



UPLB R & D Program on Jatropha and Biofuels

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Jatropha curcas, more commonly known as *tuba-tuba* in the Philippines, is increasingly catching the attention of Filipinos as a promising source of alternative fuel. Jatropha is not a strange crop among Filipino farmers, for it is already part of the rural farming landscape being used for other traditional uses. Hence, many farmers are now looking at Jatropha as a potential economic crop. However, while not yet mainstreamed as a viable source of biodiesel, Jatropha already seems to be successful in fueling a controversy on its viability.

Quite recently on September 9, 2007, the Talk of the Town section of the Philippine Daily Inquirer carried the article "Jatropha: What the public should know" authored by Professors Ted Mendoza, Oscar Zamora and Joven Lales of the College of Agriculture, University of the Philippines Los Baños (UPLB). The article was published presumably to caution the public about Jatropha, and coming from renowned agricultural scientists, this generated mixed reaction from the public. Although these scientists belong to UPLB, their study results should not be taken as UPLB's definitive position on the matter. Rather, it would be prudent to consider these as the authors' inputs to the issues relative to the ongoing build-up of scientific knowledge and experience on Jatropha.

At this point in time, UPLB's position is to continue to vigorously pursue research and development on Jatropha and biofuels and encourage relevant stakeholders to look beyond current limitations in search for solutions to current concerns—the essence of scientific research and development.

We believe that science-based knowledge is an indispensable foundation upon which a sustainable alternative fuel program should rest. As the leading research university in the country whose areas of distinctive excellence are in agriculture, biotechnology and the environment, UPLB has put together an R & D program on Jatropha and Biofuels which is being carried out with support from various institutions including the PNOC Alternative Fuels Corporation, DOST-PCARRD, CHED and the Bureau of Agricultural Research (BAR) of the Department of Agriculture. There are also collaborations with the DENR Philippine Forest Corporation, 17 State Colleges and Universities (SUCs) and the private sector.

The UPLB alternative fuels R & D program is anchored on our commitment to ensure that the growing biofuel industry will have the appropriate science and technology support. Currently, our R & D program is being run by teams of scientists working on Jatropha, bioethanol, biogas, solar, hydroenergy, wind and biomass, among others, as alternative sources of energy. For Jatropha, studies are being conducted with respect to germplasm collections; varietal improvement; component technologies with respect to plant propagation, pruning, flower and fruiting management, fertility management, pests and diseases management; farming systems; plantation management; post-production technologies; and processing of biodiesel and byproducts. UPLB with CHED support is coordinating the provenance testing of Jatropha in 17 locations where cooperating SUCs are located. As to the amount of oil in the seeds, DOST-ITDI and the UPLB team analyzed seeds from local collections obtained from various parts of the country and found them to yield 28-36 percent oil (using solvent extraction). Initial findings of the UPLB team also indicated that some Jatropha

lahar-affected areas; and even mine silted areas. Field trials on the use of mychoriza, organic fertilizers and other biofertilizers are being tested in marginal soils in Laguna, Rizal and Quezon. Field trials in lahar areas are established in Zambales in cooperation with the Central Luzon State University and the Ramon Magsaysay Technological University. Trial planting of Jatropha in mine tailing areas was established in Marinduque. Initial results from BIOTECH and feedback from farmers indicated good response of Jatropha to Mykovam inoculation.

UPLB believes that farmers should not be left behind in the development of the biofuel industry. If indeed the biofuel industry takes off, the involvement of farmers this early can help ensure equitability of benefits. Poor farmers should be given opportunities to benefit from the biofuel revolution as growing this biofuel crops generates additional employment and income. Integration of Jatropha with agroforestry and agricultural systems such as in coconut and hillyland farming are being studied.

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collections have sterol and no free fatty acids, which has some positive contribution in processing efficiency and storage cost. Oil yields were affected by varietal characteristics, seed quality and the extraction method.

UPLB further seeks to ensure that the promotion of biofuels will not sacrifice food security and general welfare of Filipinos and would not be detrimental to the environment. UPLB is one with the government in ensuring that food crop areas are maintained and protected for food security. We are therefore seeking to develop biofuel crops in the agroecosystems in which they can best perform without sacrificing the need for foods, feeds, and sound environment while addressing the needs of the marginalized farmers in the country.

Sweet sorghum, for example, should not necessarily compete with corn and sugarcane for production areas. Sweet sorghum is being considered in areas where rice, corn and sugarcane cannot be productive because of limited irrigation water. In rain fed areas, sweet sorghum fits well as a dry season crop after wet season rice crop.

In the same manner, Jatropha is mainly targeted for planting in marginal areas where food crops (including sweet sorghum) are not planted or cannot be planted. These areas include degraded grasslands; denuded uplands;

The UPLB team is also working on village-level processing of Jatropha. A 1,000 liter per day coconut oil expeller has been modified and initial results are encouraging. The results showed 79.5 percent oil extraction efficiency using enzymatic processing and reduction in reaction time by as much as 30-60 minutes during the esterification process. The potential of using processing by-products for animal feeds, organic fertilizers and production of bioplastics are also being explored to add value to Jatropha.

Efforts are being done to start small by exploring the use of Jatropha to fuel stoves and other small-time village-level power generators. Efforts are being undertaken in Jormalig and Panukulan in the Polilio Group of Islands to plant Jatropha and provide fuel for the energy needs of the islands.

Some practical advice from our team. Considering the yet uncharted course of using Jatropha as a biofuel, and consequently its profitability as an economic crop, it may yet be unwise for farmers to immediately start big but they can start small and be part of the country's quest for alternative fuel sources without compromising food security in an attempt to attain energy sufficiency.

It is worthwhile to note that Jatropha is not a stranger among our farmers. It has been in the

Philippines for quite long and local varieties are expected to be better adapted (including adaptation to pests and diseases) to Philippine conditions. Interested planters may use these varieties in their areas as long as they grow vigorously, bear fruit, have at least eight capsules per cluster, 2-3 seeds per capsule, bear at least three clusters per branch per fruiting season, and have at least 35 fruiting branches. Jatropha start to produce fruits as early as six months after sowing in case of plants from seedlings or four months if stem cuttings are used. Yield increases every year as there are more fruiting branches developed to peak in the fifth year.

Farmers can plant at least 10-100 plants in their fences or in their idle lots not necessarily investing a fortune or buying that PhP100/kg seeds. As farmers plant, they will learn and experience things. They can validate among others, the effects of some pruning techniques on the amount of fruits, the influence of water availability and fertilizer management on the performance of the crop and the management of pests and diseases as well.

Whatever campaigns and promotion we do, we trust that small holders are wise enough to test things on Jatropha first before they commit their whole farm resources to something new. It is projected that small farmers will have until 2009 to study how things are going without being left out when things do get better.

As to the big companies coming in, they have their own facility to determine the risk and could speculate (or research) on the gains. If they go big thinking that they can get big chunks of lands for their operations, they most likely would have to hurdle lots of difficulties unless adequate mechanisms are put in place to work with small farmers and provide a plowback mechanism for gains in processing.

The country is approaching an important crossroad as it joins the world in search for sustainable alternative fuels. At this crucial time, it would be well for all stakeholders to do their part to make sure we choose a path and carry on, rather than remain undecided on the crossroad.

We at UPLB have decided to carry on the tradition of contributing to nation building through a science-based approach on the matter of Jatropha and biofuels as with other conservation and development issues we constantly tackle. While the end may not be in sight, we know we are leading the pack on the research and development track and will be true to our mandate as we strive to deliver concrete results worth reckoning with.