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What ails India's biodiesel programme? ☆

Pradip Kumar Biswas, Sanjib Pohit *

National Institute of Science, Technology & Development Studies (CSIR), Room No. 10, NISTADS, Pusa Gate, Dr. K.S. Krishnan Marg, New Delhi 110012, India

HIGHLIGHTS

- Even after a decade of efforts in promoting biofuel, India's achievement does not augur well.
- Objective is to understand the factors behind tardy progress.
- Suggests policy remedies.

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ABSTRACT

With more than 95% of India's surface transport dependent on imported fossil fuel, India has made a concerted effort to promote biofuel. The newly announced biofuel policy of India stipulates a blending target of 20% for both bioethanol and biodiesel. In the case of biodiesel, complement to fossil fuel diesel, India's predominant transport fuel, this target is to be achieved by cultivating non-edible oil seed plants in wastelands and fallow land. In spite of best effort, very little progress has been made on the ground. As the result, the deadline for blending target of 20% for biodiesel has been postponed from 2011–2012 to 2006–2017. This paper makes an attempt to understand the factors behind the tardy progress in India's biodiesel scene and suggests policy remedies.

1. Introduction

At the outset, India is an energy deficit nation (ADB, 2011). The energy deficit is all the more pronounced in the liquid transportation fuels sector which faces two basic challenges, i.e. rising energy demand in the face of limited reserves and higher dependence on increasingly costlier imported crude oil. With more than 95% of India's surface transport dependent on petroleum products, the demand from transportation fuels is accelerating significantly concomitant with India's high economic growth (ADB, 2011).

With global demand and global energy prices likely to increase in the medium to the long term, its impacts on India's balance of payment would no doubt be adverse and could even affect her future development. This dismal energy prospect for India has forced her policy-makers to intensify their efforts to search for alternate fuel options. In this context, biofuel may offer alternative options for meeting part of India's energy needs.

India's approach to biofuel programme is characterised by a combination of pragmatism and novelty and within them high degree of ambitiousness. It is novel in the sense it did not rely on intensifying or extending the conventional agriculture, whether for ethanol production or for biodiesel production. By contrast, countries like Brazil, USA or Germany use food crops like sugarcane, corn, soybean, wheat and rapeseed for primary feedstock. This has immediate adverse impact on food availability. Therefore, there is a possibility that food price would rise (see Pohit et al., 2009). Also, their extra productions using more chemical fertilisers have adverse environmental effects. By contrast, India chose agricultural by-product like molasses (for ethanol) or tree borne oilseeds (TBOs) to be grown in wasteland (for biodiesel) as feedstock (Biswas et al., 2010). The production of TBO for feedstock in wasteland would lead to carbon sequestration and enrich the biomass of the soil. This may be contrasted with the palm oil feedstock production after clearing rainforest in the countries like Indonesia/Malaysia which has significant negative environmental effects.[1] Several factors such as availability of farm land, slow productivity growth in agriculture, increasing population pressure, the risk of food shortage and consequential price rise have led the policy-makers to adopt this pragmatic approach. However, India's biofuel programme relied more heavily on promoting biodiesel production and feedstock thereof than on ethanol as diesel is the principal fuel used for transport sector in India.

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* Corresponding author. Tel.: +91 11 2584 3011; fax: +91 11 2584 6640.
E-mail addresses: pkbiswas63@hotmail.com (P. Kumar Biswas), spohit@gmail.com, spohit@nistads.res.in (S. Pohit).

[1] Substantial areas of rainforests are diverted into agricultural land for biofuel production. CO_2 emissions increase substantially as the biomass and soil in rainforests store large amounts of CO_2 (Ernsting, 2007, p. 5).

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Indian policy-makers searched for several oleic seeds bearing plants grown in the wild which can be cultivated in wastelands and unproductive or low quality fallow lands. Out of these, jatropha, and to a small extent pongamia, was selected for the production of biodiesel.[2] Unlike the conventional ethanol production, which requires diversion of cultivated land from food crops to sugarcane production, jatropha or pongamia will be grown only in the wasteland which is thought to be almost abundant in India. Agricultural ministry made detailed estimates of different types of wastelands and a large section of them was stated to be suitable for jatropha plantation. It would thus be possible to rapidly expand their plantation in the large tracts of the wastelands to meet feedstock demand for biodiesel in the near future. In order to expand the use of biodiesel, it was felt that the country needed to channelize its efforts through special mission, and so the biodiesel mission was launched 2003. It was divided into two phases—Phase I, a research and demonstration phase, spanning the period 2003–2007 and Phase II, an implementation Phase, spanning the period from 2007 to 2012. The policy envisaged a 20% blending target by 2011–2012.

Apparently the mission went quite systematically: it involved several universities and research institutes to develop appropriate plant varieties, it fixed purchase price for biodiesel and feedstock and designated some twenty oil marketing companies (OMCs) to purchase and distribute the biofuel. By 2008 more than 700,000 ha of land was brought under jatropha plantation, which is significantly small if India has to fulfil a 20% blending target of biodiesel. Furthermore, due to high uncertainty about the yield (the average being less than half of what was expected) and chronic feedstock shortage for biodiesel, the mission was decided to be abandoned by August 2008. Subsequently, a new policy was introduced to adopt wider set of plants producing non-edible oilseeds that could also be grown on marginal, degraded or wasteland. In December 2009, the government adopted the National Policy on Biofuels which set the blending target for biodiesel at 20% by 2017 (see Table 1). Given the diversity of agro-climatic conditions and the existence of a large number of non-edible oilseeds bearing plants suitable for specific areas, it was a wise decision to widen the choice of plants rather than restricting to jatropha only. Although the country has not made any remarkable success in biodiesel production over almost seven years of experimentation, it has provided a number of learning experiences that may guide the future course of actions and their appropriateness would determine future success.

This paper critically analyses the past policies and their recent changes given the background of the nature of resource endowments of the country. It would specifically focus on four aspects, namely availability and development of plant varieties, availability of wastelands, organisation of production especially relating to cultivation and value chain, and institutional constraints. While the present section being introductory, the rest of the paper is organised as follows: Section 2 analyses the appropriateness of the available plant varieties, especially for commercial use, in different agro climatic regions. It notices that along with the development of plant varieties, suitable cultivation techniques are also required to be developed. Section 3 raises the issue of land constraints as the wastelands need not necessarily be freely available for planting jatropha or other oilseeds bearing plants. Since, land ownership and occupational patterns vary significantly within India, the mode of organising cultivation and the associated value chain would also vary. This is the focus of our discussion in Section 4. Section 5 discusses about the institutional constraints. The failure to develop suitable institutions capable of linking farmers with other organisations for transferring correct information and designing right kind of incentives resulted severe problems that the poor farmers have to face and this in turn restricted the progress of the jatropha farming. Finally, Section 6 makes some concluding observations and highlights some policy changes that are essential for the success of the biodiesel programme.

2. Plant varieties and their suitability

The National Biodiesel Programme laid almost exclusive emphasis on jatropha curcas although more than 400 varieties of oilseed bearing plants are identified. No doubt, there were several advantages in comparison to other plants. It is found almost everywhere in the country. It is resistant to common pests and is not forayed by the cattle.[3] Barring the initial years of plantation, it normally requires no irrigation and it can withstand substantial agro-climatic variation. Moreover, jatropha curcas is a shrub, not tree, and has shorter gestation lag. Its harvesting season does not coincide with the agricultural harvesting time. It seems that with a little care and a nominal paid out cost, jatropha plants can be grown in large areas. As desired by the government, it is suitable for cultivation in fallow/degraded land and thus there is no need to divert land from field crops to these plants. Till date, jatropha is found to have no other major uses except for making biodiesel. The by-products of biodiesel are also quite useful as biofertiliser and glycerine. Thus, its exclusive use for production of biodiesel would not directly or indirectly cause scarcity of any commodity.

Although some or other of these advantages may be found for many other non-edible oilseeds bearing plants and these plants may be more suitable for specific agro-climatic conditions, these were overlooked in the national biodiesel programme till recently. On the contrary, jatropha received almost exclusive priority in the initial phase of the programme. It was only in 2008 that this emphasis on jatropha was relaxed to include other possible TBOs in the programme of biodiesel production.

However, beginning the biodiesel programme with only one plant variety with high potentiality is a good idea given the resource constraint and the efforts needed to transform a wild plant into a commercial crop. One can imagine the time and effort spent by our ancestors on each of the crops that we cultivate now to bring to its present form or the level of productivity from its wild form. It requires developing high yielding varieties jatropha plants suitable for specific regions. It needs to develop and acquire the knowledge of efficient technique of cultivation and transfer the knowledge and appropriate plant variety to the farmers of particular region. Of course, the advancement of technology, like biotechnology or genetic engineering, together with information/ computing technology has tremendously reduced the time required to develop new varieties of plant. Moreover, uncertainties about long term endurance, commercial viability or environmental sustainability of the innovated plant variety remain. India has a reasonable stock of genetic varieties (about 12 different species of jatropha plants) which need to be isolated and suitably recombined for developing commercially viable plant varieties.[4] This involves substantial research efforts by the biotechnologists at the laboratory as well as field trials/

[2] In India, around 400 non-edible oilseeds are found. But jatropha was given priority in the biodiesel programme due to its high oil content (40% by weight) and lower gestation period (2–3 years). Probable the choice was influenced by the fact that some countries in Africa and Latin America were using it for the same purpose.

[3] See Pohit et al. (2010) and Achten et al. (2008).

[4] See Tamilnadu Agricultural University (2011).