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COMMITTEE ON WORLD FOOD SECURITY

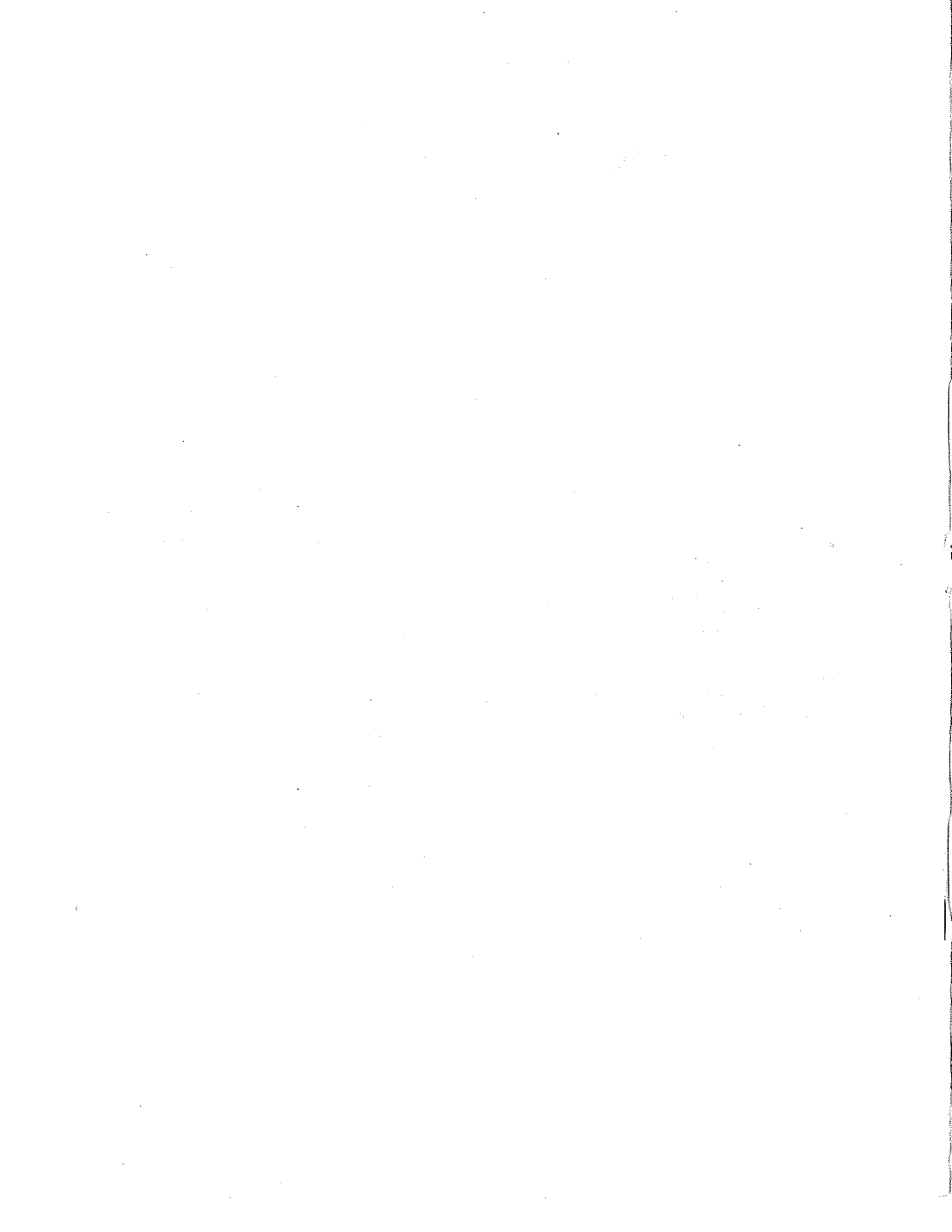
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An Inventory of National Policies, Plans and Programmes
to Produce Fuel Alcohol from Agricultural Commodities

The Committee on World Food Security at its Sixth Session recognized "that the potential competition between food production and energy cropping was directly relevant to world food security". The Committee requested member countries to provide information on their policies, plans and programmes for producing liquid fuel from agricultural commodities so as to assist the Secretariat to prepare an "inventory of national programmes" with a view to analysing the impact on world food security. The preparation of an inventory of this nature is also in conformity with one of the main recommendations of the FAO Expert Consultation on Energy Cropping versus Food Production held in Rome in June 1980, that "within FAO ongoing programmes of monitoring the short-, medium- and long-term developments in the food situation should make a special effort to integrate potential effects from food/energy conversion into their analyses". Moreover, the FAO Conference, at its 21st Session, also "Recognized that energy cropping in agriculture needed to be approached with caution so as not to endanger food supplies or lead to an increase in prices, as this could have a detrimental effect on world food security", and therefore considered it "useful that FAO monitor the developments in this field".

This inventory has been prepared on the basis of replies from 35 countries to a questionnaire which requested member governments to provide information on the status of their national fuel alcohol plans, policies and programmes, supplemented by information from other official and unofficial sources. Delegates are invited to provide the Committee with additional information on recent developments so as to enable the Secretariat to monitor the progress of national energy programmes in line with the recommendations of the Sixth Session of the Committee and the Twenty-First Session of the FAO Conference.



I. SUMMARY AND CONCLUSIONS

1. Liquid fuel production from agricultural commodities totalled 8.4 million litres in 1981, and utilized 82 million metric tons of agricultural products (largely maize and sugar cane) from an area of 2.5 million hectares in five countries - Brazil, Paraguay, the Philippines, Thailand and the United States. In these countries liquid fuel output from such products is targeted to reach more than 20 billion litres by 1985, absorbing just under 200 million tons of agricultural feedstock and utilizing between 7 and 8 million hectares of arable land. Brazil and the United States account for more than 95 percent of both current and planned production of liquid fuel from agricultural commodities. Of the remaining 64 countries for which information is available, 8 have small scale or pilot projects underway, 8 are engaged in feasibility studies, and 25 are in the research stage. 23 countries have no programmes.
2. Available information indicates that ethanol is being produced commercially in Brazil, the Philippines, Thailand, Paraguay and in the United States. Four common characteristics are found in the programmes of these countries. First, all governments concerned subsidize the establishment and operation of the programmes through such measures as inter alia tax relief and concessional credit for investment. Second, in all countries production of the feedstock concerned is in excess of current domestic requirements. Third, in all cases, the ethanol produced is used as automobile fuel for which there is a domestic market. And finally, all five countries are net importers of petroleum.
3. Among these five countries, the only one which uses grain as a basic feedstock is the United States where maize is converted into ethanol which is blended with gasoline (90 percent) to produce gasohol, an automobile fuel. In the other four countries, ethanol is produced from sugarcane and, as in the United States, is blended with gasoline. Pure ethanol is used to power automobiles only in Brazil, although this is now also under consideration in Paraguay.
4. Many countries are currently investigating the potential of converting agricultural commodities into fuel alcohol. Three major research areas include experimentation with alternative feedstocks (e.g. cassava and sweet sorghum) to produce fuel alcohol, with vegetable oils to replace diesel fuel and with new conversion techniques in order to reduce the production cost of ethanol. There is also considerable interest in the production of fuel alcohol from agricultural waste. Research projects in this area are currently underway in 13 countries, but only in Pakistan has a pilot project been initiated. 1/
5. For the time being few countries seem to have reached the stage to expand their small-scale research programmes or to begin a full scale national fuel alcohol programme. It appears that large scale production of fuel alcohol from agricultural commodities requires substantial government subsidies, given the present state of the conversion technology and the prevailing price relationships between agricultural feedstocks and other energy sources. Of the numerous obstacles which national fuel alcohol programmes have encountered, including in some cases consumer resistance, the need for substantial subsidies appears to be the major constraint to the establishment and implementation of these programmes.
6. As ethanol production is heavily dependent upon large and uninterrupted government support, it is difficult to forecast the level of future production in coming years. If financial support to these programmes continues in the four major ethanol producing countries, the targets set for 1985 could be achieved, and energy cropping in these countries could have a substantial impact on world markets. If ethanol production targets are met, ethanol production could absorb by 1985 the equivalent of the total volume (18 million tons) of sugar traded internationally in 1980. The impact on the cereal sector could also be substantial. By 1985, if the ethanol targets were achieved in the United States, the equivalent of about 40 percent of United States maize exports in 1981/82 might be used to produce fuel alcohol.

1/ At its 21st Session, the FAO Conference "stressed that, to the maximum extent possible, energy cropping should aim at utilizing non-food crops and/or agricultural waste".

7. It is doubtful, however, whether this is likely to occur in practice. Although production of liquid fuels from agricultural commodities has so far proceeded as planned in Brazil, the Philippines and the United States, the Brazilian government has recently decided to postpone its 1985 target for two years, while the United States programme is currently under critical review. If government support in either of these countries were to be severely curtailed, it is improbable, given the present technology and price relationships, that the present targets would be met.

8. Given the early stage of the energy cropping programmes in most countries, and the uncertainties which surround these programmes in countries where these have proceeded more rapidly, further developments will need to be watched very closely in order to assess the impact of energy cropping on food supplies and prices. In view of this, and as suggested by both the Sixth Session of the Committee on World Food Security and the 21st Session of the FAO Conference, the Secretariat will continue to monitor closely the progress of national energy cropping programmes.

II. STATUS OF NATIONAL PROGRAMMES

	<u>AGRICULTURAL FEEDSTOCK</u>	<u>STATUS OF PROGRAMME</u>
<u>North America</u>		
Canada	Agricultural wastes, barley, maize, sugar beet, potatoes, artichokes	Research stage
United States	Maize, sweet sorghum	On-going-programme ^{1/}
<u>Western Europe</u>		
Belgium	-	No programme
Denmark	-	No programme
France	Jerusalem artichokes, sweet sorghum	Research phase
Finland	Agricultural waste	Feasibility study underway
Germany, Fed. Rep.	Grain, sugar beet, agricultural waste	Research phase
Iceland	-	No programme
Ireland	-	No programme
Italy	n.a.	Research phase
Netherlands	-	No programme
Norway	-	No programme
Portugal	Agricultural waste	Research phase
Sweden	Cereals	Results of experimentation to be evaluated in 1983
Switzerland	-	No programme
<u>Eastern Europe and USSR</u>		
Bulgaria	-	No programme
Czechoslovakia	-	No programme
Germany, Dem. Rep.	n.a.	Research phase
Hungary	Agricultural crops	Research phase
Poland	-	No programme
Romania	n.a.	Research phase
USSR	Agricultural waste	Research phase
<u>Oceania</u>		
Australia	Wheat, corn, sugarcane, sweet sorghum, cassava, oilseeds, molasses	Research and small scale production for marketing trial
New Zealand	-	No programme

^{1/} See detailed notes, pp. 10

II. Status of National Programmes (continued)

	<u>AGRICULTURAL FEEDSTOCK</u>	<u>STATUS OF PROGRAMME</u>
<u>Far East</u>		
Bangladesh	-	No programme
China	n.a.	Research phase
Korea	n.a.	Feasibility study underway
India	n.a.	Research phase
Indonesia	Agricultural waste	Research phase
Japan	Agricultural waste	Research phase. Under a 7 year 32 billion Yen programme, the Government hopes to begin large-scale production of alcohol fuel in 1990
Nepal	n.a.	Research phase
Pakistan	Agricultural waste	Pilot project
Philippines	Sugar, coconut oil	On-going programme ^{1/}
Thailand	Sugarcane	Preliminary ^{1/}
Sri Lanka	-	No programme
<u>Near East</u>		
Cyprus	-	No programme
Iraq	-	No programme
Israel	Agricultural waste	Research phase
Jordan	-	No programme
Syria	-	No programme
Turkey	Agricultural waste	Research phase
<u>Africa</u>		
Cameroon	-	No programme
Kenya	Sugarcane	A major policy objective is to achieve 20 percent replacement of gasoline by 1985. An alcohol distillery, which will use molasses by-product of sugar mills as a feedstock for producing ethanol for blending with gasoline was to have come on-stream in 1981. Two additional fuel alcohol plants based on molasses and sugar are expected to come into operation in 1983 and 1985.
Lesotho	-	No programme
Liberia	-	No programme

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^{1/} See detailed notes, pp. 8; 9

II. Status of National Programmes (continued)

	<u>AGRICULTURAL FEEDSTOCK</u>	<u>STATUS OF PROGRAMME</u>
<u>Africa (continued)</u>		
Mozambique	Agricultural waste	Research phase
Nigeria	n.a.	Research phase
Sierra Leone	n.a.	Research phase
South Africa	Cassava	Pilot projects. Plans exist for 13 ethanol distilleries to produce 137 million gallons of liquid fuel per year (no target date specified).
	Sugarcane	n.a.
	Sunflowerseed	Pilot project
	Vegetable oil	Experimental
Sudan	Molasses	Feasibility study underway
Tunisia	-	No programme
Zimbabwe	n.a.	On-going project
	Vegetable oil	Experimental
<u>Latin America</u>		
Argentina	Molasses	Implementation phase - small scale
Bolivia	-	No programme
Brazil	Sugarcane	On-going programme ^{1/}
Colombia	-	Feasibility study
Costa Rica	Sugarcane	Small pilot project
Cuba	Sugarcane	Small pilot plant in operation
Dominican Republic	Sugarcane	Feasibility study
Ecuador	-	No programme
Equatorial Guinea	-	No programme
Guatemala	Sugarcane	Feasibility study underway
Guyana	Agricultural waste	Feasibility studies underway
Jamaica	Sugarcane, cassava, tropical grasses and fast growing trees	Feasibility studies underway
Paraguay	Sugarcane	On-going programme ^{1/}
Peru	Sugarcane	On-going programme
Suriname	Agricultural waste	Research phase
Venezuela	Sugarcane	Research phase

^{1/} See detailed note, pp. 6; 7

BRAZIL		1978	1979	1980	1981 Est.	1985 Proj.
Total gasoline consumption (billion litres)		15.1	19.3			10.7 ^{1/}
Production of liquid fuel from agricultural commodities						
Targeted volume (billion litres)					4.8	
Actual volume (billion litres)		1.6	2.9	4.2	4.8	
Share of total gasoline consumption (percent)		(10.5)	(15.0)			
Required agricultural feedstock						
Sugar cane volume (million tons)		23	42	60	70	154
area (million ha.)		0.4	0.75	1.05	1.2	2.4-3.5
share of total production (percent)		(18)	(30)	(40)	(45)	
Under experimentation: cassava, oils						
<u>Policy objectives</u>						
- To produce 10.7 billion litres of fuel alcohol by 1985.						
- To replace gasoline completely with hydrous alcohol and diesel with an alcohol petroleum base or an alcohol/vegetable oil mix.						
<u>Measures to achieve objectives</u>						
- Incentive prices to encourage sugar cane production for conversion into liquid fuel.						
- Subsidised loans for construction of distilleries.						
- Sales tax on all petroleum derivatives to contribute to the financing of the national ethanol programme.						
- Reduced road tax on alcohol powered cars.						
- Subsidised loans for purchase of alcohol powered cars.						
- Curtailment of gasoline sales from Friday night to Monday morning, during which time only fuel alcohol can be sold.						
<u>Obstacles</u>						
- Shortage of public funds.						
- Declining consumer acceptance of alcohol fuel due to lack of confidence in supply reliability, lower mileage obtained and higher maintenance costs involved with alcohol compared to gasoline.						
- Problems concerning the disposal of stillage, a by-product of alcohol distilleries with a high pollutant effect.						
<u>1/</u> The Government in November 1981 announced that it would postpone this target by one or two years.						

PARAGUAY	1981	1982	1983	1984 Est.	1985 Proj.	1986 Proj.
Total liquid fuel consumption (million litres)	163	190	218	240	265	299
Production of liquid fuel from agricultural commodities						
Targeted volume (million litres)	15	31	48	58	70	91
Share of total gasoline consumption (percent)	(9)	(16)	(22)	(24)	(26)	(30)
Required agricultural feedstock						
Sugar cane volume (thousand tons)	240	517	800	966	1170	1400
area (thousand ha.)	6	13	20	24	29	35
share of total production (percent)	(15)					
<u>Policy objective</u>						
- Gradual substitution of petroleum with liquid fuel alcohol.						
<u>Measures to achieve objective</u>						
- Government authorization to begin to blend gasoline with 10 percent alcohol in 1981, with 20 percent alcohol in 1982.						
- Special lines of credit for sugarcane production and for construction of distilleries.						
- Minimum fixed prices for sugarcane used to produce alcohol.						
- Fuel alcohol sales exempted from alcohol sales tax.						
- Investment tax credits for distillers.						
- Construction of government owned distillery with annual capacity of 21.6 million litres.						
- The government is currently considering the possibility of an import tax exemption for alcohol powered cars.						
<u>Obstacles</u>						
- High cost of converting sugarcane into fuel alcohol.						
- Limited domestic market for fuel alcohol.						
- Initial lack of consumer confidence in the use of the alcohol blend.						

	1980	1981 Est.	1982 Proj.	1983 Proj.	1985 Proj.	1988 Proj.
PHILIPPINES						
Total gasoline consumption (billion litres)	2.50	2.57	2.64	2.72	2.89	3.17
Production of liquid fuel from agriculture commodities						
Targeted volume (million litres)	22	55	144	244	545	925
Actual volume (million litres)	22	(2.1)	(5.5)	(9.0)	(18.9)	(29.2)
Share of total gasoline consumption (percent)	(0.9)					
Required agricultural feedstock						
Sugarcane volume (million tons)	0.33	0.90	2.1	3.6	8.1	13.8
area (thousand ha.)	7.0	20.0	-	-	-	-
share of total production (percent)	(1.6)	(4.3)				
<u>Under experimentation:</u>						
Cassava, sweet potato, banana, sweet sorghum, rice and coconut						

Policy objectives

- To produce 925 million litres of ethanol by 1988.
- To save foreign exchange.
- To provide the sugar industry with a guaranteed market.

Measures to achieve objectives

- Guaranteed producer prices for sugar.
- Increases in alcohol prices are tied to increases in gasoline prices.
- Government financial assistance including investment tax allowance, capital gains tax exemption, preferential government loans, and income tax reduction.
- Recultivation of marginal or abandoned cane lands.
- Incentives to farmers through credit and haulage allowances.
- Research programmes to diversify alcohol feedstocks.

Obstacles

- Fuel system corrosion problem still remains unresolved.

THAILAND	1980	1981 Est.	1982 Proj.	1983 Proj.	1984 Proj.	1985 Proj.	1986 Proj.
Total gasoline consumption (billion litres)	2.806	2.942	3.124	3.151	3.177	3.173	3.212
Production of liquid fuel from agricultural commodities	-	0.147	0.250	0.315	0.318	0.476	0.482
Targeted volume (billion litres)	-	(5)	(8)	(10)	(10)	(15)	(15)
Share of total gasoline consumption (percent) $\frac{1}{2}$	-	2.2	3.7	4.2	4.7	7.3	7.1
Required agricultural feedstock	-	0.05	-	-	-	-	-
Sugarcane: volume (million tons)	-	(14)	-	-	-	-	-
area (million ha.)	-	-	-	-	-	-	-
share of total production (percent)	-	-	-	-	-	-	-
<u>Under experimentation: cassava</u>	-	-	-	-	-	-	-

$\frac{1}{2}$ When available, percentages are calculated on the basis of actual production levels.

$\frac{2}{2}$ Assuming an extraction rate of 68 litres of alcohol per ton of sugarcane.

Policy objectives

- To replace 15 percent of gasoline used in the transportation sector which accounts for 85 percent of total gasoline consumption with fuel alcohol.
- To produce 482 million litres of alcohol as fuel in 1986.
- Provision of stability to the sugar industry.
- To achieve substantial foreign exchange savings from imported fuel.

Measures to achieve objectives

- Tax is applied on the sale of petroleum products.
- Government establishes the price level for petroleum.
- Government has recently negotiated expansion of current distillery capacity.

Obstacles

- A certain degree of producer reluctance to incorporate their farmlands into large sugarcane conversion enterprises.

UNITED STATES	1979	1980	1981	1982 Est.	1985 Proj.	1986 Proj.	1990 Proj.
Total gasoline consumption (billion litres)	302.8						379
Production of liquid fuel from agricultural commodities							
Targeting volume (billion litres)	-	-	1.9	3.5	9.5	15.1	37.9
Actual volume (billion litres)	0.30	0.38	3.4	-	-	-	-
Share of total gasoline consumption (percent)	(0.1)						(10)
Required agricultural feedstock							
Maize volume (million tons)	0.8	1.0	9.0 ^{1/}	9.2	25.0	40.0	100
area (million ha.)	.12	.16	1.44 ^{1/}	1.48	4.08	7.2	18
share of total production (percent)	(0.3)	(0.5)	(4.5)	-	-	-	-
<u>Under experimentation: sweet sorghum</u>							

Programme objectives

- The US Energy Security Act of 1980 established a federal programme with the aim of producing 4 billion gallons of gasoline (10 percent ethanol and 90 percent unleaded gasoline) by 1986 and 10 billion gallons or 10 percent of total domestic gasoline consumption by 1990.

Measures to achieve programme objectives

- Exemption of gasoline from 4 cent/gallon federal excise tax (through 1992).
- Special 10 percent investment tax credit (through 1985).
- Grants, loans and loan guarantees totalling US\$ 1.05 billion.
- Mandatory use of gasoline in federal motor vehicles.
- The Secretary of Agriculture has the authority to grant alcohol producers preferential access to government held stocks of maize and to establish a gasoline feedstock reserve.
- Incentive payments are provided to farmers devoting set-aside acreage to production of crops for fuel.
- Priority allocation of natural gas (in case of shortage) to crop production for fuel alcohol and for production of fuel alcohol.
- Exemption of gasoline from state gasoline taxes in 25 states.

Problems

- Programme is under critical review by present Administration.
- Achievement of programme's objectives unlikely if federal financial assistance is withdrawn.

^{1/} Calculated on the basis of actual production.