural communities. The government land classified as wastelands encompassed Common Property Resources (CPRs); land which was used by communities for cultivation of crops, and grazing of livestock.

In the second model the government land was managed by Joint Forest Management Committees or other government agencies along with Self Help Groups (SHGs). The various government agencies like state biofuels boards, forest departments, National Oilseeds and Vegetable Oils Development Board (NOVOD), etc. were key players in this model. They had to ensure that the farmers were provided free seedlings, trained
on pruning and plant maintenance, provided fertilisers and manure, and informed about buyback mechanisms. In this model the farmers were either landless or poor farmers, or landless labourers who were hired to work on the land. The majority of the labourers were placed under the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) which guarantees hundred days of wage-employment to rural household members. Many NGOs and SHGs were also involved in this model. Here the harvest belonged to the government agencies.

The third model followed a different approach; it was the corporate model of cultivation. It was business oriented as it was managed by private firms both local and international. In this model the companies either bought or leased vast tracts of land and employed farmers or labourers to plant Jatropha, or they formed contracts with farmers or local communities to grow Jatropha on their own land. In the contract farming model the company would provide the farmers with cheap seeds or loans and they promised to buy back the seeds at a fixed price. The proportion or majority of models followed, varied across the research sites based on the nature of rural users and practices.

A study sponsored by the MoA the ‘State of the Indian Farmer’ pointed out that the agrarian structure in India, is characterised by predominance of small and tiny holdings that are economically non-viable (Chadha et al. 2004). Most of the farmers interviewed across the research sites were marginal farmers owning less than one hectare of land. Based on the state and people being interviewed there was a difference in opinion on Jatropha and farming practices. However, respondents across the states said the same thing when they were asked, from whom or how did they hear about Jatropha? They said that their land had lost its fertility and crop yield had reduced over the years. Many of the farmers were in debt or were not earning enough to sustain their families. The initial questions I asked were how they heard about Jatropha and why were they cultivating Jatropha? The farmers said they were approached by government officials, NGO personnel, and representatives of private
companies to शिक्षित educate them on the जादू wonder crop Jatropha. During a group interview at Jalgaon a district near Pune, the majority of the interviewees said that:

राजस्थानी अधिकारिया आए और रतंज्योत के बारे में बताने लगे। उन्होने बताया कि यह बीज फायदेमंद का है यह सूखी जमीन पर बढ़ती है और कम पानी में भी अच्छी फसल होती है

Government officials came and told us about Ratanjyot. They told us that this seed is very beneficial and grows on dry areas and even with little water the yield is good.

The respondents said they primarily heard about Jatropha from the sahaabs who came in their air conditioned cars. These city people representing the government agencies, NGOs or private companies said that our problems would be solved and we could earn money. The same story was repeated across the three states. However the culture and practices varied across the sites and had an effect on how each set of farmers adopted Jatropha plantation.

7.3.1 Farmers in Chhattisgarh

In Chhattisgarh three types of plantations were carried out namely; block plantations, roadside, and farmer plantations. Block and roadside plantations were carried out under the supervision of the Chhattisgarh Biofuel Development Authority (CBDA) and will be discussed in the next section. Farmer plantations were carried out on land owned by farmers but under the guidance of CBDA members. In Chhattisgarh Jatropha plantation was undertaken across many districts, however due to Maoist presence it was not possible to visit all the districts. I visited seven districts – Bilaspur, Janjgir, Korba, Mahasamund, Raigarh, Raipur, and Surguja and interviewed farmers cultivating Jatropha in the villages situated in these districts.

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25 Jatropha is called Ratanjyot in Hindi
The majority of the farmers in these areas were marginal or small farmers and the average size of a plot was a half hectare. During a focus group interview in Basna village it was repeated by the interviewees that over the years their land had become less fertile and each year they had to add more manure or fertiliser to get better yields of the crop they were cultivating. They said that some parts of their land were not productive for cultivation of food crops, hence when they heard about Jatropha and its properties they were keen to try it out. They were approached by officials from the CBDA who told them about Jatropha and provided them with free seeds. Initially the farmers’ views in this village were divided over this new crop and they debated whether to cultivate it. However, when a few farmers received free seeds and help from the CBDA members to plant it, other also did the same. The farmers said that they were assured by the government *sahaabs* that they would have a good yield and they would buy back the seeds from them. Hence as they already had buyers the farmers felt reassured as they would not have to compete with others to sell their produce.

Despite the initial interest displayed by the farmers they still had doubts because they were worried about the long gestation period of three years. A farmer named Harinath Mishra said his concern was “If I grow only one crop which takes three years to produce fruits, how will I feed my family”? Then he said this problem was also solved by the CBDA officials. They told them not grow Jatropha on their entire land; rather they encouraged the farmer to practice inter-cropping. However, most of the farmers did not want to practice inter-cropping as they would have to irrigate the second crop and add manure and they were not keen on doing that. Initially the farmers said that they cultivated Jatropha only on non-fertile or less fertile land and not on productive land. However during field visits I observed that Jatropha was being grown in between rice fields and fertile areas. On questioning the farmers about this, different responses were elicited. Some of the farmers claimed that since the government subsidised rice at ₹2/kg it was beneficial to grow some other crop that would pay more. Another group said in hushed tones behind trees, that they were
forced by the officials to grow Jatropha or else they would not receive subsidies and loans.

It is evident that even though as a rural development initiative, biodiesel was meant to be produced from Jatropha grown on wastelands, new usage patterns had developed. People in this area were growing Jatropha on arable land and it was competing with food crops and thus new technological practices had emerged that were different from what was initially conceived or expected. The farmers cultivating Jatropha across the various districts followed different patterns. The majority of the plantations were carried out on rain-fed areas and the farmers did not have to irrigate their land. Differences in practice existed in the addition of manure; marginal farmers were poorer than the small farmers and they did not add manure to the Jatropha plantations, instead they added manure to their other crops. Whereas, those under the category of small farmers added manure to their Jatropha plantations. Therefore within the same region based on size of land holding the usage practices varied, which in turn affected the yield pattern and overall adoption or rejection of Jatropha, which will be discussed in the next chapter.

7.3.2 Farmers in Maharashtra

Maharashtra is located in the western part of India. It is the richest state in the country and is known as the business capital of India. In Maharashtra fieldwork was carried out in Jalgaon district. Jalgaon is an agriculturally productive area and is famous for the cultivation of bananas. Vidarbha is located near Jalgaon and is famous for cotton production. In Jalgaon district fieldwork was carried out in five villages; Vishnapur, Adgaon, Ambade, Vadati, and Borajanti. The farmers interviewed in this area were under the category of marginal and small-scale farmers; however there were a few semi-medium-scale farmers too. In this region the land is fertile and has been used for banana, cotton, and sugarcane production. In the last ten years sugarcane cultivation has been predominant in this area. The farmers said that they switched to sugarcane production because they were being paid well for it and there is always a good demand for it.
India is the world’s largest consumer of sugar, hence demand is always high. The farmers mentioned that sugarcane is a water intensive crop requiring sufficient irrigation to achieve a good yield. They said that due to low rainfall the yield had been affected in the last few years and they had suffered losses. As they had suffered losses, they could not afford to irrigate their sugarcane plants regularly. The majority of the medium and large-scale farmers continued to grow sugarcane as they had the money to do so but the small and marginal-scale farmers started growing other crops. They started growing sorghum which is a food crop and is also used as fodder. During this period they were approached by NGO personnel and researchers from nearby agricultural universities and were informed about Jatropha and the benefits of growing it. In comparison to Chhattisgarh the farmers in this area were sceptical towards Jatropha. Many of them had already diversified once by growing sugarcane and had faced losses and were reluctant to try another new crop. Thus they were not very keen to grow Jatropha. Many of the farmers interviewed said why they were reluctant to grow Jatropha.

Why should we plant this new seed? Already we have faced losses, why should we face losses again?

Most of the interviewees had the same doubts, so my next question was, why did they cultivate Jatropha eventually? From the one to one interviews and focus group discussions it was revealed that in this area the government did not play an important role in convincing the farmers to cultivate Jatropha, instead the private companies were the key players in this area. The companies entered into contract farming and also farmer centric farming. The contract farming will be discussed later in this chapter. In the farmer centric model in this region the farmers grew Jatropha in their land just as in Chhattisgarh but they had different incentives to do so. The government promised loans to grow Jatropha and sold seeds at reduced prices, even the private companies provided loans to the farmers to grow Jatropha. In these villages Mission Biofuels Ltd was the main company involved in Jatropha.
plantations and they were giving loans to the farmers to grow Jatropha. When the first batch of farmers received loans from the company, they told their neighbours and the message spread quickly and everyone was willing to grow Jatropha. The question of interest was, even though the government was providing loans, the farmers did not approach the government banks instead they were keen to get loans from the private company? When I asked the farmers this question, they said,

हम पहले से सरकार से पैसा ले चुके हैं दोबारा पैसा मिलना मुश्किल होगा लेकिन कंपनी लोगों से पैसा पाना आसान होगा और फिर वोह लोग इतने सारे कागजात नहीं माँग रहे हैं

We have already taken loans from the government offices and it will be difficult to get money from them again. It is easier to get money from the company people and plus these people do not ask for so many papers.

The majority of the farmers felt it was easier to get money from the private companies and once the first farmer received the promised sum of ₹5000 the other farmers were convinced they would all receive that amount. Hence they agreed to cultivate Jatropha on their land. In the villages visited Jatropha was grown only on arable land and not on wastelands or community lands. Many farmers in Vishnapur village received ₹5000 and started cultivating Jatropha and other farmers also approached the company for the same amount of money. They were told that they would receive the money in a few months’ time, and were asked to commence Jatropha plantation and not to worry about the money. The remainder of farmers who had not received money from the company also started growing Jatropha, hoping to receive money soon. Hence those farmers who were reluctant to grow Jatropha initially started cultivating Jatropha hoping to receive the promised sum of ₹5000 from the company. In this region the users changed their practices lured by financial benefits and adopted a new initiative which they were reluctant to adopt initially.

Usage patterns had changed but when the premise on which the usage pattern had changed the first time was not kept up, it resulted in further changes. Farmers across
Adgaon, Ambada, and Vishnapur said that only the first batch of farmers received money from the company and the other farmers who cultivated Jatropha on the promise of being paid within few months were never paid. Those farmers waited for the money for a year but did not receive the money and finally out of anger and frustration they uprooted their Jatropha plantations. A conversation with a group of farmers who had not received money revealed the following:

Namdevomkar Bil: I never received the money, my neighbour got money but they did not give me any money? I even planted Jatropha on my field.

Interviewer: Are you going to wait for the money and continue growing Jatropha?

Suryakant: I think I will wait for a while but am losing my patience?

Namdevomkar Bil: (sneers) You are a fool to hope they will pay you? Don’t you see this is an evil crop it only benefits some and not everyone?

Interviewer: What do you mean by it is an evil crop and benefits some and not everyone?

Namdevomkar Bil: The company people gave money to those who flattered them and not honest people like me. The crop has changed the nature of people. My neighbour has money so he is showing off?

Shivnath: Yes yes those who have received money are not our friends now, as they are better off than us now.

Interviewer: So what are you planning to do?

Namdevomkar Bil: I got tired of waiting and uprooted my Jatropha plantations after one and half years. I am now growing sorghum.

In this case different meanings were associated with the same crop. Those who received money from the company associated Jatropha plantation and production of biodiesel as a new technology with associated benefits. They felt it helped them earn money and they did not have to invest much in it. Many of the farmers also started
From Green Revolution to Green Gold: The Evolution of the Indian National Mission on Biodiesel

cultivating peanuts along with Jatropha and it increased their yield rates and they were very happy with their decision to grow Jatropha. Whereas in the same region, those farmers who did not receive money from the company uprooted the plant and called it ‘evil’ and rejected the new initiative. This provides an interesting example of the construction of technological meanings. Technological meanings impact the practices that emerge and these practices in turn play a key role in adding meaning to the technology/initiative.

7.3.3 Farmers in Tamil Nadu

Tamil Nadu is located in the southern part of India and is one of the leading states in Jatropha development (Government of Tamil Nadu 2009). In this state fieldwork was carried out in Chennai and Coimbatore. Chennai is the capital and the largest city in Tamil Nadu. Coimbatore is the second most industrialised district in Tamil Nadu and is a centre for *Jatropha curcas* research. Coimbatore has red sandy soil and 40% of the land is under agriculture. The main crops grown in this area are coconuts, cereals, and millets. In Coimbatore 30% of the total agricultural land is held by marginal or small farmers, who constitute 70% of the landholders in Coimbatore (GoI 2001).

The majority of the farmers interviewed in this area said they were approached by staff from the Centre for Excellence from the Tamil Nadu Agricultural University (TNAU). The researchers told them they were working on developing a high yielding variety of Jatropha and provided them with free seeds to grow on their land. They told them about the properties of the plant and also the government’s mission to produce biodiesel from Jatropha. Tamil Nadu is the only state in India that receives rainfall from the retreating monsoon from September to October. The farmers complained that the area has water scarcity and labour scarcity. More and more farmers were migrating to the cities to work in the construction industry. They expressed the reduction in farm labour and felt that Jatropha would be conducive as it needed less care and maintenance. The farmers said they decided to plant Jatropha because they did not have to tend to the plant regularly. This arrangement allowed them to look for other part-time work, to sustain them and they did not have to move far away from their villages.
In this district the users associated different meaning with the NMB. They did not adopt Jatropha plantation only because the researchers were promoting it, they associated it with less labour and irrigation inputs, coupled with the benefit of taking up other jobs. New practices emerged in the district, many farmers stopped migrating to the city, and instead they planted Jatropha and also worked as labourers for large and medium landholders. These large and medium farmers were also planting Jatropha and did not have enough man power to do so; hence they hired the small and marginal farmers on a part time basis.

The users in the three different states provide an example of how different meanings were associated with the same technology. The users constructed different technological meanings and their practices were linked to their perception of the rural development initiative the NMB. Hence the technological meanings varied across the states and so did the practices, which in turn affected the way Jatropha cultivation was viewed and adopted across the states.

7.4 Labourers

The second category of users was the labourers who cultivated Jatropha on land owned by the government, private companies, large farmers, and the community. The National Policy on Biofuels states:

Cultivators, farmers, landless labourers etc. will be encouraged to undertake plantations that provide the feedstock for bio-diesel and bio-ethanol. Corporates will also be enabled to undertake plantations through contract farming by involving farmers, cooperatives and Self Help Groups etc. in consultation with Panchayats, where necessary. Such cultivation / plantation will be supported through a Minimum Support Price for the non-edible oil seeds used to produce bio-diesel (GoI 2009, p.6).

The NMB and the Biofuel Policy stress that feedstock production for biodiesel will create jobs for the rural people. It will involve farmers who are willing to cultivate Jatropha on their own land, but it will also create jobs for labourers who are willing to work on government land and corporate land. The previous section introduced the
From Green Revolution to Green Gold: The Evolution of the Indian National Mission on Biodiesel

farmers in the different states, and why they adopted Jatropha plantation. This section will emphasise the role of labourers as rural users, how their practices played a role in their adoption of Jatropha cultivation. The majority of the users interviewed were landless labourers who worked on a wage basis. However, the labourers also included marginal farmers who worked part-time as labourers.

7.4.1 Labourers in Chhattisgarh

In Chhattisgarh three types of plantations were carried out namely; block plantations, roadside, and farmer plantations. The previous section described the farmer plantations; this section focuses on the block and roadside plantations. The CBDA established linkages with the Forest Department (FD), Department of Agriculture, Forest Corporation, Minor Forest Produce Federation, Renewable Energy Development Agency (CREDA), and the Agriculture University to carry out Jatropha plantations and produce biodiesel. Officials from these six agencies coordinated with members of the CBDA to implement large scale cultivation of Jatropha across the state.

Block plantations were carried out on government owned fallow or waste lands and were mainly near the hilly regions and forests. The seeds were provided free of cost and the majority of the labourers were employed under the Mahatma Gandhi National Rural Employment Guarantee Scheme (MNREGS). During field visits to block plantation sites, I noticed that more than 50% of the labourers were women, whereas the first group of users discussed in the previous section comprised 85% men. Despite the presence of so many women it was very difficult to interview them, as they were shy and were not willing to speak to strangers. Later on, one of the officials of CBDA, Mr J.L. Gupta explained that the majority of the people employed were tribals and did not mix with people from cities. He added it was a male dominated society and normally women would not speak easily with strangers.

However, the women employed there knew him, and after a lot of persuasion few of them were willing to speak to me. I asked the same questions as before, where did they hear about Jatropha and why were they working here and what were their
experiences till now with Jatropha? To my astonishment, the same questions were posed to me! Why was I in Chhattisgarh, what did I work as, what were my experiences in my job? I realised that the women were not comfortable in being asked questions by a stranger and felt that they needed to know more about me before they answered my questions. This experience proved that the people in this area were reclusive and were not comfortable with strangers coming in and being inquisitive. They displayed the same demeanour when the CBDA officials initially came to tell them about Jatropha plantations. They were reluctant to plant Jatropha on community land which they had been using for years to grow subsistence crops. However, the land belonged to the government and they had to acquiesce, and they felt it was better to at least get paid to work on the land.

Initially when the respondents were asked about Jatropha they gave a positive feedback about it. However when the CBDA officials left they expressed their real views about the plant. They said according to the officials the crop did not require irrigation or fertilisers and would be harvested after three years. One of the labourers said

*Sahaab* said it requires little care and the seeds can be harvested after three years. What do we do till then; we cannot use our communal land for three years and will not be employed for the duration of three years. What sort of a plant is this, does it have magic properties to survive without any care?

The users in this area were not keen to grow Jatropha on the land which they considered their own and were displeased with the government taking over their land. The block plantations were mainly carried out under rain-fed areas and were not irrigated, the users were told that the plant had a waxy layer and prevented loss of water and hence did not require irrigation.

The CBDA also carried out plantations on roadsides and these were implemented with the help of the Forest department. The plantations were done by farmers and labourers from the nearby areas. They commenced roadside plantations in 2007-2008.
and the main areas were in Mahasamund district. Block plantations were carried out in Birkoni village and road side plantations in Patewa village. The plantations on the road side were again done in those areas which fell under the category of rain-fed areas and did not require additional irrigation inputs. The users involved in roadside plantations perceived Jatropha differently from the ones who undertook block plantations. Most of the users had their own land or were employed by larger farmers. When they were approached by the officials from the forest department, they saw it as a source of additional income and were willing to take it up as they were planting on tracts of land near the highways and were not responsible for the output.

These users however, played a major role in the adoption of Jatropha plantation by other farmers in the same area. When these labourers went home they spread the word about Jatropha and said the government would not be investing in it if was not profitable. They supported the narrative of Jatropha being an ideal crop, “saying it needs very little inputs and will have high yield rates after three years”. It was these labourers who influenced the farmers in their region to grow Jatropha on their own land.

Hence these users, the meaning and practices they associated with Jatropha and the NMB impacted the first group of users – farmers to accept Jatropha cultivation as a useful initiative. The findings suggest that the users adopting block plantations were reluctant to cultivate Jatropha as it prevented them from using their community land and interfered in their existing patterns and practice of using community land for food, wood, and fodder. Whereas the users involved in roadside plantation felt the cultivation of Jatropha fit in with their practices and they would not have to go to the cities to search for extra work, they could be employed to cultivate Jatropha on land near their villages.

In addition to state-led activities, many national and international companies were also involved in Jatropha plantations in Chhattisgarh. The Indian Oil Corporation (IOC) formed a joint venture with the stage agencies and announced plans to employ
33,000 farmers, and expected to produce 100,000 tonnes of biodiesel (Indian Oil Corporation 2006). CREDA-HPCL Biofuel Limited is a subsidiary company of Hindustan Petroleum Corporation Limited (HPCL), with Chhattisgarh State Renewable Energy Development Agency (CREDA) for the plantation of Jatropha in the State of Chhattisgarh (http://www.hindustanpetroleum.com). D1 Oils and Reliance Pvt Ltd were the other companies that invested in Jatropha plantation in Chhattisgarh.

The companies followed two routes – they either bought or leased land and employed farmers and labourers as staff to work on the land, or the companies entered into contract agreements with the farmers, who would cultivate Jatropha on their own land. Companies like IOC and CREDA-HPCL formed linkages with the government and were allocated wastelands to carry out Jatropha plantations. D1 Oils entered in to contracts with the farmers. In the contract farming mode, “the company provides inputs, technical guidance and other extension services during the initial years of establishment” (Shinoj et al. 2010, p.396). The contracts can be set on either a pre-decided price for the seeds or the understanding that the company will purchase the seeds at the prevailing market price at the time of harvest. Reliance Pvt Ltd bought land and also leased large tracts of land from the government and from large farmers. Most of the rural actors were willing to work on land owned by the large companies, as they would be employed as day labourers and would be paid for their work irrespective of the yield. In Chhattisgarh most of them were paid ₹50/day and this was lesser in comparison to what the labourers were paid in the other two states. However, Chhattisgarh gained statehood in the last few years and is not as developed as the other two states and hence the wage rates were lower. Despite the rate of pay being low, many people wanted to work for these companies. On being asked why, a labourer named Kumar said,

These are private companies; they are not as corrupt as the government owned ones. Here we do not have to bribe the officers to get a job. Sometimes there is a delay in getting paid but we get paid.
Another farmer said

My wife and two sons handle our own land, while I work on the company land. Earlier I used to work on government land and I was never paid properly. I used go every day and stand in line but had to return empty handed.

Most of the people rural labourers employed by the companies came from nearby villages. However, some of them were from the neighbouring districts. They said “when they heard about the company and it was looking for people. They left their villages to come and work here as there was no work in their villages”.

Hence many private companies leased large tracts of land and carried out Jatropha plantations, they employed people on a daily wage basis, provided them with inputs, supervision, and they regularly checked on the progress. However, in the absence of company officials most of the respondents said that the land they were working on was good arable land. On being asked how they knew, they said “our forefathers were farmers and so are we, and we know how to identify good land madam. You are from the city, you don’t know about all this”. However, during interviews officials from D1 Oils stressed that all their plantations were carried out on marginal or wastelands. In this area it did not matter to the users (labourers and farmers working as labourers) that agricultural land was being used to grow Jatropha. Despite them being farmers it did not matter. Their concern was to earn money as they were not earning enough from growing staple crops. The users also said that the land either belonged to the company or large farmers. The expressed that the large farmers were very rich and earned money from the business they did in the cities, so it did not matter to them what their land was being used for as long as they were being paid. The users said “if the owner of the land does not care why we should bother about what is being grown, as long as we get paid we are fine”. The users in this case were concerned with being employed and not the viability of the crop or the

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26 These interviews were carried out over the phone as the officials from D1 Oils refused to meet me in person.
land it was being grown on. They associated the new plant as a mean for them to earn money and hence they accepted it willingly, without raising questions on good arable land being used for cultivating Jatropha.

There were three categories of users working as labourers in Chhattisgarh. The first category was the users cultivating Jatropha as block plantations on CPRs, these users were not willing to cultivate Jatropha but were forced to do so. The second category of users was involved in roadside plantations of Jatropha and they viewed it as an additional source of income. Not only did they adopt it, they also spread awareness on Jatropha in turn convincing other users to enrol in the initiative. The third category was the users employed to work on land leased or owned by corporate organisations. They did not voice their opinions about the plant, farming practices or the type of land being used for cultivation. They adopted the initiative because they gained employment and were guaranteed wages at the end of the day or month. Hence it is evident that the users in the same state associated with the NMB in different ways and had varying expectations from it.

### 7.4.2 Labourers in Maharashtra

In Jalgaon in Maharashtra the majority of the users were farmers who owned marginal tracts of land or did not own any land and worked as labourers on other’s land. In the villages in this district, Jatropha plantation was mainly carried out by a private company named Mission Biofuels Ltd. The company either entered into contract farming or leased large tracts of land to cultivate Jatropha. The users were not directly approached by officials of the company; instead the company tied up with a local company named Purandhar agrofuels which was entrusted with the task of convincing the rural people to grow Jatropha on their land. In Chapter 6, I discussed how the villagers did not trust officials from the company and hence staff from the local NGO hired Deepak Patil a staff member from the local college to speak and convince the farmers to cultivate Jatropha. The rural actors, knew Mr Deepak Patil as he was a member of the staff of the local college and they trusted him. Hence when he approached them and explained the benefits of Jatropha plantation, the users opened up to the idea. Additionally the state government of
Maharashtra provided subsidies under the MNREGS and taluka agriculture department.

A Taluka is an administrative and geographical block consisting of an average of 80-100 contiguous villages. It has a geographical area of about 1000-1500 sq km and a population of about 2 to 2.5 lac. There are 3,342 Talukas in India and the major activity in them is agriculture related. The fixed geographical boundaries of a Taluka can be thought of as a closed biomass and rain water basin. Each Taluka can cover majority of its demand of food, fuel, fodder, and fertiliser (www.innovationsofindia.com). In this case the officials from Mission Biofuels Ltd and Purandhar Agrofuels recognised the importance of the user and tacit meanings associated with trust and used it to influence the users to adopt Jatropha plantations.

The users interviewed in this area consisted of farmers cultivating Jatropha on their land and farmers or labourers working on the company land. The controversy in this area was that 65% of the respondents were farmers who planted Jatropha on their own land while the remaining 35% were farmers or labourers who worked as labourers on the land leased by the same company. Depending on the area and gender, the labourers received a basic pay of ₹70 to ₹95 per day. The labourers were those users who did not have enough land of their own and the company felt it was better to pay them to work as labourers on their land. The company did not hire those people who had sufficient land to grow Jatropha and this created a sort of resentment among the users. The officials from the company segregated the users based on their land holdings, while the respondents argued that the officials from the company gave loans and jobs to those people they liked and the process was not fair.

The labourers working on the company land had mixed opinions about Jatropha and the company. The users in this area paid more importance to the company and not Jatropha. For them to adopt a new initiative they had to trust the people advocating it, this was because the users in this area grew sugarcane and banana that were high in demand and they were aware of the politics of markets and demand for cash crops. Initially they asked why they should work for the company instead of working for
the large farmers who grew sorghum and sugarcane. Mr. Deepak Patil explained the subsidies associated with Jatropha and how it can be used to produce bio-diesel. He told them that oil was more expensive than sugarcane and they could earn more money by selling Jatropha seeds. He also told them they could produce their own oil from Jatropha seeds and created a feeling of empowerment. Ramnath Keshav a labourer on the land said

I am sure the company produces a lot of oil from the seeds. Why else would they employ so many of us to grow this crop? Even we can produce our own oil and use it in our motors.

The users in this area had two reasons for adopting Jatropha cultivation. They were being paid by the company to work on the company land. They felt that by working on company land they would learn the tricks of plant management and could then ask the medium and large-scale farmers to grow Jatropha and use it to produce oil for the village. Hence in this case money was not the only meaning associated with the initiative, instead the users wanted to use the technology to produce oil to run their motors, jeeps, and tractors. They just did not want to cultivate Jatropha they also wanted to produce biodiesel and use it.

7.4.3 Labourers in Tamil Nadu

In Tamil Nadu, the rural users worked on land owned by the TNAU. Just like in Jalgaon the users in Coimbatore believed in the researchers from TNAU, many of the respondents said

The University has been here since ages and researchers have helped and guided us many times. They are educated people and research on crops and know about the latest plants, fertilisers, and irrigation techniques.

These users were employed by the Centre of Excellence in Biofuels in TNAU. The researchers from this centre were carrying out Multi Location Trials (MLTs) of Jatropha. They employed farmers to work on their land and the farmers were paid for their services. The farmers carried out Jatropha plantations under varying conditions like – different soil types, inputs of irrigation, fertilisers, and addition of pesticides.
They followed the advice of the researchers and the researchers regularly visited the locations to check on the Jatropha plantations.

The farmers associated with the researchers expressed a sense of pride in assisting them in this new project. The respondents in Coimbatore working on TNAU-owned land said they were regularly employed by the university. They were not concerned about Jatropha rather they were keen to be associated with the university. In this case the users did not form any ideas about Jatropha, their association was primarily with the researchers from the university and they were keen to collaborate with them. Hence, they worked on TNAU land willingly, irrespective of the type of crop being cultivated. The technology did not matter to them, recognition and employment by TNAU mattered to them.

The section on users introduced the different kinds of users involved in Jatropha plantations. It distinguished the presence of two types of users and focused on their practices and the meanings they associated with the cultivation of Jatropha and production of bio-diesel. Pfaffenberger (1988) argues, ‘viewing technology as humanised nature does not, unfortunately, make things simple’ (p.248). He says it rather forces recognition of the complexity between human technological forms and human culture. Despite the complex nature of the relationship between a new technology and the society adopting it, it is beneficial if the policy makers and designers take into account the culture of the people and related impact the technology might have on them. The following section will reveal the complexities that emerged when the representations of the policy makers and bureaucrats of how the initiative will affect the rural actors did not correspond to how the NMB actually affected the farmers and labourers cultivating Jatropha

### 7.5 Differences among Users

A neglect of differences among and between producers and users may result in a romantic voluntarism that celebrates the creative agency of users, leaving no room for any form of critical understanding of the social and cultural constraints on user-technology relations (Oudshoorn and Pinch 2003, p.16)
As mentioned previously, the key actors (policy-makers, bureaucrats, technocrats) promoted the NMB as a ‘pro-poor’ initiative that would create jobs and utilise unused wastelands. The narratives supporting the NMB as a policy option emphasised the creation of jobs for the rural people and utilisation of dry, marginal, and unused wastelands for the cultivation of the non-edible energy crop Jatropha. The policy makers and bureaucrats mapped out the areas where Jatropha would be cultivated and the preface of the NMB by Mr D.N. Tewari states

the proposed plantation in 4 lakh ha. in phases will generate 127.6 million person days of work in the Tenth Plan. In addition, the seed collection will provide sustainable employment to the tune of 8 million person days or 1.22 lakh person years and primary processing, oil esterification, transport etc. will create additional jobs (GoI 2003).

Madeline Akrich (1992) introduced the idea of projected users, created by the designers of technology. She says these users are defined with specific tastes, motives, aspirations, and political prejudices. The designers then inscribe this vision of the user into the technical content of the technology and how they will accept it (Lindsay 2003). However, what will happen if the projected user does not correspond to the actual user? The same problem arose with the NMB; the policy-makers thought of the NMB as a rural development pro-poor initiative however the NMB did not manifest as pro-poor initiative among the rural actors cultivating Jatropha. The policy-makers overlooked the needs of the rural users which resulted in contentious issues and affected them. Debates arose on the use of the so called wastelands which were the CPRs used by the rural people to grow fodder, graze their cattle, or collect firewood. Similarly there were disputes on the form of contract farming employed by the private companies. However the government officials, technocrats, policy-makers and representatives from the private sectors expressed the outcomes of the biodiesel initiative differently from the rural users/actors. The analysis in the next chapter will focus on the representations of the outcomes of NMB by the various users in the biodiesel network.
7.6 Conclusions

This chapter emphasised the importance of the rural users – farmers and landless labourers and how they agreed to cultivate Jatropha under the NMB. As this thesis is anchored in STS studies the chapter emphasised on the importance of SCOT and discussed the acceptance of the NMB by the rural users based on their cultural and associated practices, and meanings that affected the adoption of the NMB.

The empirical findings in the chapter introduced the two types of users involved in Jatropha plantation across the three sites. The discussion revealed the differences among the same types of users (farmers and landless labourers) across the three sites. It revealed the varying cultural associations, practices, and tacit meanings among the users in each site which in turn revealed why each group in each site undertook Jatropha cultivation. A range of literature on biofuels has focused on GIBN, biofuel complex and biofuel assemblages but not on the social practices of the farmers and labourers cultivating Jatropha at a regional level (For example see Mol 2007, Smith 2010, Borras et al. 2010, Ariza et al. 2010, Tompsett 2010), the data in this chapter addresses this gap in the literature by focusing on rural farmers and labourers across three biofuel networks, their cultural practices, expectations from Jatropha and why and how they cultivated Jatropha under the NMB. This chapter while drawing from the literature of practice theory and STS to frame empirical findings also added to these theories by citing examples from the NMB in India. The data in this chapter contributed to the literature by explaining the meanings associated with Jatropha plantations across three sites and how the users based on the varying interpretations of the NMB associated differently to it.

While this chapter introduced the users, practices and meanings associated with the cultivation of Jatropha, differences among them, the next chapter will discuss how the NMB affected these rural users. Additionally it will also discuss how the other

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27 In chapter 3 I defined users and introduced the various kinds of users in the NMB and I also said why I refer to farmers and landless labourers as users and not producers.
The Role of Rural users (farmers and landless labourers) in adopting the NMB
Chapter 8: The Social Production of Outcomes

8.1 Introduction

This thesis has focused on the social nature of introducing and implementing the National Mission on Biodiesel (NMB) in India, and has stressed that a development scheme cannot be imposed; it requires collaboration and compromise, that is it requires actors who will form networks to take the initiative further (Mosse 2004). The thesis focused on the importance of networks and actors in forming linkages and taking the NMB forward. Chapter 6 focused on the three types of networks and how the key actors formed primary and secondary networks to promote the NMB in India.

The thesis then focused on the social nature of accepting a new technology/initiative. The discussion in chapter 7 focused on the rural users cultivating Jatropha, it highlighted the types of rural users across the three research sites, their social and cultural practices and how it affected the model/manner in which they agreed to cultivate Jatropha. The thesis till now has emphasised the importance of biodiesel narratives, the creation of three types of networks, and the importance of the rural users adopting the NMB across the three networks. Hence till now the thesis has traced how the NMB developed as a policy option, how it spread across the three different states in India, and in turn why the rural farmers and labourers cultivated Jatropha. The discussion in this chapter will reveal the consequences of the NMB. It will highlight how the government officials, private companies and NGOs represented the NMB and it will then discuss the consequences of the NMB on the rural users.

8.2 NMB a pro-poor development initiative

This thesis has revealed how the NMB was introduced as a pro-poor rural development initiative in India. Chapter 2 highlighted the role of science and expertise in development policy-making in India, chapter 5 listed the biodiesel narratives in India and explained how narratives are used by policy-makers in development policy-making, and chapter 6 traced the policy processes that resulted in the formulation of the NMB as a biofuel policy option in India. Two key concerns
contradicted the pro-poor narrative of the NMB, one was the allocation of so called wastelands for the cultivation of Jatropha, and second the wonder properties of Jatropha being an ideal crop that can survive in dry arid areas with minimum inputs of irrigation and fertilisers. In Chapter 5, I already argued how these narratives were not backed by sufficient data and discussed how these narratives were false. In this section I will focus on the representation of these wastelands and the cultivation of Jatropha from the viewpoint of the government officials, policy-makers, technocrats, bureaucrats, and representatives from private companies who were key actors in the development and promotion of the NMB.

Classifying wastelands in India is rooted in the colonial land settlement process. The term was applied under both the zamindari and ryotwari settlement systems, the two dominant land tenure systems of the colonial period. It applied to the various types of land underperforming in the generation of revenue and the classification also served to identify and improve the productivity capacity of the lands and reduce efficiency loss (Gilmartin 2003, Gidwani 2008). The land was primarily classified based on its economic productivity, and importance was not given to its ecological, cultural, or livelihood benefits. According to the Wasteland Atlas of India

Wastelands refer to degraded lands that are currently underutilized, and are deteriorating for lack of appropriate soil & water management or on account of natural causes. Wastelands develop naturally or due to influence of environment, chemical and physical properties of the soil or management constraints.” (National Remote Sensing Centre 2010, p. 4)

To meet the 20% blending target, the Committee on Biofuel recommended cultivating Jatropha on 17.4 million hectares of underutilised and degraded land (approximately 5% of India’s total land area), according to the following land types detailed below in Table 3.
From Green Revolution to Green Gold: The Evolution of the Indian National Mission on Biodiesel

<table>
<thead>
<tr>
<th>Land Type</th>
<th>Area (in lakh ha)</th>
<th>Percentage of Wasteland Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint Forest Management (JFM) Forest lands</td>
<td>0.3</td>
<td>17%</td>
</tr>
<tr>
<td>Agricultural border fences</td>
<td>0.3</td>
<td>17%</td>
</tr>
<tr>
<td>Agroforestry schemes</td>
<td>0.2</td>
<td>11%</td>
</tr>
<tr>
<td>Culturable fallow lands</td>
<td>0.24</td>
<td>14%</td>
</tr>
<tr>
<td>Integrated Watershed Development wastelands</td>
<td>0.2</td>
<td>11%</td>
</tr>
<tr>
<td>Public lands along roads, railways, canals</td>
<td>0.1</td>
<td>6%</td>
</tr>
<tr>
<td>Government-designated wastelands</td>
<td>0.4</td>
<td>23%</td>
</tr>
<tr>
<td>Total area allotted for Jatropha cultivation</td>
<td>1.74</td>
<td></td>
</tr>
<tr>
<td>Total land area in India and percentage of land allotted for Jatropha cultivation</td>
<td>32.87</td>
<td>5%</td>
</tr>
</tbody>
</table>

Table 3 National Mission on Biodiesel Jatropha Cultivation Recommendation (GoI 2003)

Despite the existence of wasteland classification in India, many of the stakeholders interviewed agreed that there is no such thing as wastelands. The rural farmers, labourers, and representatives from the civil society clearly expressed that “wastelands do not exist; it is a term given by the higher sahaabs”. However, the definition and existence of wastelands varied across the different actors in the biofuel network. Government officials and representatives from the private sector did agree that there is no such thing as wastelands, only wasted lands. They said those lands that were not being used for conducive economic purposes should be put to better use. Hence the members of the Committee identified and earmarked these wasted land owned by the GoI for the cultivation of Jatropha.

The government officials interviewed said that the land belonged to the GoI, especially land managed by the forest department and was being wasted and not earning any revenue. Hence they decided to use the land for the welfare of the rural people and also for the country. They argued if these wastelands were used for the
cultivation of Jatropha, they could employ rural people to work on the land, and in turn they could make money by selling the Jatropha seeds. The corporate actors interviewed said it was indeed a good idea to use these lands for the cultivation of Jatropha, they said that they could lease these unused, marginal lands from the GoI, and invest in Jatropha cultivation and production of biodiesel. According to them it was a “win-win” situation for everyone.

The government officials would be paid by the private companies for the lease; hence they would earn revenue for land that had been idle all these years. The rural farmers and labourers would be hired by the private company to cultivate Jatropha and they would be paid wages for their work. Hence, they did not have to invest in seeds, fertilisers, or irrigation; they were being hired and paid for the hours they worked. The private company in turn would earn profit by producing biodiesel and selling it to the oil companies. The government and corporate actors said the concept of using the wastelands had taken in to account the needs of all the users, especially the rural users as they were going to get employed and be paid on a regular basis.

In addition to leasing the wastelands to private companies, the GoI also used these wastelands under the National Rural Employment Guarantee Act (NREGA). Chapter 5 focused on how the GoI wanted to accommodate Jatropha cultivation under the land development, creation of employment, and durable assets under the NREGA. The government officials said the cultivation of Jatropha under the NREGA scheme, would provide labour opportunities for the poor and landless. Some of the government officials at the state-level, who were a bit sceptical about the contract-farming model being followed by the private companies, said that if the rural actors enrolled under the NREGA their interests would be served by the GoI. They felt it was safer if the rural users worked under government schemes than forming contracts with private companies.

The government officials across the various states actively supported the use of wastelands for the cultivation of Jatropha. In Tamil Nadu, in 2002, the state government began issuing 30-year leases of government-owned wastelands to
companies to grow Jatropha (Government of Tamil Nadu 2002). The Tamil Nadu government set a target of cultivating 100,000 ha of Jatropha from 2007-2012, and planned to achieve this goal primarily through contract farming (Government of Tamil Nadu 2009). They promoted contract farming between the government and the farmers, according to the contract, the government would provide a seedling subsidy of 50%, the Agricultural Department would administer the program and the TNAU would provide the seedlings. The government officials said they were providing the rural farmers with contracts, so that they continue using the land, earn better revenue from it, and not feel that they were being coercively employed by the state government.

When I asked the government officials about the contested nature of wastelands, and how these lands were used as Common Property Resources (CPRs) by the tribal societies, the officials said the land belonged to the GoI and by using it for the cultivation of Jatropha the rural actors would benefit. The government officials repeatedly supported the use of wastelands for the cultivation of Jatropha and said it added to the pro-poor narrative of the biodiesel mission. Along with the government officials, the private company representatives also supported the use of wastelands for the cultivation of Jatropha. These actors represented the use of wastelands as a successful narrative of the biodiesel initiative, they maintained that the land was not being used economically and would not be useful to grow edible crops; hence diverting it for the cultivation of Jatropha was an ideal option. They presented their views, success achieved under the NREGA, and land leased by companies across conferences and in the print media, that is, they sustained it socially. The government and private company actors represented the utilisation of wasteland narrative as a successful component of the NMB, and maintained networks of support that a created a public audience for their work.

8.3 Private Companies
When the GoI expressed an interest in producing biofuels, it evoked the attention of both local and international companies. The NMB advocated the production of
biodiesel from Jatropha grown on wastelands and identified 13.4 million hectares of marginal land available for Jatropha plantations (GoI 2003). Prior to India, many of the European countries had set up biofuel blending mandates and targets; however they did not have sufficient land to be used for the cultivation of energy crops (Oxfam 2008). When India announced its biodiesel production plan, companies from different parts of the world set up ties with Indian companies and invested in the biofuel sector in India (Rajagopal 2008). The major domestic and foreign companies who invested in the green gold rush are, D1Oils Pvt Ltd, Mission Biofuels, British Petroleum, Godrej Agrovet Ltd, Tata Motors, Indian Oil Corporation, Kochi Refineries Ltd, Biohealthcare Pvt, The Southern Online Biotechnologies Ltd, Jain Irrigation System Ltd, Natural Bioenergy Ltd, Reliance Energy Ltd, and Emami Biotech Ltd.

Prior to the introduction of the neoliberal policies in India the central and state governments, played a key role in the agriculture sector and the farmers relied on government sources of funding and subsidies. However with the adoption of the liberalisation, privatisation and globalisation (LPG) policies, agribusiness companies started procuring land, forming contracts, and interacting directly with the farmers with no or minimal interventions from the State (Athreya 2008).

Chapter 6 focused on the creation of central and state networks, involving the enrolment of diverse interests, to build successful alliances of actors, to promote the NMB. Among the various actors, the representatives from the private sector played an important role during the formulation and the propagation of the NMB at the ground level. The Planning Commission’s Report (GoI 2003) states:

Biodiesel must be produced in the country in quantities sufficient to enable its blending with HSD to the extent of 20% in ‘2011-12’. The estimated production of bio-diesel will require plantation of Jatropha curcas over 11 million hectares of land in and outside forests and mobilisation of initiative and enterprise of large numbers of stake holders including individuals, communities, entrepreneurs, oil companies, business, industry, financial institutions, government and its institutions (p. xiv).
Since the project will be implemented for the first time in the country... Institutions supported by the Government of India, State Agriculture Universities and interested institutions in the industry – both public sector and private sector will be invited to make their contribution to problem solving (p. xvi).

From the outset, the NMB involved representatives from the industry. The majority of the respondents from the industry said that they were cultivating Jatropha not “only to profit from it” but also to improve the livelihoods of the rural users. The discussion in this section will narrate the strategy formulated by a private company, Reliance Life Sciences (RLS) to promote the cultivation of Jatropha in Chhattisgarh.

The Reliance group is India’s largest private sector enterprise, with annual revenues of US$ 58 billion. The Group’s activities span oil and gas exploration and production, petroleum refining, petrochemicals, polyester, plastics, organized retailing, and telecom. The Group’s flagship company Reliance Industries Limited is the largest private sector company and a Fortune Global 500 company. RLS is part of the Reliance Group of companies; it was established to develop business opportunities in medical, plant, and industrial biotechnology; with key initiatives in biopharmaceuticals, pharmaceuticals, regenerative medicine, clinical research, molecular diagnostics, plant and industrial biotechnology (http://www.rellife.com). The officials from RLS said that their vision was to “establish first end to end biodiesel initiative in India” and to achieve this vision they wanted to:

Evolve a unique end to end business model for biodiesel that will ensure constant, adequate, and best quality supply of seeds at optimal costs on one hand and maximise returns for the producers on the other.

The actors in the reliance network said their mission was to cultivate Jatropha on “1 million hectares through 1.5 million farmers by 2012”. According to them the most important thing was to “establish acceptable Jatropha economics for marginal farmer on marginal lands” and once that was done they were aiming to have a steady supply of Jatropha seeds from the farmers at a rate of ₹5/kg.
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To achieve this mission their objectives aimed at: acceptance of Jatropha cultivation by the farmers, multiple engagement points with the farmers, cultivation and productivity on marginal lands, creation of ‘farmer stakes’ through ‘producer companies’, partnership with NGOs. The company claims the benefits they will provide to farmers are:

- increased income of ₹5000 per acre from the 26th month to ₹14000 per acre in 4th year from Jatropha seeds, ensured forward linkage for quality farm products, hand-holding of farmers till the production starts, quality technical assistance for farmers, re-vegetating marginal lands, assistance and capacity building for farmers’ club, providing committed and development oriented staff up-to village level, providing Demo-Farm for each 1000 ha plantation (presentation by RLS officials to the Collector of Bastar).

Officials interviewed from RLS said they were keen to incorporate the needs of the rural users and wanted to create employment across different states. They said they had achieved a ‘few milestones’ so far; they had reached the most adverse area’s in 5 states, they had a committed human resources department to face the challenge, they were supplying seedling at an affordable rate of 0.50 paisa to ₹2, they had planted 3500 ha of Jatropha under varying conditions and with different intercrops, they had made the farmer accept that Jatropha was a non-harmful and complementary crop, and had ensured small but sure interventions on value addition to farmers through Jatropha cultivation initiatives.

To give an idea of the activities carried out under RLS to support the cultivation of Jatropha, Table 4 depicts one of their projects namely ‘Project Bastar 2008’. This project aimed at Jatropha cultivation in Bastar district of Chhattisgarh in 2008.
The respondents from the company said that under this project RLS was: providing technical assistance to self help groups (SHGs), aiming to complete government targets of Jatropha production with quality and sustainability, providing a model for development that included members of the community, corporate sector, and public sectors.

To fulfil the above responsibilities RLS officials said they required: finance to prepare the land, dig pits and other related activities; finance for the nursery farmers to ensure they supplied best quality planting material. The respondents stressed how the company aimed at helping the rural users by encouraging them to cultivate Jatropha, training them on cultivation techniques, providing them with raw materials at a low costs, and were willing to buy the Jatropha seeds at the market price set by the Government of India (GoI).

From the above discussion it is clear that the officials from the company supported the ‘pro-poor’ narrative of the NMB. They sustained and promoted the ‘pro-poor’ representation of the biodiesel initiative. The RLS staff not only worked hard to stabilise the particular frameworks of interpretation of the NMB, but also tried to secure it socially by actively recruiting and enrolling a range of actors (rural users, NGO representatives). According to Latour (1996) this work of actors that sustains representations of a project or policy is known as ‘contextualisation’, he uses this concept to explain the ‘Aramis’ transport project in Paris and says that:

<table>
<thead>
<tr>
<th>Blocks in which RLS are working</th>
<th>Bastar, Bakawan, Darbha, Jagdalpur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of villages</td>
<td>132</td>
</tr>
<tr>
<td>Total target set for year</td>
<td>2200 Ha</td>
</tr>
<tr>
<td>Total number of farmers</td>
<td>2700</td>
</tr>
<tr>
<td>Total number of staff selected for the project</td>
<td>42</td>
</tr>
<tr>
<td>Total number of village level animator</td>
<td>32</td>
</tr>
<tr>
<td>Total number of Resource people</td>
<td>8</td>
</tr>
</tbody>
</table>

*Table 3 Project Bastar 2008 (Presentation by RLS officials to the Collector of Bastar)*

The Social Production of Outcomes
…[the project] nearly becomes a pile of paper covered over by the drab surfaces of closed files…But then something happens: the work of contextualisation starts up and is so successful, so sprightly, that Aramis…has become a political slogan, a reference in so many speeches…it has a life of its own; it can’t be stopped…Contextualisation is fabricated and negotiated like everything else (Latour 1996, p.142-142).

The NMB was contextualised in the interests and agendas of the government officials, policy-makers, technocrats, and representatives of the industry, but the actors promoted the initiative across conferences, television, print media, radio, puppet shows, and village fairs and thereby connected the initiative to a wider national audience. The actors from RLS advertised their work across the different states; they presented the progress achieved by them to the various collectors of different districts, and enrolled more actors to promote the success of the initiative. Hence they played an important role in promoting the biodiesel narratives and in turn recruiting actors to the biodiesel network which enhanced the adoption of cultivation of Jatropha across different states in India.

RLS was not the only company investing in the biodiesel initiative; many other local and foreign companies were also playing an important role in promoting the cultivation of Jatropha in India. The majority of the companies were either large Indian companies, or small companies that had tied up with large local or foreign corporations. However, there were a few small companies that were promoting the biodiesel initiative too; Clean Star Energy Pvt Ltd was one of them. The actors in this company were keen to develop a renewable energy franchisee model. The model aimed to meet the need of reliable energy for cell phone towers and it comprised establishing small power plants that would be owned by the local village women’s self help groups. The respondents from the company said that they wanted to use a biofuel-based generator to supply back up power to the cell phone tower when there were power failures, and said that the excess power generated from the model would be sold to the villagers.
According to their model, Jatropha seeds would be produced by the local farmers and SHGs and would be then sold to the company. The company would use the oil extracted from the seeds to run the generator that would power the cell phone towers. Officials from the company would train local youth from the village to operate and maintain the generator. The company planned to deploy a Mobile Seed Collection Unit (M-SECU) to collect seeds from the farmers’ doorsteps in local villages using a simple small truck. This truck in addition to collecting the seeds would also spread awareness about this program and improve the efficiency in the collection logistics. To connect directly with the farmer, representatives from Clean Star have developed a short messaging service (SMS)-based Mobile Seed Market System (MSMS). SMS allows cell phone users to send small text messages to other cell phone users, thus, a farmer would be just one SMS away from being connected to the end customer for his Jatropha seeds. This the company officials said would ensure that local middlemen were not involved, resulting in higher profits for the farmer.

The interviewees said that Clean Star Ltd has developed a 6-month training module for the women’s SHGs on running the Clean Star Franchisee. A training system has been put in place for village youth to be trained as certified diesel technicians, generator operators, oil mill operators, and biofuel conversion specialists. The company has already commenced this model in a few villages and are waiting to see how it works out and based on it they will implement it across other villages in India.

Like the officials from RLS, the actors within this company were also keen to promote the NMB. The officials from these two companies, and their websites represented the cultivation of Jatropha and production of biodiesel as a feasible option that would create employment and improve the livelihoods of the rural poor. The actors from private companies forged relations with government officials responsible for the NMB, agricultural scientists, regional NGOs. Mosse (2005, 171-172) states that “development success is not objectively verifiable but socially produced. It is an institutional process not an objective fact”. Hence the various actors from the private companies portrayed the NMB as a successful initiative and
created strong links and networks to build the reputation of their work and enhance the adoption of the NMB across India.

8.4 NGOs

Chapter 6 highlighted the presence of actors from the private companies and NGOs in the policy network that supported and stabilised the NMB, and traced the role of a private company-NGO led network. The Planning Commission’s Report (GoI 2003) included NGOs in the institutional networking of the plantation sector of the NMB. In the network, NGOs were among the actors responsible for raising nurseries and planting Jatropha. The Planning Commission’s Report (GoI 2003) states;

Plantation over non-forest land including marginal lands of farmers, fencing of farmers fields, public lands along roads & highways, canals and railway tracks to be implemented by NGOs, Self-help and User groups, cooperatives, public and private sector corporate and other bodies (p.120).

The Department of Rural Development … will be responsible for plantation in degraded and wastelands all over the country … through the Panchayats and NGOs (p.121).

The NGOs were also actors in the processes related to setting up of seed collection sources, and extraction of oil (ibid.). When the NMB was formulated the private enterprises and NGOs were eager to adopt the initiative and to prove their support, they commenced Jatropha cultivation prior to it being adopted by the GoI officially.

During the course of fieldwork I observed that the NGOs either operated with the government officials, the private companies, or on their own. The majority of the NGOs either aligned with the government or the private companies, very few NGOs worked on their own. In chapters 6 and 7, I explained the manner in which the NGO unit of Purandhar Agrofuels joined with a private company named Mission Biofuels Ltd to promote the cultivation of Jatropha in Maharashtra. In Chhattisgarh few of the local NGOs associated with the CBDA to promote the cultivation of Jatropha.

The majority of the actors from the NGOs believed the NMB was a pro-poor initiative and hence they formed linkages with private companies and government
organisations. A NGO named Winrock International India (WII) actively supported the NMB, and to prove their support for the initiative they started an initiative to electrify a remote tribal village in India by using non-edible oil derived from Jatropha. The objective of the initiative was to demonstrate the technical and financial viability of running diesel generators using vegetable oil in place of conventional diesel. The project was carried out in Ranidehra village in Kabirdham district of Chhattisgarh. This village comprises 110 households of tribals (Gond and Baigas community) who depend on agriculture, forest produce and wage labour for their livelihoods. The village is under developed owing to its poor connectivity and agricultural practices and WII with the support of the MNRE set out to implement the viability of Jatropha oil for rural electrification.

Initially the WII officials had to convince the local community about the feasibility of the project and then they formed the Village Energy Committee (VEC) and women’s self-help group in the village. The VEC undertook Jatropha plantations on barren land, private farm bunds, kitchen gardens, etc. with the seeds provided by WII and planted by the villagers, and a power house was set up comprising an oil extraction section, power generation room, rice de-husking chamber, power distribution room, and a large storage area for Jatropha seeds and food grains. The power unit uses 1 tonne of oil seeds per month for 3 hours of domestic and 3.5 hours of street lighting per night (Practical Action Consulting 2009). This initiative has electrified the village and empowered them to produce their own electricity.

When I conducted the first phase of my fieldwork, the majority of the NGOs supported the initiative. Actors from NGOs like WII, Purandhar Agrofuels (NGO unit), and Ahimsa supported the NMB and said they were keen to implement the activities of the initiative. They represented it as a successful initiative and formed alliances with the private companies and government organisations to back and promote the NMB.

However, during the second phase of my fieldwork, when I was interviewing the rural actors, whose CPRs had been diverted for the cultivation of Jatropha, many of
them said their concerns were being represented by few local NGOs and civil organisations. These NGOs and civil organisation felt the people were being harmed by the NMB and they wrote letters, held protests, and filed cases against the government agencies and private companies. Mosse (2004, 2005) alleges the success of a development project, policy, or initiative depends on the socially sustained interpretation of the various actors, but the interpretations are vulnerable to the effects of the project, policy, or initiative. Initially the majority of the NGO representatives actively supported the NMB; however with the progress of the NMB, few of them such as Ahimsa and other local NGOs withdrew their support for the initiative and aligned with the rural users.

8.5 Impacts of Jatropha Cultivation — From the Perspective of the Rural Users

8.5.1 Unused Wastelands or Not?

Scott (1998) says the process of classifying land as wastelands is an example of state simplification. There are certain state processes, such as establishing land and population surveys, that are undertaken to decipher the actions of populations, which in turn augment the state’s ability to monitor its citizens. These processes often simplify “complex, illegible, local social practices” (Scott 1998, p.2) but such processes may be easy to write on paper but difficult to implement in practice (Li 1999) and often they fail in their goal of improving the human condition (Scott 1998). Such schemes or initiatives have the potential to modify or change the landscapes of the communities they operate in and subsequently alter the relationship between the state and its citizens. The NMB was one such process that altered the relationship between the people and the government when their CPRs were termed as wastelands and diverted for the cultivation of Jatropha.

According to the Wasteland Atlas of India, the area classified under ‘cultivable wastelands’ in the year 2000 summed up to 45 million hectares and a major fraction of this, amounting to at least 26 million hectares comes under forest land, providing sustenance to large number of forest communities in myriad ways. The uncultivated
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land, excluding current fallows, covers areas classified under ‘permanent pastures and grazing land’ amounting to 11.8 million hectares (Wasteland Atlas of India 2008).

In Chapter 5, I discussed how the rural users said the land termed as ‘wastelands’ by the GoI are not wastelands, but are used as pasture lands, to grow woody crops to serve as fuel wood, are the means of procuring revenue by the landless farmers and labourers, and are intrinsically linked to communities’ livelihoods. The wasteland narrative promoted by the policy-makers, bureaucrats and private companies varied from the representations of the rural farmers and labourers, who were unwilling to cultivate Jatropha on their CPRs. Hence there is an on-going dispute over the use of these so-called wastelands, which the government had disregarded or not taken into notice, before the swift decision to allocate them to cultivate Jatropha without consulting the rural people whose subsistence depends on them. To meet the biodiesel blending target the GoI has estimated that 13.4 million hectares of wasteland will be cultivated with Jatropha (GoI 2003); many social researchers and rural users expressed that this form of diversion of land can have profound implications on rural livelihoods and rural ecosystems.

This chapter has already highlighted how the government and biofuel lobbies have contended that instead of displacing the rural communities this ‘wonder crop’ can in turn enhance their livelihoods. In addition to the reason cited in the previous section, the government officials said that, Jatropha seeds can be sold at a good rate in the market and with the ensuing steady demand to meet the biodiesel blending targets it can turn out to be a ‘gold mine’ for the poor farmers and landless labourers. To prove their logical claims and support towards this non-edible crop, in many states the government distributed free seeds and encouraged the farmers to plant Jatropha. From the interviews with the farmers it emerged, that they either willingly or forcibly agreed to cultivate Jatropha, hoping their problems would end with this wonder crop but they were mistaken. Sufficient research had not been carried out on the right variety to be planted, the yield was far below the promised level, and the farmers
were not trained in the appropriate pruning techniques, and the dismal output enhanced their existing burdens (Ariza et al. 2010).

I visited block plantations in the villages of Birkoni, Basna, and Sinodha in Chhattisgarh. These block plantations were carried out on land identified by the state government as wasteland. However, the people living in these villages claimed “it was their land and they had been using it for years and all of the sudden the government decided to use the land for something else”. The CPRs were planted with the first batch of Jatropha in 2007-2008. The villagers were told by officials from the Chhattisgarh Biofuel Development Authority (CBDA) that they did not have to irrigate the plant, all they had to do was harvest the seeds after three years. The rural users said the prospect of earning money form the harvesting process reassured the villagers to an extent and despite their dissatisfaction with the new initiative they did not protest too much. They said within a year the vegetative growth of the Jatropha plant was very high and the plant grew very tall. They were impressed and thought it would flower even before three years. They thought they would be rewarded by the government officials. However, when the officials returned a year later they were dismayed to see the rate at which the plant had grown. One of the villagers Karmat Dev said what the officials told them. He stated,

they asked us why we had not cut the side branches. We told them we did not know we had to prune the plant. They said the plant had grown too high and had not been pruned at the right time. Now it would not yield enough seeds. We were told to uproot the plant and sow new Jatropha seeds!

The villagers had not been informed about the importance of pruning and how the failure to do would drastically affect the rate of yield. The state officials and members from CBDA had not anticipated the knowledge gap of the rural farmers and labourers in regard to Jatropha and related farming practices. Despite this failure, the villagers were not paid for their services of planting Jatropha and were in turn coerced to plant Jatropha again. The villagers said they did not want to grow Jatropha but they had no choice, some of them tried to grow other crops and their crops were uprooted by sahaabs and their people, and they had to follow their orders. According
to the GoI the biodiesel programme was a pro-poor initiative but the respondents said they were becoming poorer. Many interviewees expressed dissent towards their community land being used for Jatropha plantations. Some said they were in greater debts than before and felt the officials blindly followed whatever new policy the government announced and did not care for them.

### 8.5.2 Contract Farming and Land Grabbing

The apparently secure foundation of the success of the biodiesel initiative by representatives from the industry was critiqued by the emergence of contract farming and land grabbing issues (Baka 2011). The rural users involved in Jatropha cultivation with the private companies raised issues of contract farming and land grabbing across parts of India. This section will discuss these issues affected the users cultivating Jatropha.

Contract farming refers to a system for the production and supply of agricultural produce under forward contracts, the essence of such contracts being a commitment to provide an agricultural commodity of a type, at a time and a price, and in the quantity required by a known buyer (Singh 2002, p.1621).

A contract normally comprises four things—pre-agreed price, quality, quantity or acreage, and time. Contracts can be of three types: (1) procurement contracts in which only sale and purchase conditions are specified; (2) partial contracts where some of the inputs are supplied by the contracting firm and the produce is bought at a pre-agreed price; and (3) total contracts where the contracting firm supplies and manages all the inputs on the farm, while the farmer just supplies the land and labour (Singh 2002, p.1621).

Singh (2002) insists that contracting and timely availability of raw material are the pre-requisites for a successful agribusiness firm, in the domestic or international market. He further adds that the restructuring of the agricultural production sector can be attributed to changes in the policy and markets sector, particularly in the industrial and trade sectors. As a result of globalisation policies the world over, agriculture is being internationalised involving “globalisation of production, capital
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and trade”, and contract farming encompasses all of these “through intervention in input supply and production decisions, supply of capital and finance, and global sourcing of agro-products” (ibid., p.1622). Contract farming has become an extension of global sourcing where a firm in one part of the world can produce anything anywhere, by sourcing inputs from anywhere in the world to be sold in the global market.

In Tamil Nadu there are several private companies promoting the cultivation of Jatropha, few among them are: D1- Mohan Bio Oils Ltd, Siva-Vanariamman Sugars, AGNI NET Biofuel Pvt. Ltd, KCP Sugars, MGR Jatropha Biodiesel Ltd, Mission Biofuels Ltd, Saravanna Bioventures, Satanpura Biofuels, Sri Ranga Biofuels, and Century Agrotech Ltd. Among them D1- Mohan Bio Oils Ltd is the most prominent company promoting Jatropha plantations. This company is a joint venture between D1 Oils plc, a UK based multinational company, and Mohan Breweries and Distilleries Ltd a Chennai based company (http://www.d1plc.com/).

This company has been actively promoting the cultivation of Jatropha and by 2007-2008 it had formed contracts covering 12000 ha of plantations in Tamil Nadu (Ariza et al. 2010). The majority of these plantations were on the land owned by farmers and involved contract farming between them and D1- Mohan Bio Oils Ltd. Hill and Ingersent (1982) cite various reasons why farmers and farm product processors/distributors prefer contracts. According to them a farmer prefers a contract because it does not last forever and can be terminated on a short notice which is preferable than being tied down with one producer or buyer forever. Contract farming is a source of extra income for many farmers and it balances out the risks of adverse price fluctuations. Also the farmers can access new technology and inputs which may normally be outside their reach (Goldsmith, 1985).

On one hand contract farming is beneficial for farmers, on the other hand, it also conducive for agribusiness firms. These firms can invest in different countries and source variety of goods, also contracts make smaller demands on capital resources and solve the problem of hiring labour, buying land, and overlooking farm
production activities in comparison with captive farming (Buch-Hansen and Marcussen 1982, Kirk 1987). The firm can also project an image of working with local producers from different parts of the world.

D1-Mohan Bio Oils Ltd developed a farming contract with farmers in Tamil Nadu to cultivate Jatropha. According to the contract, farmers were provided with free Jatropha saplings to grow on their land and during the period of the contract, the company officials would provide technical advice and guidance to the farmers. A rate of ₹7-10/kg was set to be paid to the farmers based on a buy-back agreement, and the main conditions were that the company would definitely buy the produce, while the farmer had to sell to them and also repay part of the loan with the harvest. During the period of the contract the company agreed to give a loan amount of approximately ₹15000/ha over two instalments, around two-thirds of the sanctioned amount would be released in the first year and the rest would be given over a period of two years.

The main role of D1 Oils was to provide finances for the contract while the role of Mohan Breweries was to convince the people to enter the agreement and ensure they delivered the final product. Local staff were entrusted with the task of informing the farmers about the NMB, Jatropha, and benefits of cultivating it. The farmers and labourers interviewed said that officials from the company regularly visited the villages where Jatropha was being cultivated by farmers who had contracts with them. Their visits were to check on the plantations and also to persuade more farmers to form contracts with them.

A farmer who was initially reluctant to grow Jatropha said “these officials were local educated people whom we knew and they were very persuasive. I thought if they are saying and so many people are already growing Jatropha perhaps even I can do the same”. The officials were also keen to ensure that the farmers entered in to contract farming with them and not other companies and said that they gave better loans than those companies and their buyback mechanism was better.
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The respondents said that the officials from these companies told them that Jatropha was a ‘miracle’ crop and could grow on dry land, did not require irrigation, was resistant to pests, and had good yield rates. Despite Jatropha being marketed as a ‘miracle’, and ‘pro-poor’ crop results have shown there is a disparity in its expected performance and the actual yield rate. According to TNAU the yield rates of Jatropha should be around 7500 kg/ha under irrigated conditions and 2500kg/ha under rainfed conditions after three years (Paramathma et al. 2007), however according to a study by Ariza et al. (2010) the maximum yield reported by farmers were 750 kg/ha under irrigated conditions and 450 kg/ha under rainfed conditions. It was also observed that crop survival and nuts per plant were better under irrigated plots as compared to rainfed plots, proving that irrigation is necessary for a good yield which is contradictory to it being a hardy crop.

The low agronomic performance made the crop economically unviable and changed the economic balance between the farmers and the business firms. While entering the contracts with the companies, the farmers were told that the crop was hardy, requiring minimum inputs, and had good yield rates. However, the farmers said that the yield rate varied markedly with and without irrigation and it was expensive to afford irrigation. The medium scale farmers said they were able to afford irrigation but the small scale farmers found it expensive to afford the electric pump sets.

Expecting to get the promised loans, technical advice, and profits from the companies, the majority of the farmers said they planted Jatropha as a substitute for food crops and less than 20% of them used barren or marginal land. As the Jatropha gestation period is around three years many of the farmers also took up part time jobs as labourers to earn money till the oil seeds could be harvested. However the yield rates were dismal and also the quality of the seeds and oil content varied across different plots. The company officials interviewed said the low yield rates were due to “inadequate inputs and management” by the farmers and the farmers complained that the officials from the company refused to buy the seeds or bought them at a very low rate.
The farmers were already experiencing difficulties in yield rates because of the higher than expected requirements of irrigation and fertilisers which were compounded by the lack of government involvement and the non-fulfilment of the terms of the contract farming by the company (Ariza et al. 2010). Many farmers said that they did not even receive the entire loan amount promised by the company and as they had to wait for three years for the crop to yield seeds, they started borrowing money from money-lenders at high interest rates hoping they would receive loans from the company soon. Even if some of the farmers received loans from the company it was difficult to pay off the loans to the money lender with the interest rates and they had to do so by taking up additional farm labour jobs. Ariza et al. (2010, p.890) state “given the already heavily indebted situation of Indian farmers, and the high input costs, opting for Jatropha cultivation will lead to still greater indebtedness”.

Just as the farmers in Tamil Nadu, the same sentiment was expressed by farmers in Vidarbha. In Vidarbha in Maharashtra the farmers mainly cultivated sugarcane, Jowar, and cotton, however due to low yields, increase in costs of raw materials, and decrease in prices of the produce they took up Jatropha plantations. The main company involved in this region was Mission Biofuels Pvt Ltd, and they associated with a local company Purandhar Agrofuels Ltd and followed the same sort of contract farming as in Tamil Nadu.

In this contract the farmers were promised a loan amount of ₹5000, and the farmers willingly started planting Jatropha on their good arable land. Many of them substituted Jowar and sugarcane with Jatropha, the wealthier farmers used fertilisers and irrigated their fields, while the small-scale farmers could not afford to irrigate their land. Just like in Tamil Nadu the yield rates fluctuated in this region across the various plots. However in this site there was an increase in yield rate when Jatropha plantations were intercropped with groundnuts and grown on a sloping land surface. In this area too, the farmers and labourers complained that many of the contracts were not fulfilled, the company only gave loans to 35% of the farmers and bought back seeds from only 15% of the farmers.
Wilson (1986) argues contracting leads to exploitation of farmers and the companies indirectly control the land and he questions what happens when the yield rates are low, costs of production rise and there are fluctuations in the market? The farmers who had entered contracts with the firms to produce Jatropha were faced with the above mentioned problems. The major problem was the reluctance of the state governments to intervene and aid them, instead the policies were “pro-investor, rather than pro-farmer” (Ariza et al. 2010). Prior to the neoliberal policies, the private firms could not have easily formed contracts with the farmers as the state governments played a stronger role in the agriculture sector and the farmers relied on government sources of funding and subsidies. However with the adoption of the LPG policies, agribusiness companies started interacting and forming contracts with the farmers directly with no interventions from the State.

This section has discussed the problems faced by the rural users who entered contract farming with private companies to cultivate Jatropha. Many of the users interviewed openly voiced their dissent with the companies and said the government was oblivious to their problems and did not want to help them. They said “the initiative was making the rich richer and the poor poorer”. Although the majority of the rural actors cultivating Jatropha complained about the unfair contracts with the companies, they also raised the issue of land grabbing by private companies.

The biofuel rush in Africa had induced large-scale land grabbing (Cotula et al. 2009, World Bank 2010), whereas land grabbing in India involved smaller tracts of land and were more elusive and kept under wraps (Baka 2011). Many times the farmers did not even know that their land had been taken over by the firms. The NMB is a wasteland-centred scheme, but many rural users expressed that it had resulted in the displacement of farmers and their families; it was reducing the extent of agricultural area, and dispossessing farmers of their ancestral land. Land grabbing by private firms to grow Jatropha or for other purposes has been happening across India but has not been documented properly as the results are still emerging. Baka (2011) has documented the mechanics of an 800 acre biofuel land grab that occurred in Southern Tamil Nadu beginning in 2005-2006. She covered the land grabbing which
occurred in Virudhnagar district, in Tamil Nadu. The land was amassed by a New Delhi based company T. Shivaleekha and by 2007 they had illegally bought/grabbed around 800 acres of land spanning across 12 villages.

Initially the company planted Jatropha on around 400 acres of land, however they did not maintain the plant and did not harvest the seeds, and by 2009 they started selling the land to real estate companies in Bombay. According to the farmers the company hired brokers to approach the marginal and small scale farmers, and persuaded them to sell their land. The farmers were offered ₹3000-5000/acre (£30-50/acre), while this was a meagre amount for their land, still the majority of the farmers were willing to accept this price. These farmers had been unable to farm on these lands for numerous years due to the low rainfall, and had borrowed money from money lenders to make ends meet. If they sold their land, they would be able to repay their loan and would be rid of their debts (Baka 2011).

However, to sell even a part of their land the farmers had to provide their land ownership documents to the brokers so that the plots could be transferred to the company. One of the key land documents is the patta, which is a document issued by Revenue department at Tamil Nadu. This document ensures that the land is owned by the patta holder, that is, the name mentioned in the patta and it is not a government land (Government of Tamil Nadu 2008). Most of the time the patta would include a list of all the lands owned by the farmer and in many cases it would include land owned by the neighbours and/or did not reflect partitions within the family.

Once the brokers were in possession of the patta, they re-registered all the land in the name of their company irrespective of the fact whether all the plots in the patta were purchased. In many cases the government officials at the village level were associated with the brokers in these deals and took a commission for each land that changed owners. Buying the land was not the only form of grabbing; sometimes the brokers obtained survey data of the land from the officials by bribing them and then
prepared false documents and re-registered the land without the knowledge of the farmers (Baka 2011).

The majority of the rural actors interviewed across Chhattisgarh, Tamil Nadu, and Maharashtra voiced their dissent against the company officials and said that the government was to blame for their problems. Respondents from NGOs involved in helping these actors said the various state government biodiesel policies not only encouraged private investors to invest in Jatropha plantations, they also set favourable conditions for industrial biodiesel processors. According to the Tamil Nadu biodiesel policy, activities such as oil extraction and transesterification have to be undertaken only by the biodiesel manufacturers. The government officials argued that industrial biodiesel processors were equipped with the appropriate machinery and extraction units to carry out these processes, while the local operators were inefficient and their processes of oil extraction would have an impact on the standard of biodiesel being produced. The respondents said that the state policies prioritised the industries and deferred purchase and sale tax for a period of five years to the biodiesel industry to sustain their business (Tamil Nadu 2007).

The previous chapter revealed why the rural users had joined the initiative, while the discussion in this section has presented the adverse consequences of the rural development scheme. On one hand the officials from the private companies expressed that they were actively pursuing the ‘pro-poor’ mandate of the NMB and were creating jobs for the rural users, while on the other hand the rural users said they were being exploited by the private companies. The officials from the private companies worked hard to maintain representations that projected the NMB as a successful development initiative. However, the representation from the rural users did not portray the NMB as a successful rural development programme.

8.5.3 Gender Issues

Despite the progress achieved by the Indian economy, around 260 million Indians live below the international poverty line, accounting to around 26% of the population (Dhar 2006). In spite of being much ahead of sub-Saharan African countries in

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economic prowess, India stands lower than many of them when it comes to fighting hunger and has 19% more poor people than all of Africa put together. In examining poverty and the gender aspect, Sen (2008) argues poverty has a distinct gender dimension in the sense that poverty is experienced differently by women and men and their responses are different.

Clancy (2008) says that gender issues in biofuel programmes have emerged in terms of access and control over assets. She contends that women and men have different degrees of access and control over land and natural resources; they are generally excluded from decision making about what crops to grow and also from owning land. Indeed in India the degree of access and control over land and natural resources varies markedly between men and women and the differences are profound among the uneducated rural poor (Sen 2008). India is still predominantly a patriarchal society, where decisions are solely made by the father or the husband of a woman, implying women do not even have the right to choose what they plant in their fields despite the fact they toil side by side with their male counterparts. In such a scenario, women are particularly vulnerable when common lands are diverted for biofuels feedstock production, because, they have limited control over private resources and they draw heavily on common property resources to meet the majority of their needs.

In northern India, it is estimated that nearly half of the income of poor women is generated by the resources from common land, compared to only one-eighth of poor men’s incomes (Reddy, Williams and Johnson 1997). Access to common property resources can be threatened when traditional use-rights are disregarded and overridden by official legal agreements (Kartha and Larson 2000). According to Gundimeda (2005), in India, CPRs contribute between 12% and 25% of poor households’ incomes – the poorer the household the higher the contribution. Hence, the use of CPRs for the cultivation of Jatropha had a profound effect on the poor, especially the women (FAO 2008).

A majority of the women interviewed in Chhattisgarh said they used the CPRs for fodder for their cattle and for wood for cooking. They complained they now had to
plant Jatropha on their community land and because of it they had to walk for hours in to the forests to collect fodder and wood. In a study conducted by Lahiri in 2008 he stressed the alarming rate at which common lands and pastures were being diverted for the production of Jatropha and the large number of people who had succumbed to it. In another event a group of NGOs, peoples organizations, and individuals from different parts of India initiated a national consultation from 3rd to 4th December 2007 titled *Biofuels in India: Will they deliver, or destroy?*, held in Pataspur village of Medak district in Andhra Pradesh. The consultation stressed that indigenous people, pastoralists, small farmers, and tribal communities all across India have a holistic view of life that is reflected in their interaction with the living world, which, in turn, provides for all their needs of food, fuel, fodder, and energy. In a statement issued at the end of the consultation the participants declared,

> We believe that the promotion of large-scale corporate-sponsored biofuels (agro-fuels) in the garb of improving energy security is yet another form of not only physically destroying the above, but also a psychological assault perpetrating the idea that farming as our people have done it is no longer good or tenable…’

> ‘Rural and forest communities [...] say that there is no such thing as wastelands. Most of these lands are grazing lands, common pastures, degraded forests, and also lands of small and marginal communities. They not only support a multitude of livelihoods but also have a critical ecological role. This is where the government and corporations are pushing for their fuels, displacing thousands of peoples...’

The above discussion demonstrates the problems faced by the rural users when their community land was diverted for Jatropha production. It establishes the false validity of the wasteland narrative. The policy makers were certain that growing Jatropha on wastelands was a pro-poor initiative; however, the users felt it was anti-poor and was a plan to take away their land and subject them to obey the officials and plant Jatropha. Hence, what the government had perceived as a good measure for the users turned out to be a major issue of debate and concern instead. The next sub-section
will focus on how the rural users said they were displaced because of the Jatropha plantations.

8.5.4 Jatropha Plantations – Displacing Farmers and Families

According to the 2011 Census, 68% of the Indian population lives in rural areas and rural poverty is particularly high among those who do not own their own land or who only have access to marginal land, including those who work as agricultural labourers (Census of India 2011). The majority of the rural populace rely on subsistence farming and forest farming to feed their families. They depend on forests and common lands for their livelihoods; they collect timber, fruit, fodder, and medicinal plants from the forests. They use the common land for fodder or subsistence farming and have been doing since many years. This status quo was threatened when the NMB allocated marginal land, CPRs, and less productive areas in the forests for Jatropha cultivation (Gundimeda 2005 cited in Rajagopal 2008).

The rural population comprising landless labourers and poor farmers were told that they could not use the CPRs for grazing or cultivating subsistence crops, instead they had to grow Jatropha on it. One of the states which has attracted good and bad publicity for its biofuel venture is Chhattisgarh. The previous chapters have illustrated why Chhattisgarh was chosen as one of the sites to conduct fieldwork, how the CBDA was set up, the creation of the government led network, and why the rural users cultivated Jatropha. Table 5 depicts the areas in Chhattisgarh where Jatropha was planted under the aegis of the CBDA.
### Table 5: Jatropha plantation carried out by the CBDA

<table>
<thead>
<tr>
<th>No</th>
<th>District/Zilla</th>
<th>Area planted in 2005-06 (Lakh Hectares)</th>
<th>Area planted in 2006-07 (Lakh Hectares)</th>
<th>Area planted in 2007-08 (Lakh Hectares)</th>
<th>Area planted in 2008-09 (Lakh Hectares)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Raipur</td>
<td>0.010</td>
<td>0.070</td>
<td>0.050</td>
<td>0.020</td>
<td>0.150</td>
</tr>
<tr>
<td>2</td>
<td>Mahasamund</td>
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<td>0.050</td>
<td>0.030</td>
<td>0.005</td>
<td>0.095</td>
</tr>
<tr>
<td>3</td>
<td>Dhamtari</td>
<td>0.020</td>
<td>0.020</td>
<td>0.010</td>
<td>0.000</td>
<td>0.050</td>
</tr>
<tr>
<td>4</td>
<td>Durg</td>
<td>0.000</td>
<td>0.040</td>
<td>0.020</td>
<td>0.006</td>
<td>0.066</td>
</tr>
<tr>
<td>5</td>
<td>Rajnandgaon</td>
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<td>0.060</td>
<td>0.040</td>
<td>0.004</td>
<td>0.114</td>
</tr>
<tr>
<td>6</td>
<td>Kabirdham</td>
<td>0.010</td>
<td>0.020</td>
<td>0.030</td>
<td>0.015</td>
<td>0.075</td>
</tr>
<tr>
<td>7</td>
<td>Bilaspur</td>
<td>0.020</td>
<td>0.060</td>
<td>0.100</td>
<td>0.027</td>
<td>0.207</td>
</tr>
<tr>
<td>8</td>
<td>Janjigir-Champa</td>
<td>0.010</td>
<td>0.030</td>
<td>0.020</td>
<td>0.002</td>
<td>0.062</td>
</tr>
<tr>
<td>9</td>
<td>Korba</td>
<td>0.010</td>
<td>0.030</td>
<td>0.070</td>
<td>0.004</td>
<td>0.114</td>
</tr>
<tr>
<td>10</td>
<td>Raigarh</td>
<td>0.010</td>
<td>0.030</td>
<td>0.050</td>
<td>0.003</td>
<td>0.093</td>
</tr>
<tr>
<td>11</td>
<td>Jashpur Nagar</td>
<td>0.010</td>
<td>0.030</td>
<td>0.020</td>
<td>0.012</td>
<td>0.072</td>
</tr>
<tr>
<td>12</td>
<td>Surguja</td>
<td>0.050</td>
<td>0.100</td>
<td>0.080</td>
<td>0.016</td>
<td>0.246</td>
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<tr>
<td>13</td>
<td>Koriya</td>
<td>0.020</td>
<td>0.020</td>
<td>0.020</td>
<td>0.006</td>
<td>0.066</td>
</tr>
<tr>
<td>14</td>
<td>Bastar</td>
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<td>0.050</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Narayanpur</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Dantewada</td>
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<td>0.010</td>
<td>0.010</td>
<td>0.000</td>
<td>0.030</td>
</tr>
<tr>
<td>17</td>
<td>Bijapur</td>
<td>0.000</td>
<td>0.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Kanker</td>
<td>0.010</td>
<td>0.040</td>
<td>0.040</td>
<td>0.000</td>
<td>0.090</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>0.230</strong></td>
<td><strong>0.660</strong></td>
<td><strong>0.640</strong></td>
<td><strong>1.550</strong></td>
<td><strong>1.685</strong></td>
</tr>
</tbody>
</table>

Chhattisgarh is traditionally a rice-growing region and is often called the ‘The Rice Bowl’, despite being a region producing a high quantity of rice, 45% of the population lives below the poverty line and many of them sustain themselves from the marginal lands and CPRs which the state government was diverting for the cultivation of Jatropha. The rural actors interviewed said that in spite of the proactive

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stance of the state government to grow Jatropha and produce biodiesel, they were not enthusiastic to support the goals of the state government. Many people felt that they were being targeted under the ‘Politics of Jatropha’ (Friends of the Earth Europe 2009). Shiva (2009) argues that “tribals’ farms are being forcefully appropriated for Jatropha plantations, aggravating the food and livelihood crisis in Chhattisgarh”.

The report ‘Losing the plot’ (Friends of the Earth Europe 2009) claims there is a clear cut conspiracy to uproot and displace hundreds of thousands of adivasis and dalit farmers from their CPRs by planting Jatropha on public land. I argue that it is not a conspiracy rather the policy-makers and bureaucrats did not foresee the problems of diverting CPRs for Jatropha production. The technocrats and policy-makers at the high level assumed that these CPRs are marginal, unused, waste lands and could be used for Jatropha cultivation. However, once the NMB was drafted they were keen to ensure that the CPRs were used only for Jatropha production as it was government land and also they did not back away from the utilisation of wasteland narrative.

The widespread diversion of CPRs for the cultivation of Jatropha led to disputes and displacement of farmers, especially in Chhattisgarh, where the officials were keen to implement Jatropha plantations. The Table 5 above depicts the area covered with Jatropha plantations across the 18 districts of Chhattisgarh; these areas comprised road plantations, block plantations, forest areas, and CPRs. The forest areas and CPRs were the areas that provided subsistence for the rural people and when they were forced to cultivate Jatropha it resulted in dissent and displacement of many farmers, labourers, and their families.

Chhattisgarh was one of the first states in India to actively adopt the NMB and commence Jatropha plantations. In 2006, the former Indian President A.P.J Abdul Kalam during a visit to the state praised it for being at the forefront of biodiesel

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28Dalits and Adivasis are groups belonging to Scheduled Tribes and Scheduled Caste communities in India
production from Jatropha and the state government responded by welcoming him to the ‘land of Jatropha’. However this enthusiasm of the state government was not expressed by everyone, social groups and people’s organisations opposed the move and penned a letter to the former President, stating.

Rice Bowl or Land of Jatropha: the patriotic people of Chhattisgarh would decide.”...Any reference made to Chhattisgarh as the ‘land of Jatropha’ undermines the significance of ‘rice’ as the foundation of people’s economy, cultural identity, and dignity and is an insult and open attack on their ‘rights to life and livelihoods (Lahiri 2008).

Despite protests from the people, the state government continued with the plantations. During fieldwork, it was clear many of the farmers and labourers were upset with their land being used for Jatropha plantation. In a village named Bhumia, the forest officials asked the people to stop using the land for grazing and asked them to cultivate Jatropha. Along with being promoted as a non-edible crop, requiring minimal care and inputs, Jatropha was also supported because it was toxic and animals did not feed on it, hence prevention was not taken to prevent animals from grazing. The respondents said after six months when the saplings had grown cattle trampled upon the plantation and all the saplings perished.

The farmers were asked to sow new Jatropha seeds and were told to erect a fence this time and they were paid a subsidised wage under the NREGA scheme. According to the scheme each adult member entitled for the scheme required a job card with his photo to be paid. Many people complained that it was not easy to get the job card and they had to bribe the local officials to get a job card. Some respondents said they had finished planting Jatropha but had still not received their job cards and hence they had not been paid. The users complained that first they lost their common land and then they were not paid for their labour.

While conducting research in the areas where Jatropha was being planted on CPRs, I noticed the local people muttering under their breath that they had been evicted from
their land and were hired to work as labourers on their own land. During a group discussion, this is what the people\textsuperscript{29} said:

Interviewer: Is this your land?

Villager 1: Yes this is our land?

Interviewer: Do you have the papers to prove it?

Villager 2: What do you mean by papers? Our ancestors owned this land and now it belongs to us.

Interviewer: The Government says it is their land?

Villager 3, 4, 5: Yes yes that is what they will say? Everything is theirs. Because we are poor they can take our land away? Where were they all these years? Why are they suddenly claiming the land in and around our village?

Interviewer: If you think this is your land why don’t you stop them from planting Jatropha on it?

Villager 1: Don’t forget who they are? They are the sarkari sahaabs. They have the police on their side. Who do we have?

Villager 2: We are poor and nobody cares about us? They forced us to uproot our plants and we had to plant Jatropha

Villager 6: They took away the land my husband had been tending for years and now he is just the caretaker of the land? He has to take care of the Jatropha nursery.

It was evident that the people had a sense of ownership over the CPRs. Their forefathers had been taking care of the land and they had been using it for years together. It came as a surprise to them when the government officials asked them to stop using the land for other purposes and told them to cultivate Jatropha. Like Blaikie (1985) referred to soil erosion as a political-economic issue, biofuel production in India had also become a political-economic issue. The mission brought

\textsuperscript{29} Even though the respondents told me their names, they wanted their identity to be kept anonymous as they were scared of the government officials
in its wake varying interventions which mainly affected the poor labourers and farmers who were displaced from their land and were forced to migrate to the cities or cultivate Jatropha.

My initial contact in Chhattisgarh was with the CBDA, and their officials took me to a few areas where Jatropha was being planted and I got to interview the farmers. However, as I was in the presence of the CBDA officials the farmers were constrained and said good things and did not complain. After a while I started visiting areas on my own and got to speak to people who had been evicted from their land and discuss their issues. However, I did not have enough time to get sufficient data to find out how many families had been displaced. Nevertheless people always kept telling me that their neighbour or friend had moved away and was working in a bigger district, town, or city. It was evident that people had lost their land and were forced to take up other jobs or move to new areas to sustain themselves and their families. To capture the plight of the people, Table 6 illustrates number of displaced families and land forcibly acquired for Jatropha plantation in Kanker and Bastar districts of Chhattisgarh.
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Table 6 The number of displaced families and land forcibly acquired for Jatropha plantation in Kanker district of Chhattisgarh (Friends of the Earth Europe 2009, p.21)

<table>
<thead>
<tr>
<th>Name of the village</th>
<th>Name of Panchayat</th>
<th>Forest Division</th>
<th>District</th>
<th>No. of displaced families</th>
<th>Land acquired for Jatropha (in acres)</th>
<th>Land in possession (in years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghota</td>
<td>Ghota</td>
<td>Bhanupratapur (East)</td>
<td>Kanker</td>
<td>04</td>
<td>17</td>
<td>22</td>
</tr>
<tr>
<td>Bayanar</td>
<td>Dongarkatta</td>
<td>-do-</td>
<td></td>
<td>03</td>
<td>09</td>
<td>18</td>
</tr>
<tr>
<td>Chichgao</td>
<td>Chichgaon</td>
<td>-do-</td>
<td></td>
<td>04</td>
<td>13</td>
<td>30</td>
</tr>
<tr>
<td>Uchpani</td>
<td>Dongarkatta</td>
<td>-do-</td>
<td></td>
<td>04</td>
<td>17</td>
<td>25</td>
</tr>
<tr>
<td>Pandaripani</td>
<td>Faraskot</td>
<td>-do-</td>
<td></td>
<td>05</td>
<td>21</td>
<td>35</td>
</tr>
<tr>
<td>Narayanpur</td>
<td>Narayanpur</td>
<td>-do-</td>
<td></td>
<td>04</td>
<td>08</td>
<td>28</td>
</tr>
<tr>
<td>Hapra</td>
<td>Bheja</td>
<td>-do-</td>
<td></td>
<td>05</td>
<td>27</td>
<td>30</td>
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<tr>
<td>Kudal</td>
<td>Bheja</td>
<td>-do-</td>
<td></td>
<td>08</td>
<td>22</td>
<td>25</td>
</tr>
<tr>
<td>Karmotii</td>
<td>Karmoti</td>
<td>-do-</td>
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<td>01</td>
<td>05</td>
<td>10</td>
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<tr>
<td>Huva</td>
<td>Huva</td>
<td>-do-</td>
<td></td>
<td>08</td>
<td>18</td>
<td>18</td>
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<tr>
<td>Bhurkalkurum</td>
<td>Hahalddi</td>
<td>-do-</td>
<td></td>
<td>15</td>
<td>62</td>
<td>30</td>
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<tr>
<td>Hilchur</td>
<td>Damkasha</td>
<td>-do-</td>
<td></td>
<td>10</td>
<td>70</td>
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<tr>
<td>Taraighotia</td>
<td>Taraighotia</td>
<td>-do-</td>
<td></td>
<td>05</td>
<td>32</td>
<td>25</td>
</tr>
<tr>
<td>Huripinjori</td>
<td>Barepinjori</td>
<td>-do-</td>
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<td>04</td>
<td>20</td>
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<td>Choria</td>
<td>Kanker</td>
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<td>40</td>
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</tr>
<tr>
<td>Tilaibhari</td>
<td>Mandabhari</td>
<td>-do-</td>
<td></td>
<td>85</td>
<td>510</td>
<td>12</td>
</tr>
</tbody>
</table>

The above Table 6 illustrates the land used for Jatropha cultivation in Kanker district and the number of families displaced. This was the plight of villagers in one district of Chhattisgarh. The rural users were complaining about their land being used for the growth of Jatropha and they were not keen on adopting this new initiative. Many were forced to do it while others did it because they were being paid for their services. The problem of CPRs and the refusal and dissent expressed by the people captures the gap between scientific-bureaucratic and indigenous knowledge and the
invalidity of the wasteland narrative. The policy-makers and technocrats did not anticipate the problems that would arise by using CPRs for Jatropha cultivation but they continued supporting the biodiesel initiative, while the rural users said what had aimed to be a pro-poor initiative had evolved into an anti-poor initiative.

Prior to the neoliberal reforms farmers could seek refuge from the government through bank loans and subsidies, however the neoliberal period resulted in an acute agrarian crisis and the contract farming and land grabbing by the biofuel companies compounded the problems of the rural poor in India. The farmers are engulfed in a debt trap that has culminated to numerous farmers committing suicides across India (Assadi 2008). Since 1997, the number of farmers who have ended their lives is 200,000 and it is the most tragic outcome of the crisis faced by Indian peasants. The rising cost of production and falling prices of farm commodities has transformed agriculture from a positive economy in to a negative economy (Shiva 2009). Eminent economists like Jayati Gosh, Venkatesh Athreya, and Utsa Patnaik have said that the agrarian crisis has been accentuated by the policies of trade liberalisation and corporate globalisation (Athreya 2009).

The region in India which has accounted for the highest number of farmer suicides is the Vidarbha region in Maharashtra with 4000 suicides per year, 10 per day. This region is popular for the growth of sugarcane and Monsanto’s GMO Bt cotton; the GM seeds have created a suicide economy by replacing a renewable resource of seed with a non-renewable input which has to be bought every year at a higher price (Shiva 2009). Many of the farmers who could not afford to buy the cotton seeds nor irrigate their sugarcane fields entered in to contracts with Mission Biofuels Ltd to cultivate Jatropha on their land in return for the promised loan amount. However, many of them did not receive loans from the company and their debts increased, 10% uprooted their Jatropha cultivation, 40% continued with the cultivation hoping they would receive the loan soon, and 50% of those who had received the loan amount started inter-cropping Jatropha with peanuts so that they could make money during the three year gestation period. My fieldwork was carried out during the beginning of the second year of cultivation and many of the farmers were
disappointed with the company officials. One farmer who had uprooted his Jatropha plants said:

I did not receive the loan and how will I buy food for my family. If I had spent the same amount of time working as a day labourer I would have earned something till now. I am doomed what will I do now?

Another farmer said:

We are poor; the government does not care for us. They have money to produce movies and host expensive cricket matches, but they don’t want to help us. No wonder these companies are also exploiting us!

The farmers said they had borrowed a lot of money from the money lenders and no one was willing to give them any more money, they had also pawned or sold their valuable items and they were still struggling to make ends meet. Often they expected me to pass on their concerns to the government officials or to help them out monetarily. It was evident that they were in need of money and having formed contracts with the company had further intensified their problems.

Prior to 2000, farmer suicides had not been reported in Chhattisgarh but by 2007 around 1593 suicides were reported. Chhattisgarh is known as the rice bowl of India where more than 200,000 varieties of rice are grown, however, off late the indigenous varieties are being replaced with Green Revolution varieties, and the state is also being targeted for the growth of Jatropha. Tribal farms are being appropriated for Jatropha plantations, wastelands are being diverted to grow Jatropha, and these are aggravating the food and livelihood crisis in Chhattisgarh. The fuel economy is being given more importance than the food economy (Shiva 2009). Shiva (2009) states:

The suicide economy of industrialized, globalised agriculture is suicidal at 3 levels - it is suicidal for farmers, it is suicidal for the poor who are derived food, and it is suicidal at the level of the human species as we destroy the natural capital of seed, biodiversity, soil and water on which our biological survival depends.
8.5.5 Positives effects of the NMB

The previous sections have highlighted the consequences of the NMB on the rural farmer and labourers and it was emphasised that the pro-poor development initiative did not cater to the interests of the rural poor. However, during fieldwork some of the rural users expressed some of the benefits associated with the NMB. Some village communities severed contacts with the NGOs and private companies and managed their own Jatropha plantations, while few individuals cultivated Jatropha as their own business opportunity and benefitted from it. Tenner (1996) has emphasised a phenomenon he termed “reverse revenge effects” and said unexpected benefits can also emerge from a technology when it is adopted differently, or used in unforeseen ways. Latour (1996) and Mosse (2005) reckon that actors in a project shape the manner in which it proceeds, the following section will emphasise how an individual actor, and a particular community shaped the technology (initiative) to benefit from it.

During fieldwork carried out in Chhattisgarh the majority of the users expressed dissent at their land being used for Jatropha cultivation. According to Pfaffenberger (1992) a technology is accepted if it can easily fit in to the existing system or new activity system, and one man in Chhattisgarh benefited from the NMB by fitting Jatropha plantations in to his existing system of activity. Chamar Singh Patel was a poor farmer who took a loan of ₹5000 (£50) and moved from his village to Basna district of Chhattisgarh hoping he would be able to earn more money in a district in comparison to his village. He did not own any land of his own, hence he leased land and cultivated saplings i.e he set up nurseries of plants that were in demand. He normally planted mango, jackfruit, guava, jamun, chikoo, chillies, and ginger and had experience in maintaining nurseries, and after few months he sold the saplings to the larger farmers.

Despite being in the business of maintaining nurseries he did not make sufficient money because of the level of competition from farmers who had larger nurseries, and also he did own any land of his own and had to rent land. In the year 2000 he
first heard about Jatropha and its benefits; and when A.P.J Kalam visited Chhattisgarh and spoke about its essential qualities and viability he was keen to plant Jatropha. Chamar Singh Patel did not follow the other farmers and plant Jatropha to sell the seeds; he accommodated the technology in to his existing system of nursery plantations. He invested in nurseries of Jatropha and sold the saplings within three to six months. None of the other farmers were doing the same thing and while they waited for three years for the plant to yield seeds, Chamar Singh said he sold the saplings to farmers, biofuel companies, and research labs. The farmers bought saplings from him because most of the time many of the seeds were of bad quality and did not grow, whereas buying saplings was a safer mode; biofuel companies preferred saplings so that they could directly plant them in the tilled soil, and research labs preferred saplings because they could study the growth characteristics in a shorter time period.

In 2005 he raised 25 lakh plants, by 2006 it had increased to 1 crore plants, and by 2007-2008 he had more than 2 crore plants and the demand was increasing. In the span of three years not only did he return the loan amount he borrowed when had left his village, he bought his own land, set up his own nursery called ‘Patel nursery’, and he even bought two ambulances and donated it to the nearby hospital. To prove how well his business was doing he ensured that I had lunch with him in the best dhaba\textsuperscript{30} in their district and he paid for it. Even though he has earned a lot of money from Jatropha he still raises nurseries of other edible crops along with Jatropha and employs adivasi women and pays them regularly.

While Chamar Singh Patel’s experience revolves around one person, an entire village community in Vidarba region cancelled their contracts with Mission Biofuels Ltd and are using Jatropha for various purposes in their village. The village community members said they had been cheated by the company and the local NGO which promised them of loans and profits from the buyback of seeds. Hence, the

\textsuperscript{30} Dhaba is a road side restaurant found on highways in India
Panchayat members of Vinobha village decided they would use the Jatropha plantations for the village instead of waiting for buyers. They harvested the Jatropha seeds and extracted oil from it and used this oil to run their village Jeep. They said they initially added 20% biodiesel to their Jeep and slowly they started adding 50% biodiesel in their Jeep. The Jeep is used for various activities of the village and now the cost to run it has decreased and more people are able to afford to rent the Jeep. They said that the only problem they were having with the Jeep was that by using such high percentage of biodiesel that was not purified the motor of the Jeep had to be replaced every six months. However, they claimed the motor cost only ₹200 (£2) and it was much cheaper to replace the motor at a regular interval than run the Jeep only on diesel. They were also planning to use the biodiesel from Jatropha to run their water pumps and were waiting for their next harvest. Hence in Vinobha, the production of biodiesel from Jatropha and its use was managed by the people of the village.

These two representations did not paint the NMB as a successful initiative but rather it portrayed how the actors in the biodiesel network adopted and used the technology/initiative differently to align with their uses and interests.

8.6 The End of the NMB
Mosse (2004, p.662) states “success and failure are policy-oriented judgements that obscure project effects”. From the discussion in this chapter it is evident that certain actors (policy-makers, bureaucrats, officials from private companies) in the biofuel network painted the NMB as a successful initiative, while other actors (rural farmers, landless labourers, civil organisations) painted it as a failure. The discussion also pointed that even if the NMB did not articulate the conceived models or outcomes, it still had important positive livelihood effects for few actors. Smith (2009) argues the success or failure of a technology is not a matter of having sufficient knowledge to decide how to implement or use it; rather it is a complex working out of risk, opportunities, and costs. He further adds that:
Technologies are not transferred from laboratory to field; their adoption, refinement and innovation are rather the result of complex interactions between different knowledge bases and perspectives, and linkages between different actors and organizations, all bound up in shifting contexts of risk, benefit, constraint and utility (Smith 2009, p.72-73).

As stated earlier, according to Mosse (2004, 2005) and Latour (1996) the success of a project or technology arises from their ability to recruit actors that will support it, and enrol more actors. Chapter 6 traced the creation of networks of actors at the central and state level that supported the initiative and promoted it in India. The thesis has highlighted how these networks played an important role in popularising the NMB and promoting its adoption across the states. Despite the support of networks, once the NMB was implemented at the ground level, it was evident from the discussion in this chapter that interests of the rural actors were not taken in to account and hence they labelled the NMB as an anti-poor initiative.

Robert Chambers in his book *Whose Reality Counts?* expresses that “poor people’s reality [are] local, complex, diverse dynamic and unpredictable” (Chambers 1997, p162). He stresses that development policy, projects, or technological interventions should be participatory, bottom up, community driven or even indigenous (Chambers 1983, 1997, Chambers et al. 1989). However, Mosse (1999, 2004) and Sundar (2000) contend that ‘community’, ‘indigenous’, ‘local knowledge’, ‘people’s planning’ are categories that promise to counter top-down technocratic approaches and unlock the power of decision-making in development for the poor, but they are actually misleading counterfeits, that have made the bureaucrats more powerful.

In Chapter 6 and 8 I highlighted the role of NGOs in the deliberation and the adoption of the NMB. The government officials interviewed and the Planning Commission’s Report (GoI 2003) highlights the role of NGOs in the planning processes of the NMB. The key government officials, technocrats, and policy-makers said that they included representatives from the NGOs so that they would incorporate and represent the needs of the local people. However from the discussion in this
thesis, it is evident the even though the NMB wanted to cast a picture of bottom-up management, it was more of a top-down development initiative.

Agarwal (1995) argues that initially indigenous knowledge was viewed as an obstruction in the path of development, but off late indigenous knowledge is being distinguished as something to be explored and applied, to enhance development and adoption of new technologies across varying social groups (Agarwal 1995). While the acceptance of the importance of indigenous knowledge has reflected a shift from the theories of development and emphasised the importance of local knowledge, it does not involve the outright inclusion of the rural people in decision-making. It has rather embraced the role of NGOs and local bodies to undertake development activities (Leach and Scoones 2006, Smith 2009).

The discussion in this chapter revealed how the various actors represented the outcomes of the NMB. From the representations of the rural actors it was evident that their opinion was not sought while formulating the NMB. If the key actors would have included the local people in the planning process, they would have realised that the so called wastelands are actually CPRs that the local people rely on. They would have also formed direct and better linkages with the rural actors and would have prevented the private companies from forming unfair contracts with the local people.

Despite the varying and contested representations of the various actors, the GoI decided to take the initiative a step further. The GoI of India scrapped the NMB prior to the second phase which was a self-expansion phase of the activities of the NMB. It introduced the Biofuel Policy in India that targets a blending of 20 % bioethanol and biodiesel by 2017.

**8.7 Conclusions**

The empirical evidence in this chapter revealed how the outcomes of the NMB were represented by the various actors in the biodiesel network. The chapter distinguished how the outcomes were portrayed by the government officials, representatives of private companies and NGOs, and the rural users. This chapter discussed the
consequences of the NMB across the three research case studies and it highlighted the manner in which it affected the rural users (landless labourers and farmers).

The chapter contributed to the discussion in chapter 5 to prove that the wasteland narrative was based on unreliable facts and in fact the diversion of CPRs as wastelands resulted in families being displaced. The chapter traced the role of state government officials in commencing large scale cultivation of Jatropha on government owned land termed wastelands and large areas in the forests. The chapter also highlighted the role of private companies as actors in the biodiesel network in setting up contracts and commencing large scale cultivation of Jatropha. The discussion also focused on how the NGOs actively encouraged the promotion of NMB initially and the steps taken by them to promote the cultivation of Jatropha.

The first half of this chapter focused on how the policy-makers, bureaucrats, officials from private companies and NGOs supported the pro-poor and pro-wasteland narratives of the NMB and actively encouraged the plantation of Jatropha. The second half of this chapter focused on the consequences of the NMB from the perspective of the rural users adopting it. It explained how the wastelands were actually CPRs and their diversion to cultivate Jatropha was displacing families and deepening poverty in the rural areas. The rural users explained the mode of contract farming between them and private companies and how they had been treated in an unjust manner. The discussion emphasised how the farmers debt situation was exacerbated and in turn how they had to sell parts of their land which resulted in land grabbing by private companies. The discussion also traced the impact of the NMB on women and how they now had to walk deeper in to the forest to collect wood and graze their cattle as they could no longer access their CPRs. This chapter also focused on some of the observed positive impacts of the NMB.

The various representations of the outcomes of the NMB presented in this chapter provide an insight in to what Edward Tenner (1996) called the “revenge effects” of a technology. He notes that a technology alone does not produce a revenge effect, rather when the technology is anchored in to our laws and regulations, customs and
habits, that the irony reaches its full potential. The findings in this chapter have discussed the unintended consequences of the NMB from the perspective of the rural users and have proven they were possible because of the continued support of the government officials and policy-makers towards the NMB and its unreliable pro-poor, wasteland and miracle crop Jatropha narratives.

Tenner (1996) has also emphasised a phenomenon he termed “reverse revenge effects” and said unexpected benefits can also emerge from a technology when it is adopted differently, or used in unforeseen ways. This is what happened when Chamar Singh Patel chose to grow Jatropha as saplings and not to harvest the oilseeds. He shaped the cultivation of Jatropha to fit his existing pattern of nursery plantations and benefitted from it. Similarly the inhabitants of Vinobha village produced their own bio-diesel to run their Jeep while Winrock International used the biodiesel in their model village to electrify the village. Tenner (1996) contends these reverse effects should be monitored because they offer examples of benefits derived from the complexity of the world’s mechanisms. However, he says that these small cases of success stories will be overlooked by development practitioners who search for specific transformations that lead to “ideal” forms of social and economic order.
Chapter 9: Conclusions

9.1 Thesis Review

This thesis has examined the emergence, progress and consequences of a rural development initiative in India, the National Mission on Biodiesel (NMB). The NMB was not introduced as a policy rather it was developed as a policy option and introduced in a mission (test) mode. This thesis analysed how this test mission was developed, how it was supported by the policy-makers, how it was adopted as a policy mission across India and ultimately were its consequences beneficial enough to result in the introduction of a Biofuel Policy in India.

At the outset of the thesis I discussed the rise of biofuels and biofuel policies world over and how many developed and developing countries had either formed or were introducing biofuel policies, mandates, and missions. Biofuels were important not only as a source of renewable energy but also as a solution to address rural development issues. The GoI was supporting biofuels to address energy security, rural development, climate and environment mitigation, and trade concerns. To analyse the emergence of the NMB as a test model for a biofuel policy it was necessary to focus on the policy-making structure in India. Chapter 2 introduced the role of science and expertise in policy-making in India and the special status of technocrats in policy-making in India.

To unpack the policy-processes which resulted in the NMB being introduced as rural development initiative my first research theme focused on the role of narratives in development policy-making. The discussion on narratives emphasised the importance of narratives in policy-making and how they are used by policy-makers to simplify complex development problems and often lead to blueprint development. In Chapter 5, I listed the global narratives supporting the development of biofuels and how these narratives played an important part in the emergence of local biofuel narratives across different countries and in turn encouraged the hasty creation of biofuel policies, mandates, and missions. The chapter highlighted how the national biodiesel narratives while being influenced by the global narratives displayed
regional characteristics specific to India’s goals to produce biodiesel. The chapter focused on the creation of pro-poor, pro-wasteland, and pro-Jatropha narratives that supported the introduction of biodiesel production in India. I argue that policy-makers, bureaucrats and technocrats use narratives to promote development policies without checking the accuracy of these narratives. Often narratives are based on shaky facts and data, the discussion in Chapter 5 proved that the biodiesel narratives in India were not backed by reliable data and statistics. Additionally the biodiesel narratives misrepresented the needs of the rural poor by labelling their common lands as wastelands.

The literature on biofuels focuses on the emergence of a global biofuel integrated complex (GIBN), biofuel assemblage, and biofuel complex (Mol 2007, Borras et al. 2010, Smith 2010). It is argued that biofuels spread globally because of the creation of biofuel networks that spread the global biofuel narratives and in turn supported the creation and promotion of biofuel policies. In this thesis I use the framework of networks to explain the creation of a policy network that supported the introduction of the NMB as a policy option in India. I further argue that the literature on biofuel networks touch upon the importance of regional networks but there is a gap in the literature on the importance of these regional networks. I contend that sufficient research has not been done on the types of regional networks and hence this thesis focuses on the three types of regional networks that played a key role in the adoption and promotion of the NMB across India. In chapter 6, I focus on the creation of the policy-network at the central level, I draw from Mosse, Latour, Callon, and Law’s work to emphasise the importance of networks in policy-making and in extending development projects. Research theme 2 in Chapter 3 introduced the literature on networks, role of policy-networks and how actors form successful alliances to take a project forward. Chapter 3 also introduced the terminology used in ANT. I draw from ANT to explain the creation of the national and regional networks in chapter 6.

Chapter 6 after discussing the creation of the central policy-network, role of technocrats and policy entrepreneurs then focuses on the three types of regional networks. It discusses the creation of a government-led network, research

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organisation-led network, and a private company-NGO led network, it lists the types of actors in these networks, how they extended these networks by enrolling more actors and in turn how these networks played an important role in the adoption of the NMB across the three states.

The third research theme focuses on the social nature of introducing a new initiative and its adoption. It draws from SCOT and anthropology of technology to emphasise the importance of actors promoting and adopting the NMB. Chapter 3 introduced the literature on SCOT and anthropology of technology to highlight why it is important to analyse social practices and behaviours of the various actors particularly rural farmers and landless labourers who adopted the NMB. One of the aims of this thesis was to address the rural development potential of the NMB and hence this thesis focuses on the rural farmers and labourers who cultivated Jatropha under the NMB. In chapter 7, I introduced the rural users- farmers and landless labourers across the three research case studies and discussed how and why they cultivated Jatropha. The analysis focused on the two types of rural users involved in the cultivation of Jatropha in Chhattisgarh, Tamil Nadu, and Maharashtra. It revealed the varying cultural associations, practices, and tacit meanings among the users in each site, and how they associated with the rural development initiative. Chapter 7 reveals how the rural users across the three states formed different types of linkages with the actors in their networks and how the NMB and the cultivation of Jatropha were associated with varying interpretations.

Ultimately to analyse how the NMB performed as a test policy option, in Chapter 8 I discussed the outcomes of the NMB. As this thesis draws from SCOT I revealed the outcomes from the viewpoint of various actors such as government officials, private companies, NGOs, rural farmers, and labourers. Chapter 8 highlighted how the NMB, its progress and outcomes were represented differently by the various actors involved in the biodiesel network. Government officials and representatives from private companies insisted on the viability of the pro-poor narrative of the NMB and actively encouraged the NMB. They further advocated the wasteland narrative and allocated these so called wastelands for the cultivation of Jatropha. The GoI also
leased wastelands to the private companies to grow Jatropha. While the government officials, policy-makers, and private companies represented the NMB as a successful initiative, the rural farmers and labourers expressed the opposite. They spoke about the unfair contract farming model between the private companies, the diversion of their common lands to grow Jatropha, and land grabbing by private companies. They said that the NMB was displacing them from their common land, promoting unfair contracts, and in turn augmenting their financial burden. Hence they felt that the NMB was more of an anti-poor initiative rather than a pro-poor initiative.

Chapter 8 also revealed some of the positive effects of the NMB; it showed how certain companies and NGOs had used Jatropha to electrify a rural village and power mobile towers. It explained how certain individuals and communities had prospered from setting up a Jatropha nursery, and by using Jatropha to power a jeep in their village. Despite these few positive recommendations the NMB was not successful as a rural development initiative. The NMB did not represent the needs of the rural people adopting it and many people raised their voice against this initiative (Lahiri 2008) and refused to cultivate Jatropha. Ultimately the GoI scrapped the NMB in 2008 and introduced the Policy on Biofuels.

9.2 From the National Mission on Biodiesel to the National Policy on Biofuels

This thesis has traced the emergence of the NMB, revealed the policy-making processes, creation of national and regional networks, and how the development initiative was represented by the various actors in the biodiesel network. The discussion in the thesis has pointed to varying representations of the users’ adopting the biodiesel initiative; and the actors said that the underlying premises upon which the NMB was articulated were contested. The NMB was promoted as a ‘pro-poor’ development initiative that would utilise ‘wastelands’, to cultivate the ‘miracle’ crop Jatropha curcas that would be used for the production of biodiesel.

The rural users and actors from civil organisations contested the ‘pro-poor’ claim of the initiative and argued that this mission was exploiting the rights of the poor
people. They complained that private companies formed unfair contracts and the government officials did nothing to safe-guard their interests. The next major concern was the issue of land grabbing; many private companies had tricked the rural users and taken away their land. Hence, the very notion of the NMB being a development initiative was questioned.

The use of the term ‘wastelands’ was ambiguous, on one hand the government officials and policy-makers maintained that these lands were unused, uneconomic dry lands, on the other hand the rural actors said these CPRs were used by them as a source of subsistence. Similarly it was claimed that Jatropha was a hardy crop that could grow on dry land, was pest resistant, and did not require irrigation or fertilisers. The views of certain researcher (TNAU) and rural users differed, they said the yield rate of the plant varied drastically when it was grown on good arable land, with inputs of water and fertiliser, and it also required pesticides.

These tensions in the varying representations of the NMB by the different actors in the biodiesel network affected the progress of the initiative. Latour alleges that:

> If success depends upon extending networks and enrolling more and bigger people and their interests, failure is produced by the cascading effect of individuals disconnecting the fate of their ambitions from the fate of a project: a form of ‘decontextualisation’ in which a project has fewer and fewer pots and pans tied to its tail; it makes a smaller noise and awakens fewer people of less importance (Latour 1996, cited in Mosse 2005, p.184).

The narratives backing the NMB were contested by the rural users adopting the initiative and many of them refused to cooperate and align with the mission. In 2008 when the second phase of the NMB should have started a government official representing a group of ministers (GoM) said “The GoM has recommended that the national mission on biodiesel of the ministry of rural development need not be pursued further” (Dey and Jayaswal 2008). According to the actors interviewed at the official level “policy makers developed cold feet fearing land-grabbing by corporates in the disguise of biofuel plantation” (ibid.). As the initiative did not

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gather enough support to sustain it for a prolonged period of time the initiative was given “a quiet burial” (ibid.).

The GoI scrapped the biodiesel mission in 2008; but it approved the draft of a biofuel policy prepared by the ministry of new and renewable energy (MNRE) in September 2008, and passed the National Biofuel Policy in December 2009 (Business Standard 25 December 2009).

The Goal of the Policy is to ensure that a minimum level of biofuels become readily available in the market to meet the demand at any given time. An indicative target of 20% blending of biofuels, both for bio-diesel and bio-ethanol, by 2017 is proposed (GoI 2009, p.4).

This policy is backed by the National Biofuel Coordination Committee which is headed by the Prime Minister of India and it also comprises a Biofuel Steering Committee chaired by the cabinet secretary to oversee the implementation of the policy (ibid.). The policy states that

The Indian approach to biofuels… is based solely on non-food feedstocks to be raised on degraded or wastelands that are not suited to agriculture, thus avoiding a possible conflict of fuel vs. food security (GoI 2009, p.3-4).

Despite the contestations on the use of the term wasteland, the biofuel policy also incorporates the cultivation of feedstock on degraded wastelands. The national biofuel policy does not promote the growth of Jatropha; instead it focuses on the cultivation of non-edible oilseeds but does not name any particular feedstock. Various actors have said that the new policy has taken in to account some of the drawbacks of the NMB but has not reviewed the major challenges and problems of the NMB. Hence the policy has immediately come under scrutiny, with suggestions that it fails to address the competing renewable energy agendas of the energy and agricultural ministries (Lane 2008).
How the National Biofuel Policy will span out in India, and how it will affect the rural users is beyond the scope of this research, my research instead focused on the NMB which is considered as one of the precursors to the National Biofuel Policy.

9.3 Issues Raised
9.3.1 Reliability of Narratives
This thesis has drawn from Clay and Schaffer (1984), Roe (1991, 1994), Leach and Mearns (1996), Sutton (1999), Fairhead and Leach (1997), Keeley and Scoones 2003, and Feldman et al. (2004) to demonstrate the importance of narratives in development policy-making. In this thesis I have argued that narratives are created and promoted by policy-makers and policy-networks and they often tend to serve the interests of these epistemic communities, and in the process reduce the role of indigenous groups by justifying the role of experts and outsiders in the policy process. Roe (1994) reckons that experts feel that local people do not have the sufficient knowledge to manage their resources and hence they need the help of development practitioners. Sutton (1999, p.28) further adds that development narratives marginalise the interests of indigenous groups by “labelling and categorising them” and tend to conceive the target groups as “passive objects of policy rather than as active subjects”, this has been referred to as the ‘disarming of labelling’.

In this thesis I drew from the work of the above mentioned scholars to extend my analysis on the reliability of the biodiesel narratives in India. I argued that the pro-poor, pro-wasteland, and miracle properties of Jatropha narratives were flawed. The thesis revealed how these narratives misrepresented the needs of the local people and resulted in the diversion of their common lands for the cultivation of Jatropha. While the aim of this thesis was to contend the reliability of the biodiesel narratives in India, it can be argued that a range of development policies in India still use unreliable narratives to solve complex development problems and in turn misrepresent the needs of the rural people. For example, despite the debates on the
use of so called wastelands for the cultivation of Jatropha, the new Biofuel Policy also encourages the cultivation of feedstock on degraded wastelands.

9.3.1.1 Rise of Counternarratives

Roe and Eeten (2004) say that there are ways to change policy narratives. One is to “critique the narrative of interest, that is, criticize its arguments and storyline by finding its points empirically unfounded or implausible”. However they contend that critiquing narratives cannot stabilise decision making, and instead they promote the use of counternarratives, i.e., “scenarios or arguments that people find more convincing than the policy narrative critiqued” (ibid. p.37). Roe (1999, p.17) argues that critiquing narratives “increases uncertainty by undermining an existing development narrative without at the same time providing an alternative to take its place”. He argues that the limitation of denarrativization is the absence coming up with an alternate development narrative. Roe and Eeten (2004) discus two important environmental counternarratives against globalisation in their paper and say that these counternarratives can solve complex environmental policy situations in a better manner.

I disagree with their view on the role of counternarratives especially with respect to the biofuel policy in India. In this thesis I have contested the reliability of the wasteland and miracle properties of Jatropha narratives and argued that these narratives were not backed by scientific data and were rather misleading. When the NMB was scrapped and the Biofuel Policy was introduced there was no mention of Jatropha as a feedstock for the production of biodiesel. It is evident that the GoI was criticised for promoting Jatropha prior to developing an appropriate germplasm, and also Jatropha did not live up to the claims of being able to grow on dry degraded soil, being pest resistant and requiring minimum inputs of irrigation and fertilisers. The GoI of India came up with a new counternarrative and promoted *Pongamia pinnata* for the production of biodiesel. It can be argued that sufficient research has not been done by GoI on this feedstock too and hence the Biofuel Policy has still not been promoted or adopted actively in India.
Hence the issue here is not only about critiquing narratives and how they lead to blueprint development. I also contend that counternarratives can be equally misleading and continue misrepresenting the needs of the people. This issue of narratives and counternarratives masking the needs of the rural people can be used to analyse other renewable or rural development policies in India.

9.3.2 Role of Networks and Policy Entrepreneurs/Technocrats

The second research theme of this thesis focused on the role of networks, policy-networks in the policy-making and in promoting the adoption of the NMB in India. I drew from Keeley and Scoones’s (1999) analysis to express that policy networks incorporate a variety of government agencies, key legislators, pressure groups, relevant business and industry representatives, consultants and policy analysts and journalists, through which policies are forged. I emphasised on the importance of policy entrepreneurs as actors in extending a research project or development initiative. The thesis drew from ANT to prove that actors in a network need to recruit new actors who will align with them and take the initiative forward. My work drew a lot from Mosse’s work on development policies in India and he argues that (2004, p.645) “development schemes cannot be imposed; it requires collaboration and compromise”. Using ANT and Mosse’s framework I contended that the NMB was developed as a policy option because of the collaboration of the actors in the policy-network, and this initiative spread across India because of the setting up of regional networks and the collaboration of actors in these networks.

Despite drawing from ANT and Mosse’s work to extend my analysis of the role of networks and actors in development policies and initiatives I feel that there is a gap in the framework. According to ANT actors deliberate on issues until consensus is reached and Mosse speaks about compromise and maintaining political support. However in this thesis it is evident that the technocrats were the key actors in the policy network and instead of collaborating with the actors they used their status, power to silence the voices of other actors. Similarly across the regional networks the farmers and landless labourers were introduced as actors in these networks but their
views were not sought, rather they were either forced, manipulated, or lured by
government officials, and officials from private companies and NGOs. Hence the
technocrats were too powerful in the policy-networks and the rural users were not
treated as equal actors in the biodiesel network.

9.3.2.1 Critique of Technocracy
The concept of technocracy envisions a society guided by technical elites, who abide
by the rules of scientific and technical rationality. It assumes a sequential policy-
making process, guided by the neutral, objective, and rational advice of experts
(Fischer 1990). It is thought that ‘expertise’ and ‘politics’ are separate entities
existing in their own realms and are untouched by each other. However the
discussion in this thesis has shown that technocrats acted as policy entrepreneurs and
actively encouraged the NMB without checking the validity of the biodiesel
narratives.

Bucchi (2009) says that there is a conflict among technical-scientific experts, policy-
makers, business lobbyists, and citizens, which affects the decision making process.
Few questions raised by Bucchi are:

Are we witnessing a radical clash between science and society? How have we come to this pass? Are our institutions – from political to scientific – capable of meeting the challenges raised by research and technological innovation? Are citizens sufficiently well informed to discuss them? What scenarios await us in the future? What responses and strategies can help decision makers tackle these issues? In short, how can the increasing need to take decisions on highly complex technical-scientific matters be reconciled with rights to democratic participation? (Bucchi 2009, p.ix).

Collins and Evans (2007) in their book on ‘Rethinking Expertise’ analyse the
meaning of expertise upon which the practice of science and technology rests. They
say that the privileged position attained by people who are experts in the field of
science and technology is because we prefer the judgments of those who “know what
they are talking about” (Collins and Evans 2007, p.2). However, they add that it does
not imply that these judgments are always correct. The discussion of the constitution

Conclusions
of the NMB has shown that the members of the Committee comprised senior officials, scientists, and policy-makers and that the technocrats were not insulated from the politics of policy-making in India. Dr Tewari took it upon himself to actively promote the goals of the NMB and he ensured that the other officials supported the NMB. His actions were further encouraged by the promotion of the NMB by the then President, Dr. Kalam. These technocrats were powerful not only for their expertise but for the positions they held. Similarly many other members of the primary policy network were selected not for their expertise but for their position and power to enrol more actors who would support the initiative.

Officials and scientists of high-ranking who were not included in the Committee on NMB clearly expressed that many of the members were chosen because of their position and association with certain groups of experts who were already part of the Committee. Their sentiments echoed that technocracy in policy-making in India does not only involve scientific and rational decision rather technocracy is steeped in politics in India. It has been argued that the expanse of technocracy has been changing and actors from the private sectors and NGOs have been incorporated in the policy-making process in India. From the constitution of the NMB it was seen that officials from private companies and NGOs were involved in the NMB but they did not have a say in the policy-making process, rather they were actors who actively promoted the biodiesel narratives to serve their interests. Hence the technocrats are still powerful in the policy-making realm in India and despite arguing that policies are decentralised and involve local planning they just tend to mask the real nature of technocratic top-down policy-making in India as seen with the case of the NMB.

9.3.2.2 Actor-Networks not just collaboration and compromise
This thesis discussed how policy-making occurs within social structures such as actor-networks; also referred to as policy communities, issue networks, or historically iron triangles (John 2012). I discussed how Latour and Callon through their ANT have emphasised a ‘sociology of association’ (Latour 2005) the main principle of which is to trace the multiple associations and translations between actors within networks. The actors enrol other actors and through moments of
translation and mobilisation they support specific initiatives, policies, or programmes. Yearley (2005, p.65) has critiqued ANT and argued that if scientific controversies are understood as trials of strength and proof of that strength is whether the alliance is victorious then the “procedure is manifestly circular”. Nevertheless, ANT allows description of the importance of allegiances and consensus building as a form of legitimisation, especially in policymaking, even if not entirely providing a theory determining causality.

Mosse (2004, p.645) expresses that success of a programme depends upon the active enrolment of supporters and adds that “development schemes cannot be imposed; it requires collaboration and compromise”. According to Latour (1996, p.78) the success of a policy or project arises from their “ability to continue to recruiting support”. Development projects need ‘interpretive communities’; that is they have to enrol a range of actors to participate in the project (Sayer 1994). Latour (1987, 1996, 2005) reckons that scientific facts, policy ideas, or projects are only as strong as the networks that uphold them. Hence all of them agree that networks are conducive for the introduction, promotion, and success of development projects, policies. I drew form their frameworks to express the importance of networks especially policy and state networks in the creation and promotion of the NMB. I argued that the NMB would not have progressed easily without the presence of regional networks that played a key role in popularising it and its uptake across various states in India. Hence it does imply that networks, the actors and their continual support is imperative for the existence of a development initiative.

However from the discussion in chapters 6, 7, 8 and it was evident that the state networks varied based upon the type of actors and the manner in which they promoted the NMB. ANT and the framework used by Mosse refer to the collaboration, compromise and translation of interests of actors in a network. In simpler words the actors are able to enrol more actors by negotiating with them such that they tie their interests with the policy/development initiative. However the NMB did exhibit negotiations different to what is seen under ANT. The rural actors (farmer and landless labourers) were also important actors in the biodiesel network especially

Conclusions
when the NMB was introduced as a rural development initiative. Hence it was necessary for the other actors i.e. government officials, bureaucrats, policy-makers, and officials from private companies and NGOs to enrol the rural actors into the biodiesel network. It was noticed that the enrolment of the rural actors was not done by tying or representing their interests in the NMB rather they were either ‘forced’, ‘manipulated’ or ‘lured’ into cultivating Jatropha. Hence these actors did not align their interests with the NMB rather they were forced to join the biodiesel network and cultivate Jatropha.

Hence I argue that the NMB was successful as an initiative not only because of the collaboration, comprise and negotiations between the key actors, rather is progressed across the states because of the power held by the key actors to force or manipulate the rural actors to cultivate Jatropha. This issue shows that the networks in India did not afford the same status to all the actors, and the rural actors’ needs were misrepresented and they were forced to grow Jatropha on their common land. This then raises the question whether a majority of the development programmes in India function in this manner, are the local people forced to adopt development schemes, policies that do not cater to their interests?

9.3.3 Risks of Biofuels
In 2009, John Beddington, Scientific Adviser to the UK Government, adopted the phrase ‘perfect storm’ to describe a future nexus of food, energy, and water security. He said by 2030 the demand for food and energy would have increased by 50% and for fresh water by 30%, which would result in the creation of a ‘perfect storm’ of global events (Beddington 2009). Science and technology can make a major contribution, by either alleviating Beddington’s storms or contributing to it, however, it is requisite to understand the complex contexts and processes that lead to new technologies, and assess whether these technologies will solve our challenges or exacerbate the risks (Smith 2010).

Science and technology has long been a major driver of global prosperity, and has helped meet the ever increasing demand for energy, food, and commodities.
However, to address the risks of energy, food, and water insecurity, developments in the field of science and technology have to be associated with policy initiatives. New technologies and initiatives have to be paired with the appropriate policy measures only then they can make a difference in the lives of the people. This thesis has pointed to how many countries the world over are trying to try solving their issues of energy insecurity by investing in energy production from renewable sources and it highlighted how among the varying options being explored, biofuels have emerged as a viable option (Mol 2007).

According to the UN Special Rapporteur on the Right to Food, biofuels have shifted from being seen as a “possible multi-purpose solution to a range of problems – climate change, energy insecurity and rural underdevelopment – to a ‘crime against humanity’” (cited in Smith 2010, p.3). Just as the development of biofuels as a technology spread globally by the creation of global assemblages the risks associated with the production of biofuels were also global. Biofuels have been in the limelight for the increase in food prices and land use changes. The large-scale increase in biofuel production in US and parts of EU resulted in an increase in the price of staple food crops the world over. Biofuels have also been criticised for resulting in land grabbing and land use changes (Mitchell 2008, Oxfam 2008).

Dauvergne and Neville (2009) argue the political economy of biofuels will result in sets of north-south and south-south relations. They allege these relationships will amplify existing power relations, and exacerbate the risks of biofuel production in poorer countries and entrench historical patterns of resource consumption and exploitation. Just as the NMB in India represented the needs of powerful actors and resulted in the formation of ties between high-level government officials and representatives from the industry, such linkages might form across other developing and lesser developed economies. Smith (2010, p.97) contends that “we are witnessing the emergence of a globalising, global biofuel assemblage” and new relationships are being forged by various actors in the biofuel networks, resulting in the new policies, pathways of biofuel production, and forms of land use.

Conclusions
This thesis has focused on how the risks of biodiesel production in India manifested in the form of unfair contract-farming, land grabbing, diversion of Common Property Resources (CPRs) for the cultivation of Jatropha, and farmer suicides. Similarly the risks of producing biofuels across other countries, especially less developed countries will manifest faster due to the globalisation of biofuels and the risks associated with it. A varied range of risks have engulfed the debate on biofuel controversies. One of the controversies relates to the interaction of biofuel production with the food system and poor in developing countries (Mol 2010). It can lead to large-scale monocropping on good arable land and may impact strongly on food supply, food prices, food scarcity and with that social stability, as witnessed in 2008 (IMF 2008).

Mol (2010) warns that there is also the danger that the poorest developing countries will become biomass-, rather than biofuel-exporting regions. To produce large quantities of biomass many companies are investing in India and Africa and these large energy plantations in developing countries can “affect land availability and thus income sources for small farmers and indigenous people” (ibid., p66). Mol further questions “whose land will be turned into energy plantations, under what kind of arrangements and dependencies, and where the profits will go” (ibid., p.66).

Ultimately, “Biofuels risk generating not energy but a false sense of sustainability” (Smith 2010, p.130). The various forms of production of biofuels, claims to reduction in green house gases (GHG), different types of feedstocks, and environment sustainability are being debated along with the socio-economic effects of producing biofuels (Mol 2010). In addition to these risks associated with biofuels Smith argues biofuels tend to project a false sense of sustainability, they do not encourage the conservation of energy rather they promote the idea of over-use as biofuels can supply a steady source of energy. Various technological and social risks have been identified with the use of biofuels, and this thesis has highlighted few of the issues. It focused on the low yield rates of Jatropha attributed to the lack of research on the appropriate genotypes, it highlighted how the users were not aware of the pruning practices. The research pointed out that Jatropha is not resistant to pests and also the yield rates are dismal without inputs of irrigation and fertilisers. The

Conclusions
thesis also revealed the socials risks of contract farming, use of wastelands, displacement of farmers, and farmer suicides associated with biofuel production.

9.4 Conclusions

I have outlined above a review of my thesis findings, together with a number of issues and areas of future research that have developed out of my research. This thesis aimed to contribute to several bodies of literature. The discussion on narratives, how they lead to blueprint development and the discussion on the reliability of narratives and counternarratives with respect to biofuels in India adds to the literature on development studies and policy-making. This thesis also added to the literature on policy-making by unpicking the policy processes of the NMB and this can also be used to analyse how other renewable policies are formed in India. The regional networks analysed in this thesis added to the gap in literature on biofuels networks and also contributed to the empirical data on biofuels. The discussion on policy networks and regional networks while contributing to the literature on policy-making, and biofuel networks also contributes to STS literature and anthropology of technology. The thesis also explained how and why users adopt a particular initiative based on their social culture, practices and meanings they associate with a particular initiative.

This thesis added a qualitative account to the emerging knowledge base on biofuels. The majority of the work done at the start of this research was directed towards qualitative data collection, and this thesis has presented a qualitative account of the NMB in India. While adding to the qualitative database on biofuels, this thesis has also contributed to literature in the field of science and technology studies, development studies, anthropology of technology, and policy-making.
Bibliography


Bibliography
From Green Revolution to Green Gold: The Evolution of the Indian National Mission on Biodiesel


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Mission on Biodiesel


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Bibliography


Appendix 1: General Questionnaire (rural areas)

Few general questions pertaining to Bioenergy Crop Cultivation
1. From whom did you hear about Jatropha / Pongamia?
2. Why are you cultivating Jatropha?
3. From where did you get the seeds?
3. What is the cost of seeds?
4. On what quality of soil are Jatropha / Pongamia being cultivated?
5. What are the irrigation/fertiliser requirements?
6. Are there any NGOs / Government Agencies / Private bodies involved?
7. What is the yield till now?
8. What are your expectations from this crop?
9. Have you received any benefits – if any what are they?
10. Are you able to market the goods?
11. Have you had any problems/experiences – good or bad till now?
## Appendix 2: List of Informants

<table>
<thead>
<tr>
<th>Name</th>
<th>Organisation</th>
</tr>
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<tbody>
<tr>
<td>Anon 1</td>
<td>ICAR</td>
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<td>Anon 2</td>
<td>Ministry of Environment &amp; Forests</td>
</tr>
<tr>
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<td>MNRES</td>
</tr>
<tr>
<td>Anon 4</td>
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</tr>
<tr>
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</tr>
<tr>
<td>Anon 6</td>
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</tr>
<tr>
<td>Anon 7</td>
<td>Vanaraimman Sugars</td>
</tr>
<tr>
<td>Alagarsamy</td>
<td>MGR Biodiesel</td>
</tr>
<tr>
<td>Arvind Reddy</td>
<td>Winrock International India</td>
</tr>
<tr>
<td>Dr. Balasubramaniam</td>
<td>TNAU/MSSRF</td>
</tr>
<tr>
<td>Chamar Singh Patel</td>
<td>Patel Nursery</td>
</tr>
<tr>
<td>Deepak Patil</td>
<td>University of Pune</td>
</tr>
<tr>
<td>Gupta, J.L.</td>
<td>CBDA</td>
</tr>
<tr>
<td>Dr. Jude Sudhagar</td>
<td>TNAU</td>
</tr>
<tr>
<td>Kanakaraj</td>
<td>Ahimsa NGO</td>
</tr>
<tr>
<td>Murali Kamte</td>
<td>Purandhar Agrofuels</td>
</tr>
<tr>
<td>Dr. K. Nelson Navamoniraj</td>
<td>TNAU</td>
</tr>
<tr>
<td>Dr. Oliver</td>
<td>Biofuel Ltd/Ahimsa</td>
</tr>
<tr>
<td>Preeti Kaur</td>
<td>CBDA</td>
</tr>
<tr>
<td>Dr Rajnesh</td>
<td>Purandhar Agrofuels</td>
</tr>
<tr>
<td>Prof. Ravindranath</td>
<td>Indian Institute of Science</td>
</tr>
<tr>
<td>Jadhav</td>
<td>Nandan Biomatrix Ltd</td>
</tr>
<tr>
<td>Ravi</td>
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<td>Sagun Saxena</td>
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<tr>
<td>Sashank Verma</td>
<td>Clean Star Trust</td>
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<td>Shyam Motwani</td>
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<td>Shri. Shukla, S.K.</td>
<td>CBDA</td>
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<td>Prof. Venkatachalam</td>
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# Appendix 3: Group Interviews

<table>
<thead>
<tr>
<th>Group Name</th>
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<tbody>
<tr>
<td>Farmers (men) cultivating Jatropha</td>
<td>Coimbatore-TNAU</td>
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<td>Farmers (women) cultivating Jatropha</td>
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<td>Men cultivating Jatropha</td>
<td>Odanthurai-individual</td>
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<td>Women cultivating Jatropha (pat-time)</td>
<td>Odanthurai- self help groups</td>
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<td>Farmers cultivating Jatropha</td>
<td>Pune-Purandhar agrofuels</td>
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<td>Men and women (farmers and labourers) cultivating Jatropha</td>
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<td>Men intercropping Jatropha with other crops</td>
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<td>Women harvesting Jatropha</td>
<td>Jalgaon-self help group</td>
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<td>Farmer and Labourers involved in block plantations of Jatropha</td>
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<td>Women involved in nursery plantations</td>
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<td>Farmer and Labourers involved in roadside plantations</td>
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### Appendix 4: Members of the Committee on the Development of Biofuels

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<tr>
<th>Post</th>
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<tbody>
<tr>
<td>Principal Adviser</td>
<td>Planning Commission</td>
<td>Member-Secretary</td>
</tr>
<tr>
<td>Secretary</td>
<td>Ministry of Finance, New Delhi</td>
<td>Member</td>
</tr>
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<td>Secretary</td>
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<td>Ministry of Surface Transport, New Delhi</td>
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<tr>
<td>Secretary</td>
<td>Ministry of Petroleum &amp; Natural Gas, New Delhi</td>
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<td>Ministry of Environment &amp; Forests, New Delhi</td>
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</tr>
<tr>
<td>Director General</td>
<td>Council of Scientific and Industrial Research</td>
<td>Member</td>
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<tr>
<td>Director</td>
<td>Indian Institute of Petroleum, Dehradun</td>
<td>Member</td>
</tr>
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<td>Director General</td>
<td>Indian Council of Agricultural Research, New Delhi</td>
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<td>Indian Council of Forestry Research &amp; Education, Dehradun</td>
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<tr>
<td>Director General</td>
<td>Bureau of Indian Standards, New Delhi</td>
<td>Member</td>
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Appendix 5: Members of the Coordination Committee

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<tr>
<td>Deputy Chairman, Planning Commission</td>
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<tr>
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<tr>
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<td>Minister of Railways</td>
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<td>Minister (In-charge) of Department of Consumer Affairs</td>
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<tr>
<td>Minister of Information &amp; Broadcasting</td>
<td>Member</td>
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<tr>
<td>Secretary, Planning Commission</td>
<td>Member</td>
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<tr>
<td>Principal Adviser (E&amp;F), Planning Commission</td>
<td>Member Secretary</td>
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Appendix 6: Members of the Steering Committee

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<tr>
<td>Secretary, Department of Bio-Technology</td>
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<tr>
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<tr>
<td>Secretary, Ministry of Water Resources</td>
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<td>Secretary, Ministry of Finance &amp; Company Affairs</td>
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<td>Secretary, Ministry of Non-Conventional Energy Sources</td>
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<td>Secretary Information and Broadcasting</td>
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<td>Director General, Bureau of Indian Standards</td>
<td>Member</td>
</tr>
<tr>
<td>Adviser (E&amp;F), Planning Commission</td>
<td>Member Secretary</td>
</tr>
</tbody>
</table>
Appendix 7: Classification based on size of land holding of farmers’

<table>
<thead>
<tr>
<th>Category of holdings</th>
<th>Size of holding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marginal</td>
<td>Less than one hectare</td>
</tr>
<tr>
<td>Small</td>
<td>1to 2 hectares</td>
</tr>
<tr>
<td>Semi-medium</td>
<td>2 to 4 hectares</td>
</tr>
<tr>
<td>Medium</td>
<td>4 to 10 hectares</td>
</tr>
<tr>
<td>Large</td>
<td>More than ten hectares</td>
</tr>
</tbody>
</table>