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Workshop on Fermentation Alcohol for Use as Fuel  
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ADVANTAGES AND LIMITATIONS OF THE USE OF ALCOHOL  
PRODUCED BY FERMENTATION AS FUEL  
IN DEVELOPING COUNTRIES\*

by

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A great deal has already been said in recent years encouraging the use in developing countries of fermentable raw materials and their processing into alcohol for use as fuel and even as raw material for the manufacture of synthetic chemicals. Striking instances of the practical application of this technique, e.g. in Brazil, have been much cited.

The resulting general enthusiasm and hopes engendered must perhaps be slightly tempered by pointing out that there are possible limitations to the approach.

1. It must be recognized that there are certain advantages to the process that is being promoted as an aid to the less-favoured countries. These can be summarized as follows.

In certain of these developing countries there are agricultural resources sometimes unused or badly employed, notably sugar cane molasses, which can be simply processed into alcohol. Some of these countries have difficulties in organizing appropriate on-the-spot use of the molasses and others have both transport and export difficulties. This is why on-the-spot processing into alcohol is a ready alternative which is part of a concerted scheme. In certain cases processing the molasses, as a complement to sugar refining, can help make a developing sugar industry profitable.

In other countries the plan is to distill sugar cane grown for that purpose or to reconvert sugar production for which an outlet cannot be found into alcohol production. This solution allows the continuance and even the development of an agricultural activity the characteristics of which are intrinsically well-adapted to developing countries. The growing of sugar cane creates numerous primary jobs, exactly what these countries most need to retain the rural population and raise its living standards and rating.

Certain characteristics of the plant also make it a suitable choice as a source of alcohol. It is relatively easy to grow and in certain cases several successive harvests can be expected. It does not generally require highly developed agricultural techniques or intensive fertilization of the soil. If labour is abundant, excessive mechanization can be avoided. The high sugar content of the plant itself means that high yields per hectare can be expected. Lastly, the bagasse, which remains after the sugar has been extracted, can be used as fuel. This makes the distillery self-sufficient in energy supply, an additional consideration given the situation in question.

On the social and agricultural level, then, this form of development appears very suitable for these countries. There is an additional factor supporting this viewpoint : the technology involved is well-known. There are no problems in producing fuel quality alcohol, which does not require the same qualities as alcohol for human consumption.

From the numerous studies made the best plan appears to be to avoid the two extremes of the scale in choosing the size of the distillery. With medium-sized distilleries the raw materials can be processed near where they were produced. Very heavy investment is not required, the distillery can become operational fairly quickly and can quickly reach a capacity near the optimum.

To all this it must be added that the use of this alcohol as fuel also presents no problems. In petrol/alcohol mixtures the alcohol will provide almost the same power as the equivalent quantity of petrol it has replaced. In weak mixtures (around 1 % alcohol) no engine adaptations are required, and for stronger concentrations (10 % ) the carburettor needs adjusting and the alcohol has to be dehydrated. In certain quarters engines and boilers using alcohol alone are envisaged. A number of big car firms are actively investigating the possibility of equipping lorries and tractors with such engines.

A number of not uninteresting hopes have also been expressed with regard to other uses, for example, other fuel uses or use as a raw material. As a fuel it can replace wood for household cooking. This could aid in preventing the curse of the Sahel, retreating forests. As raw material it can be used as the base for the manufacture of synthetic chemicals. The petrol/ethylene/alcohol cycle used for some time would be replaced by the well-known alcohol-ethylene-synthetic chemical cycle.

The processing of agricultural raw materials into alcohol for use as an energy source or starting point for synthetic products is then likely to be of interest to developing countries. As a new, renewable natural and native source of energy it allows petroleum imports to be reduced, and the balance of payments to be improved, thus leading to greater economic and hence political independence.

Numerous countries have already embarked on projects. The Brazilian experience is interesting and encouraging. Countries in South-East Asia, South America, Africa, etc. are in various ways strongly interested and others will become so. Perhaps the idea will in the future become attractive even to the European Economic Community.

2. Certain relationships must be observed between the object in mind and the means used to attain it. The new energy made available ought to represent an appreciable proportion of needs, and possibly cover new needs otherwise the saving in currency will become derisory. Conversely, the programme should not be too ambitious and release surplus alcohol onto the international market, which is relatively closed and sensitive. Large excesses could cause a slump in prices and the collapse of export hopes, all the more so as it is difficult to see the industrialized countries reducing their own production and bullying their producers in order to make room for imports.

A certain amount of moderation would have to be envisaged with regard to means. Any form of large-scale planning would entail forfeiting the advantages enjoyed by medium-sized enterprises by increasing investments and costs, particularly the cost of transporting the raw material and that of the alcohol obtained. Thorough mechanization of sugar cane cultivation uses a large quantity of energy. Replacing sugar cane by other plants yielding more sugar and hence more alcohol would do away with the bagasse used to fuel the boilers and increase the cost of bought-in sources of energy, nor is the formula of greatest profitability perhaps the best social solution. But Brazil appears to be turning now towards having medium-sized distilleries but in greater number.

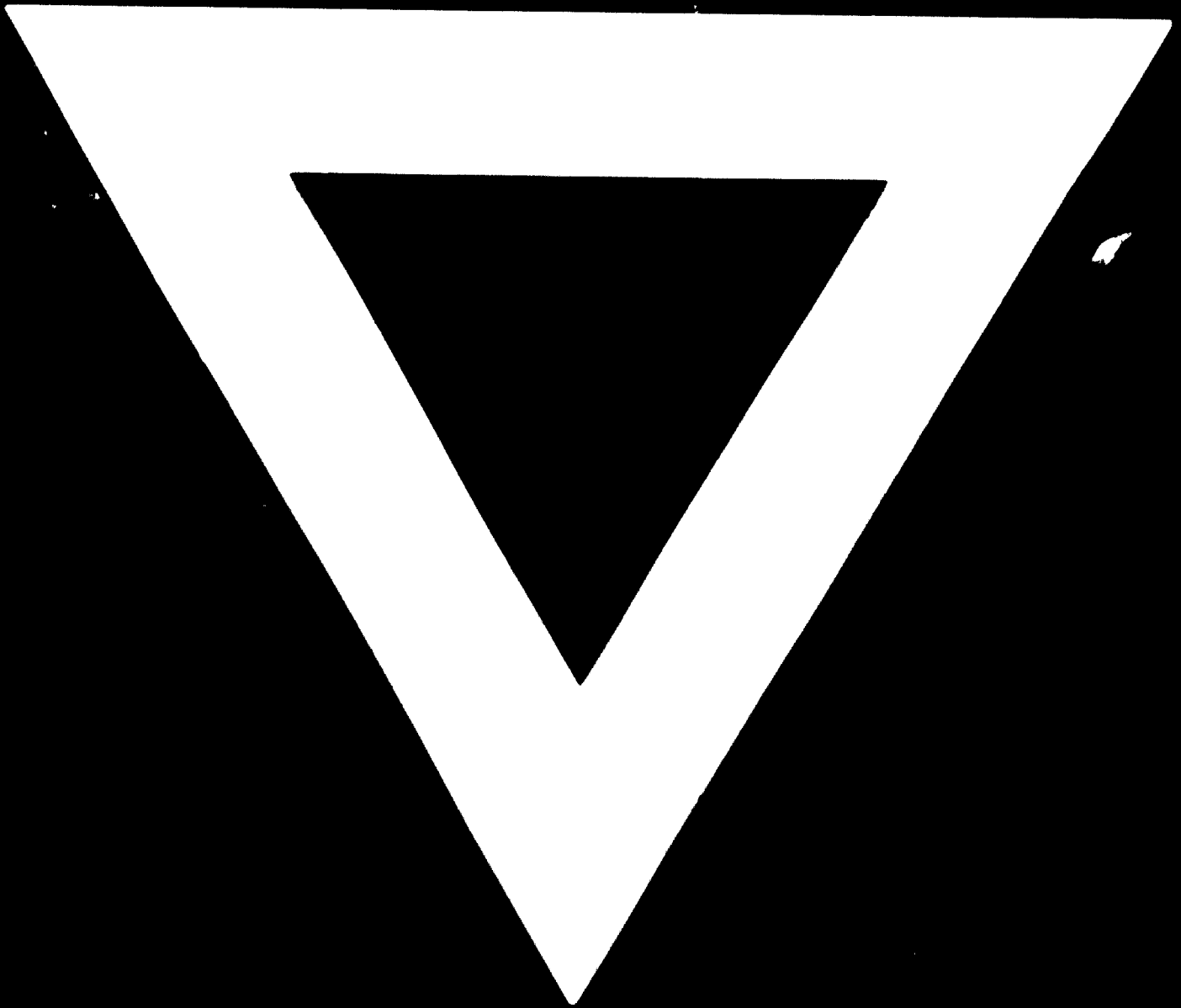
A certain amount of attention ought to be given to profitability calculation. A critical eye should be cast on the economic viability of the processes set up. Certainly the short-and medium-term petrol price is such as to encourage ventures of this nature. But there should be a certain relationship observed between what the countries interested can afford financially and the necessary investment costs.

Lastly, a certain degree of continuity ought to be observed. A programme of the type adopted in Brazil necessitates fairly fundamental structural modifications in agriculture and adaptations in products that are no less important. Such a programme can yield its full effect only if it is applied for a certain period. This implies continuity of effort and perhaps also a certain degree of stability in economic policy.

3. It is for this reason that, while one can recognize that the developing countries favourably envisage a programme based on the development of alcohol production from native agricultural raw materials and its use to provide energy (or possibly chemicals), each programme should be truly adapted to actual financial, social, agricultural and perhaps even political needs and potentials of the country concerned and ought also to meet sound criteria of economic viability. Such a solution implies, without any doubt, a fundamental choice in the research and development of new or alternative energy sources, a choice that commits the future.



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