

AGENCY FOR INTERNATIONAL DEVELOPMENT  
WASHINGTON, D.C. 20523

32006

DATE:

9/11/87MEMORANDUM

TO: AID/PPC/CDIE/DI, room 209 SA-18  
FROM: AID/SCI, Victoria Ose  
SUBJECT: Transmittal of AID/SCI Progress Report(s)

Attached for permanent retention/proper disposition is the following:

AID/SCI Progress Report No.

4. 555Rec'd 7/28/87 - Intern.2d half of 1986 - rec'd 3/9/871st half of 1986 - rec'd 10/20/862d half of 1985 - rec'd 3/14/861st half of 1985 - rec'd 8/13/85Attachment2d half of 1984 - rec'd 3/25/85

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3 cpy each

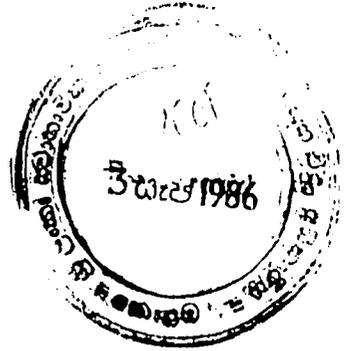


DEPARTMENT OF MECHANICAL ENGINEERING  
UNIVERSITY OF PERADENIYA  
PERADENIYA

1 September 1986

Our Ref No. ....

Your Ref No. ....



4.555

Director General  
NARESA  
47/5, Maitland Place  
Colombo 7.

Dear Sir,

Progress Report RG/AID/05

I have enclose the progress report of the above project for the first half of 1986. Please excuse for the delay.

Yours faithfully,

S.K. Seneviratne  
Grantee

Rec'd in SCI: OCT 20 1986

V

Progress Report

- 1) Report for the 1st half of 1986
  
- 2) Grantees : Dr. S. G. Ilangantilleke  
Mr. S. Seneviratne  
Mr. J. B. Rajeswaran
  
- 3) Grant No : RG/AID/05
  
- 4) Title : Promoting Jatropha Curcas (Rata Endaru) oil as  
a fuel substitute for diesel engine fuel in Sri  
Lanka.
  
- 5) Date of award : 2nd October, 1984
  
- 6) Progress to-date :
  - 1) The hydraulic press designed and fabricated for mechanical extraction was used to obtain quantities of Jatropha oil.
  - 2) Oil thus extracted have been tested to ASTM specifications, and also been subjected to chromatographic tests.
  - 3) Quotations were received for the purchase of a diesel-engine.
  - 4) An additional quantum of Jatropha seed has been collected, and some of it has been de-hulled.

## 6.1 Extraction of Jatropha Oil

The design of the mechanical extraction machine was changed to counter various problems associated with the original design. Two of the main problems encountered were the difficulty in aligning the line of action between the hydraulic press and the disc on the screw rod, and the slow extraction rate of oil. The first problem was overcome by re-designing the supports and the top plate of the machine, to allow for smooth sliding of cylinder base plate and to counteract bending torques exerted on the top plate. The second problem was overcome by replacing the 8" diameter cylinder with a smaller 6" diameter cylinder, so as to ease the consolidation of oil oozing through the Jatropha pulp.

De-hulled Jatropha used for extraction was first washed thoroughly and sun dried. They were then pulverised using a heavy duty hammer mill. A special mounting frame was constructed and fitted for this purpose.

Records are being maintained listing the weight of seeds per batch being pressed and the corresponding volume of oil obtained. On average, about 260 ml of oil is obtained from 1 Kg of ground seed, still leaving a sizable amount of oil in the residual oil-cake. It will be necessary to use chemical solvents to extract 100% oil from seeds.

## 6.2 Analysis of Jatropha Oil

Tests in accordance with specifications of the American Society for Testing and Materials (ASTM) have been conducted on our behalf by the Ceylon Petroleum Corporation. The values determined were for:

- a) Flash point temperature
- b) Distillation temperatures
- c) Density, at 15 c
- d) Specific gravity at 60 F
- e) Diesel index
- f) Viscosity at 100 F
- g) Calorific value

Tests were also carried out by CISTR on Jatropha oil samples, to determine its constituents. The results are as listed below.

### a) Fatty acid composition

Palmitic acid	16%
Stearic acid	6%
Oleic acid	45%
Linoleic acid	33%

b) Saponification value - 189

c) Iodine value - 90

The oil samples used for these tests were first sent through a high pressure filtration unit at the Chemical Engineering Department, University of Peradeniya.

Tests results obtained by CPC so far seem to indicate that the quality and the nature of Jatropha oil obtained in Sri Lanka is different to that obtained in Thailand. More tests are being conducted.

### 6.3 Purchase of diesel-engine

Quotations for the supply of a diesel engine have been sent by various agencies. It is intended now to purchase a 4 cycle, 2 stroke diesel engine of around 400 cc, similar to those used on 2 wheel tractors. The type of engine most suitable for experimentation is at present being evaluated.

### 6.4 Collection of Jatropha seeds

More seeds were collected from Nikeweratiya area, and a portion of these seeds were manually de-hulled. However, such collection has been curtailed for the present, since ample stocks are available for extraction purpose.

## 7.0 Plan of work for the 2nd half of 1986

- 1) Continue with extraction of oil and tests.
- 2) Commence converting oils to transesters
- 3) Commence diesel-engine tests.
- 4) Explore possibility of carrying out an Agronomy Study on Jatropha.

### 7.1 Extraction and testing

It is intended to further modify the mechanical extraction method for more efficient extraction rates and quantities. Extraction will also be carried out on pre-washed and steam dried Jatropha. Steps will also be taken to extract oil using chemical solvents. Already favourable responses have been received on the supply of materials and chemicals needed for such extraction.

More tests will be carried out. In particular, tests will be conducted to calculate the Cetane Index of Jatropha oil. For the calculation of a Cetane Index, it is necessary to measure a mid-boiling temperature. It was not possible to measure the mid-boiling temperature during the measurement of distillation, since after 30% recovery, there was a thermal breakdown. It is intended to try out a vacuum distillation process, determine the mid-boiling temperature, and thereby calculate the Cetane Index.

### 7.2 Conversion to Transesters

Arrangements are being made to purchase necessary chemicals and equipment to convert oil to a transester. It is intended to chemically analyse transesters and subsequently use these esters for engine testing.

### 7.3 Diesel-engine tests

A test-cell for diesel engines is available at the Engineering Faculty. The test cell comprises of a dynamometer, fuel and air flow measuring devices, and apparatus for measuring temperatures and pressures. It is intended to couple the diesel engine to be purchased to this test cell. Modifications will be carried out to accommodate engine to existing mounts and coupling.

7.4 Agronomy Study

Efforts will be taken to re-explore resume an earlier plan of leasing land, and carrying out an intensive cultivation. An agronomy study will begin then.

8.0 Signature of Research Assistant : *L. Garcia J. Morales* .....

9.0 Signature of Grantee : *[Signature]* .....

10.0 Signature of Head/Department : *[Signature]* .....

HEAD OFFICE OF THE DEPARTMENT OF AGRICULTURE  
UNIVERSITY OF CALIFORNIA  
DIVERSITY