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POSSIBILITIES OF DEVELOPING A NATION

WIDE PROGRAMME FOR POWER ALCOHOL

IN PERU*

BY

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1. INTRODUCTION

It is a well known fact that world energy crisis has caused a dramatic impact in the economy of industrialized countries, but it has undoubtedly had its severest effects in underdeveloped countries. Because of their inability to revert them in terms of significant exports, capital investment absorption, and monetary manouvering capacity.

Consequently it is only logical for these countries to re-state its energy policies and to explore the potential of new sources and raw materials.

On the other hand, Sugar Industry is able to provide, through fermentation alcohol production, a clean fuel that would have a two fold beneficial effect, particularly in the underdeveloped world:

It would generate a streamlined production of a renewable fuel and at the same time would help sugar Industry to overcome its present crisis in the export market.

This hypothesis has criginated extensive work and research, up-dating and re-approaching an old idea to solve a new problem. There is an abundant bibliography on the subject and numerous examples of practical applications at a significant scale in several countries.

Most remarkable and advanced amongst them is the Brazilian experience in its Proalcool Program.

2. PURPOSE AND SCOPE OF THE STUDY

This paper intends to explore and evaluate at a preliminary level, the possibilities of a nation wide program in Perú, for the mixing of sugar cane alcohol and gasoline for automotive use.

3. PERUVIAN OIL PRODUCTION AND IMPORTS

A brief review of statistics shown in Table 1 reveals an annual increase of apparent consumption of 8%. Another meaningful fact is the decrease of imports in the last three years, compatible with the expansion of domestic oil production. Successful drillings in the Eastern region of the Amazonas drove the trend towards a self sufficiency that will be reached this year according to announcements of officials of the state own oil company.

However, the uncertainty of success in future exploring operations, is a reason valid enough to elaborate on the hypothesis of an increasing demand against a static domestic production. In this event, Peruvian oil self sufficiency would only last for a brief period and Perú would find it-self again returning back to imports. Under such assumption, never mind how pessimistic it is justifiable, to examine the possibilities of the alcohol/gasoline mixture.

TABLA 1

CRUDE OIL DEMAND IN PERU
(GALLONS)

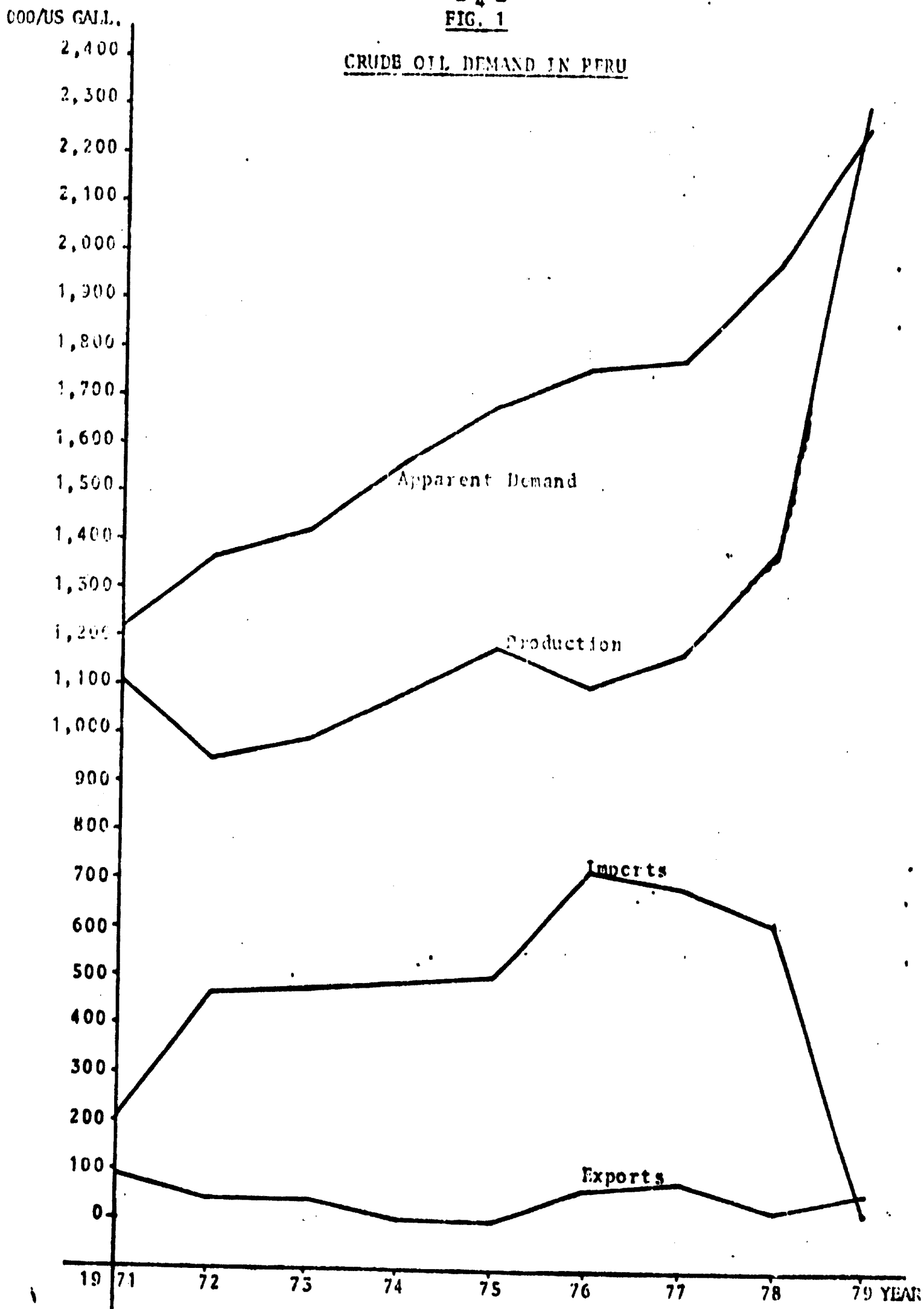
<u>YEAR</u>	<u>PRODUCTION</u>	<u>IMPORTS</u>	<u>EXPORTS</u>	<u>APPARENT DEMAND</u>
1970	1,103'311	208'851	92'498	1,219'664
1971	948'691	465'100	46'674	1,367'117
1972	993'066	478'296	45'104	1,426'258
1973	1,082'195	489'602	5'164	1,566'633
1974	1,181'957	501'845	-	1,683'802
1975	1,104'334	719'782	62'223	1,761'893
1976	1,174'537	690'969	83'646	1,781'860
1977	1,397'378	615'659	24'619	1,988'418
1978	2,312'512	17'696	51'462	2,278'746

4. BASIC ASSUMPTIONS

On the basis of wide experiences in several countries and a specific report of the Petro-Perú Technical Division, the present study assumes the Technical feasibility of mixing de-hydrated alcohol and gasoline for automotive use, provided that proper adjustments will be done in motor and carburating system.

According to the above mentioned study the proportion to be utilized would be 80-20%, in order to obtain an octane number of 84.5.

CRUDE OIL DEMAND IN PERU



5. GASOLINE CONSUMPTION

Table 2 shows actual consumption of gasoline during the last eight years as well as evolution of production, -- imports and exports. The sign of the spectacular increase in prices of both gasoline and vehicles, is clearly shown in terms of a very small annual increase of 1%, average in the above mentioned period.

TABLE 2

APPARENT DEMAND OF GASOLINE IN PERU
(000/gallons)

<u>YEAR</u>	<u>PRODUCTION</u>	<u>IMPORT</u>	<u>EXPORTS</u>	<u>APPARENT CONSUMPTION</u>
1970	398'534	-	-	398'534
1971	437'124	-	-	437'124
1972	457'671	4'720	-	462'391
1973	493'313	4'683	-	497'996
1974	496'111	5'311	-	501'422
1975	545'826	11'928	-	557'754
1976	518'126	19'465	5'132	532'459
1977	451'777	2'037	6'844	446'970
1978	453'551	3'278	40'199	416'630

6. ALCOHOL PROJECTED REQUIREMENTS

Based upon projected gasoline demand, table 3 shows alcohol requirements for 1979/89 as well as sugar production necessary for fulfilling this goal, assuming a 20% substitution.

TABLE 3

SUGAR AND ALCOHOL REQUIREMENTS FOR EXPECTED
VOLUME OF MIX

<u>(1)</u> <u>Year</u>	<u>(2)</u> <u>Gasoline</u> <u>Demand</u> <u>(Gal)</u>	<u>(3)</u> <u>Alcohol</u> <u>20% of (2)</u> <u>(Gal)</u>	<u>(4)</u> <u>Sugar</u> <u>Required</u> <u>(TM)</u>	<u>Molasses</u> <u>Required</u> <u>(TM)</u>
1979	420'796	84'159	522,000	1'044,000
1980	425'004	85'001	528,000	1'055,000
1981	429'254	85'851	532,000	1'065,000
1982	433'547	86'709	538,000	1'076,000
1983	437'852	87'576	543,000	1'086,000
1984	442'261	88'452	548,000	1'097,000
1985	446'684	89'337	554,000	1'108,000
1986	451'151	90'230	560,000	1'119,000
1987	455'662	91'132	566,000	1'131,000
1988	460,219	92'044	571,000	1'142,000
1989	464'821	92'964	576,000	1'153,000

7. PERUVIAN SUGAR PRODUCTION

Since no future expansions are envisioned in the next five years, because of government policies and market perspectives, the Peruvian Sugar Production is assumed to maintain itself in a level of 920,000 MTPY.

Table 4 shows historic figures in this respect; the heavy decrease in the last years due to a most severe water shortage plus the impact of the crisis can also be observed in this table.

TABLE 4

PERUVIAN SUGAR PRODUCTION

<u>YEAR</u>	<u>DOMESTIC MARKET</u>	<u>EXPORT MARKET</u>	<u>TOTAL PRODUCTION</u>
	<u>TON</u>	<u>TON</u>	<u>TON</u>
1971	434,538	447,957	882,495
1972	454,695	444,007	898,702
1973	484,445	412,877	897,322
1974	525,893	466,571	992,464
1975	550,786	412,871	963,657
1976	595,991	333,659	929,650
1977	522,428	377,922	900,350
1978	561,674	294,998	856,472

8. RAW MATERIAL AVAILABILITY

Statistics as exposed in previous sections of this report very clearly show that either sugar nor molasses would suffice to provide the raw material required for the proposed substitution. A requirement of 550,000 to 580,000 tons. of sugar, would imply to derive 100% of the export segment of the market and 50% of the domestic one. The excesses of molasses production for export (presently 50,000 Mt.tons) is negligible as compared to requirements estimated in Table 3.

The obvious conclusion of this preliminary analysis is that the sugar cane cultivated area presently available should be nearly duplicated in order to cope with the demand that a 20% substitution would imply. It should also be considered the fact that the estimates and projections are based on an abnormally depressed market, situation that should improve in the future, adding more pressing demands to the conservatively derived figures of this report.

9. REQUIRED PRODUCTION COST OF ALCOHOL

According to Petro-Perú cost calculating substitute alcohol should arrive at the oil refinery premises at a cost not exceeding 0.35 US \$/gal in order not to profit nor to loose.

As a reference, the present cost of industrial alcohol (95%) tax exempt amounts to 1.09 US\$/gall; that is, more than, 300% the price that could be afforded to pay.

10. OTHER CONSIDERATIONS

Additionally to the cost and raw material availability limitations, it must be borne in mind that Peruvian Oil Industry has an idle portion of installed capacity in refinery due to reduction of demand below the levels of consumption in 1971. This explains an excess production of gasoline that forces its exports at marginal prices. In order to obtain other cuts and basic fuels and lubricants the refinery inevitably produce gasoline. This fact makes the substitution even less logical presently and in the near future.

11. FUTURE PERSPECTIVES

The author wishes to emphasize that the negative results, of this preliminary work, should not be taken as equally applicable beyond 1989. Prices and costs of both alcohol and Oil, will have to vary significantly, market conditions and economic and financial situation of the country is positively improving and there is an important potential of agricultural land in the jungle, region of Perú, with soils of class I and II, apt for sugar cane growing (more than 600,000 Has. in all in Huallaga, Pucallpa and Madre de Dios).

It is true that situation in Perú energy wise is quite different than in Brazil. Demographic expansion requires the reclaiming of new lands for food oriented cultures. The country has in general good prospectes for new oil reserves; the hidro-eletric potential is barely utilized in more than 15% and other sources of energy such as coal and extensive sunny areas do offer possibilities for solar utilization. Very recently, uranium deposits have been

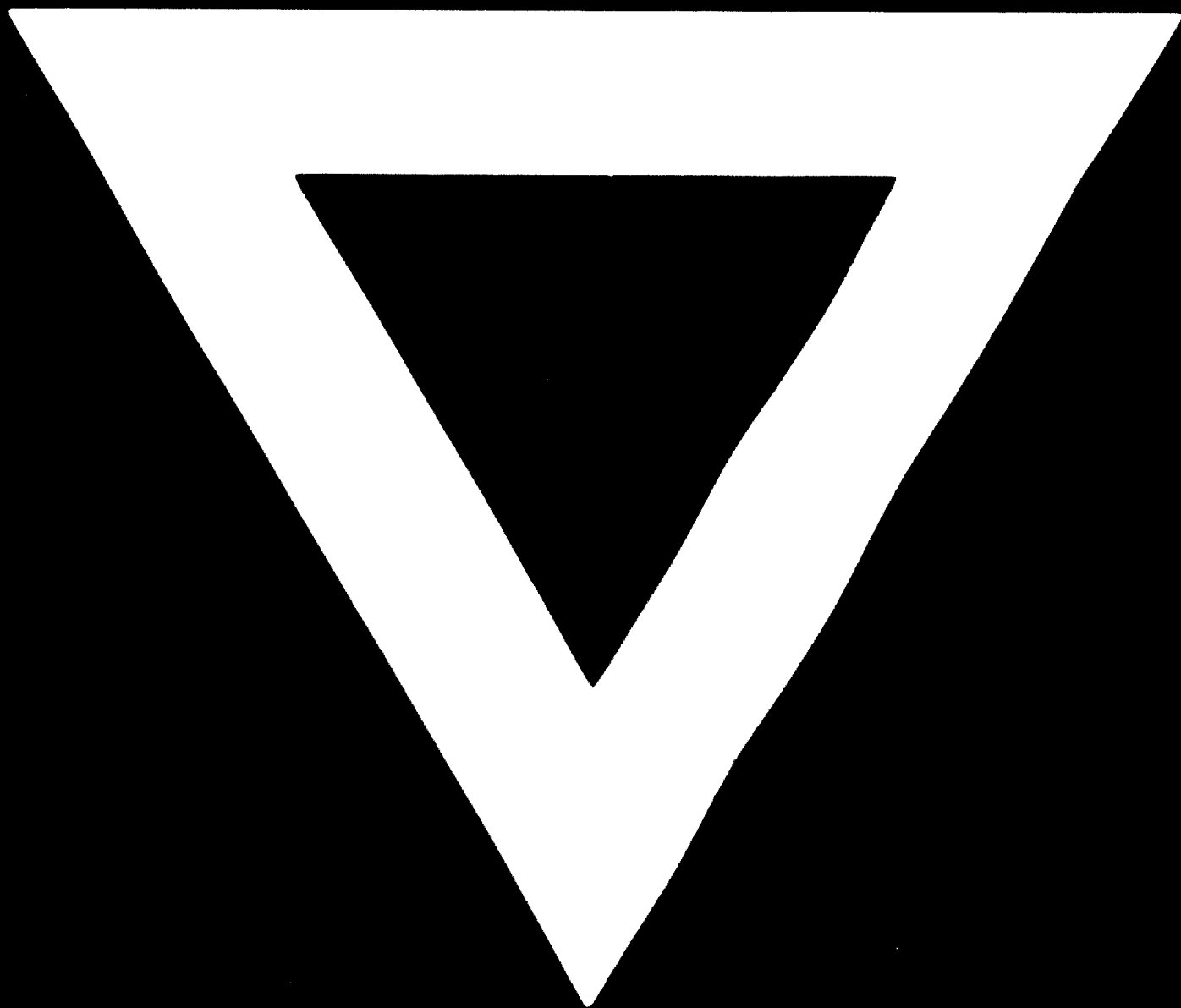
discovered and are being evaluated. There are alternatives and to have to be studied.

As far as alcohol, for automotive use is concerned it should always be very closely monitored and a detailed feasibility study with an emphasis in the evaluation of his future perspectives ought to be made in the next few years.

Sugar cane might not be the "green oil" solution for Peru but still is, and will become more attractive in its remarkable possibilities for alcohol production as an industrial raw material for industrial applications and other uses. In this areas the author wishes to express its confidence in the important contributions that will be obtained from this workshop, on the fascinating field of fermentation alcohol.



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