FEASIBILITY STUDY
EDIBLE OIL SEED PRODUCTION, MARKETING AND PROCESSING IN VIETNAM

OILSEED TEAM
PRODUCTION SECTION
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JULY-AUGUST 1971

INTRODUCTION

The general charge to this team was to investigate country-wide feasibility for the production, marketing and processing of vegetable oil seed for edible oils and oil cake. Specific references were made to peanuts and soybean production and their utilization for oil, and oil cake.

Because of the lack of sufficient data and due to the fact that some areas of the country could not be visited for observation and talking with producers and processors, some of this report must be based on judgment and conclusions resulting from years of experience in research and production under conditions which were dissimilar from those prevailing in Vietnam. Judgments have been tempered in such a way as to reflect local production, marketing and processing conditions and problems as much as possible.

In preparation for this report, the team spent the period beginning at noon July 12 and ending Saturday July 17, with USAID staff, with processors, bankers (IDB and private) and other businessmen in Saigon. The purpose of these conferences was to permit the team to learn as much as possible about interest in oil seed processing, facilities available and interest in financing any facility needs that might be indicated as a result of this study.

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Oilseed Team report.

In cooperation with USAID/Vietnam.

The week of July 19 was spent with similar groups, plus producers of peanuts, province leaders and others in the area of Danang, Quang Nam, Tam Ky, Quang Ngai and Qui Nhon. On many instances the team separated, the Agricultural Economist meeting with people associated with production of oil seed crops and the Engineer meeting with those people interested in or concerned with processing.

During July 26 and 27 the team visited Tay Ninh, Hau Nghia and Binh Duong provinces followed by visits on July 28 to 31 to Chau Doc, An Giang and Phong Dinh provinces.

These trips constituted the major time spent on in the field contacts and studies. They were supplemented by a later visit to Long Khanh province by the economist and additional conferences with businessmen by the engineer.

Additionally, several days have been spent revieving reports and data relating to agriculture and industry in Vietnam. The purpose of these visits, as supplements to available data and reports included:

a. The determination of interest in increasing acreages of these oil seed crops and significant problems that may be associated with the expansion of production.

b. The determination of interest of individuals or groups in the financing of acreages expansion, storage, processing, and related facilites.

c. The evaluation of the competitive position of these oil seed crops with other crops produced in the areas visited.

d. The evaluation of the present market structure for these crops and arrive at conclusions which would lead to improvement of market system, with the reestablishment and improvement of transportation facilities.

Many people worked with the team in planning travel, providing travel, arranging visits to producers, processors and bankers. To these people, too numerous to name here, we are deeply grateful.

REVIEW OF VEGETABLE OIL SEED CROP PRODUCTION AND DISPOSITION

The goal for the production of peanuts and soybeans in 1971 (Five-Year Plan) was 36,028 MT of peanuts and 9,007 tons of soybeans. How near the actual production is coming to the goal is not yet known, although in some provinces visited local people appeared to have reasonable expectation that the goal will be met or nearly so.

However, these goals provide for only about 2 kg. of peanuts and 0.5 kg. soybeans per capita. Most of these nuts and soybeans will be used as vegetable (direct consumption) rather than a source of edible oil and oil meal.

According to the January 10-April 9 Quarterly Report of the Chinese Agricultural Technical Group in Vietnam (Contract AID-430-2882, Ministry

of Land Reform, Agriculture & Fishery Development, Republic of Vietnam, US Agency for International Development and the Joint Commission on Rural Reconstruction, Republic of China) the production of peanuts in 1970 on 25,550 hectares was 25,550 MT of which 8,287.5 MT were consumed as nuts and the remaining 16,575 MT tons were used to produce 2,900 MT of peanut oil. The same report indicates that there were 6,000 Ha. of soybeans with a yield of 0.8 MT/Ha. producing 4,800 MT of soybeans. Additionally, 3,200 MT of soybeans come into the country from Cambodia. These soybeans (in-country produced and imports) were used 50% for bean curd, 40% for bean posts and 10% for bean sprout and others.

The import data of edible oil indicates that the consumption of imported oil has been increasing in recent years. How much of this increase represents increase in per capita consumption of edible oil and how much represents replacement of in-country produced hog lard and other fats and oils apparently is not known.

Imports, as shown in the following table shows an increase in edible oil from 9,600,000 liters in 1970 to 32,000,000 liters in 1971 (included that scheduled to arrive). 1971 imports would, therefore, equal to about 1.78 liters per capita. However, the writer questions the assumption that the 32,000,000 liters import for 1971 will be consumed in 1971.

Quantity of Edible Oil Imported
1968-1971

Year	ARVN Commissary Liters	Source	GSA Commissary Liters	Source
1968	7,776,000	Germany	0	
1969	4,400,000	Singapore	0	
1970	8,600,000	Singapore	1,000,000	Singapore
1971 to date	13,500,000	Singapore	1,500,000	Singapore
To arrive	17,000,000	U.S.A.		

However, if we assume that the scheduled 1971 import of edible oil will be used in 1971 and that it would be practical for Vietnam to produce enough peanuts and/or soybeans, to produce this oil in-country (in addition to current production of these crops) it would require considerable additional area devoted to these crops. Based on the current average yield of 1.0 MT of peanuts per hectare and 50% oil extracted from shelled peanuts it would be necessary to plant an additional 87,000 hectares if this crop produced all the additional oil. On the basis of 0.8 MT per hectare of soybeans, and 20% oil extraction, it would require 180,000 hectares to produce this additional quantity of oil.

In the opinion of this team, the meeting of a goal of this magnitude could not be accomplished in the near future and probably may never be practical of attainment. This would require the reassignment to oil seed crops much more land than is now available and suitable for

production of these crops, and more of other resources than could be made available for this purpose. Based on the current yields and methods of production of peanuts, it requires approximately 600 days of labor on the farm to produce enough peanuts to produce one metric ton of oil. For soybeans, the farm labor would be even more.

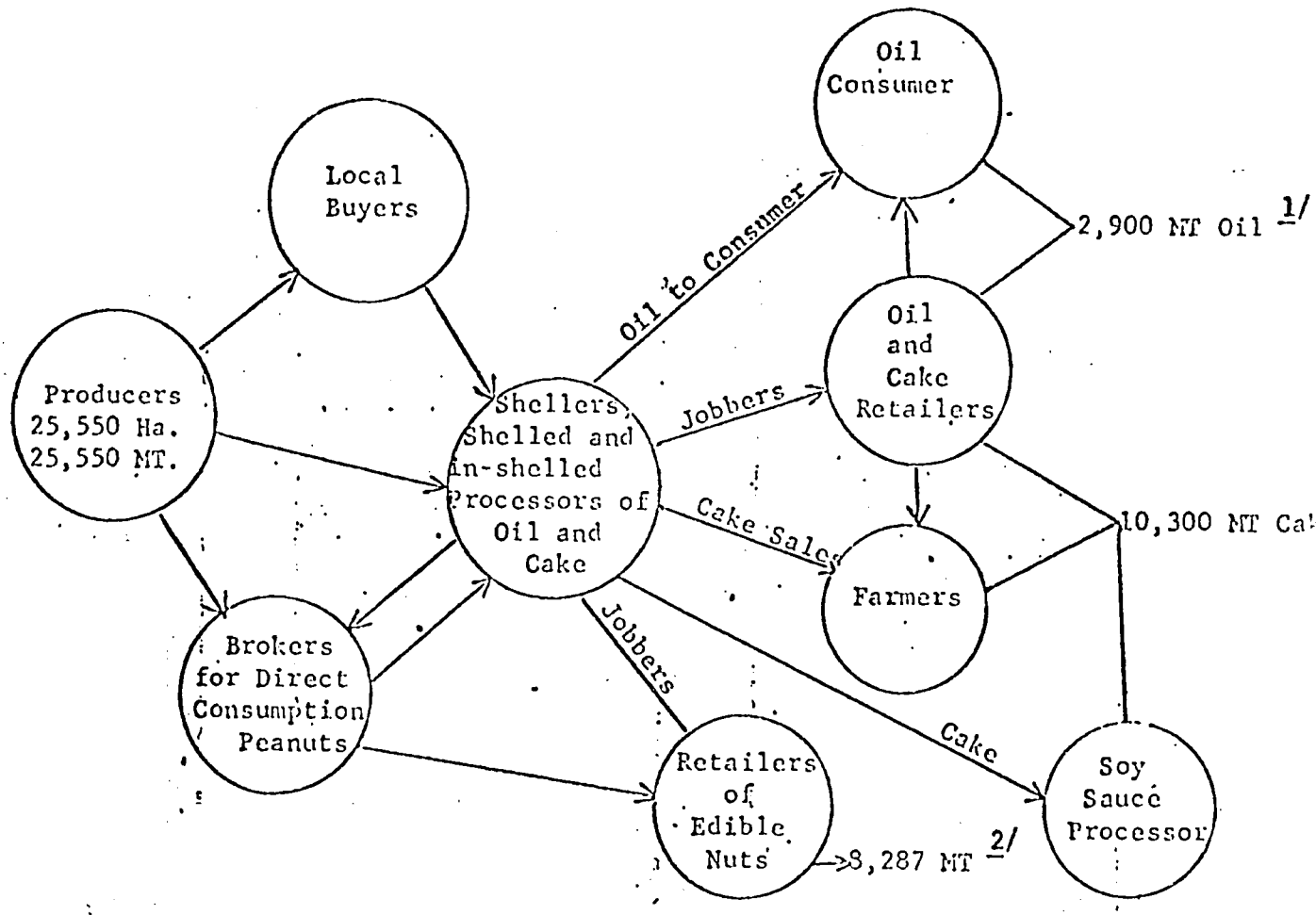
Currently all of the soybeans and about 2/3 of the peanuts produced in country are used for direct consumption.

As indicated above, this report is a combination of judgments and analysis. Much judgment is involved in suggestions as to total hectares that might go into oilseed crops under certain assumptions.

ANALYSIS OF OIL SEED MARKET STRUCTURE

Oil seed disposition as now established appears to follow no well definable market sturcture. The fact that small areas of production are widely scattered and markting and processing is, except in the case of edible nuts and beans flowing into the Saigon market, based largely on local needs. While this makes it very difficult to establish a clear cut market flow it appears to approximate the following flow chart covering the movement of the 1970 Peanut Crop as reported by the Chinese Agricultural Technical Group to Vietnam, Third Quarterly Report. Essentially, the same pattern of flow is followed for soybeans except for the injection of imported beans and the elimination of certain processes and products.

PEANUT MARKET STRUCTURE
(ESTIMATED PRODUCTION, 1970 FROM
CHINESE AGRICULTURAL TECHNICAL GROUP STUDY)



1/ Based on 22% oil recovery. Most oil appears to be produced with in-shell peanuts and required 13,670 MT of in-shell peanuts.

2/ Based on 70% shelling turn out and required 11,838 MT in-shelled peanuts. Oil and cake going directly from Processor to Oil Consumer and farmers. In most cases appeared to be the farmer who produced the peanuts, or in some cases the farmer himself owned an extraction log and he was both extractor and consumer. Cake used for tobacco fertilizer, for soy sauce and for livestock feed.

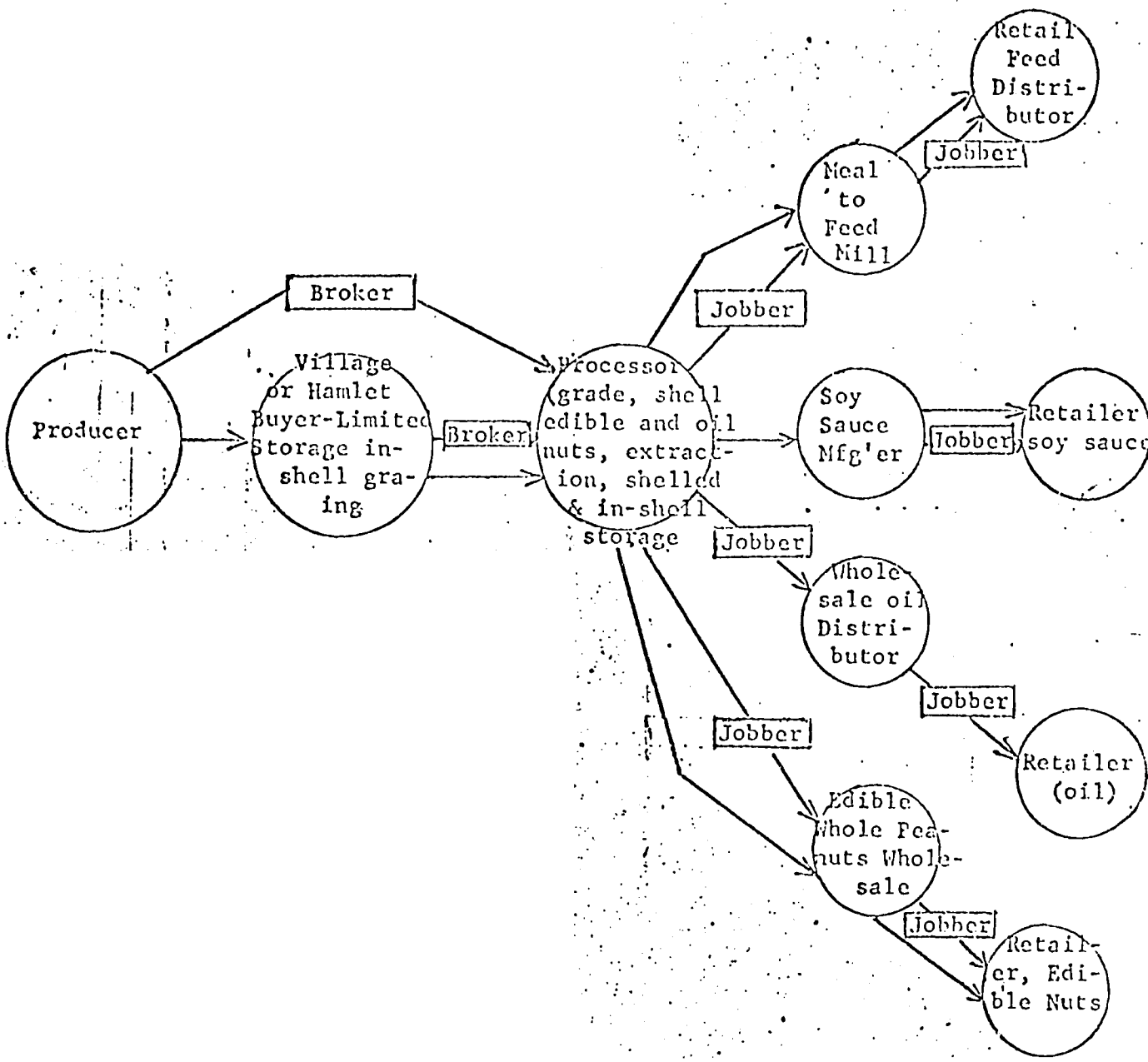
In order to provide some logical bases for establishing a viable oil seed processing industry and evaluate its potential to the nation's economy, certain assumptions are made and the flow chart reproduced herein below is used as a model of the recommended market system.

Assumptions:

That within the next five years the increases in hectares of peanuts and soybeans planted and the recommendation made under the peanut and soybeans sections of this report will result in the production of raw products to meet the needs of the edible trades and at least 30,000 MT of peanuts and 10,000 MT of soybeans for processing, and that

The VN dollar will stabilize at 350VN$ to 1US$.

SUGGESTED MARKET STRUCTURE
(PEANUT AND PEANUT PRODUCTS, AND WITH
MODIFICATIONS TO ACCOMODATE DIFFERENCES IN PRODUCT, SOYBEAN)



This suggested market flow ignores the fact that with modern extraction facilities which of necessity will not always be convenient to, nor in position to serve all small producers, the log extraction of peanut oil will probably continue in small isolated communities for a number of years. The development of highways and better market facilities will gradually eliminate even the more remote operations of this kind.

SOYBEANS

The areas of greatest interest in soybean production were Chau Doc, An Giang and Phong Dinh provinces in IV CORP and Long Khanh province in III CORP. As far as we could determine, interest and production of soybeans in I and II CORP was very little. However, there appeared to be some sections that, based on soil, general description of weather patterns, and other generalized information, could be better adapted to peanut or soybeans than some sections of those areas we were able to visit. Lack of full security made it impractical for us to go into areas in I and II CORP provinces except in the immediate vicinity of the coastal highway. The team recognizes that, as a practical matter, some of these potential areas of soybean and/or peanuts many not be available for some years to come. (See Appendix I)

Soybean production in the above indicated IV CORP provinces currently appears to be about 2,500 hectares, with the best quality beans normally produced in the dry season (planting in December for March or April harvest). While the dry season produces the best quality beans they also have the greatest competition for land, labor and capital from the other high value fresh vegetable crops of the area. Wet season soybeans, now being harvested are of very poor quality due to excess rain.

The soils of Vietnam are generally acid ranging from about 5.6 to 5.8 on the more loamy ridges, produced from the dropping of the heavier

soil particles at these points by the flooding rivers, downward to as low as 3.5 pH. These levee soils, generally more easily tilled, may extend from 100 to 200 or 300 meters in width. These soils currently produce a large part of the vegetables and fruits of these Delta provinces. They are well adapted to vegetable and fruit production as well as for soybeans and the vegetables at the present time often have an income advantage over soybeans to the extent of VN$25,000 or more.

Legumes generally do best in soil approaching neutrality as far as acidity is concerned (pH 7.0). Soybeans will do well on soils 5.8 to 6.4 if they have a good supply of calcium. Soil acidity is raised to a higher pH by the addition of agricultural calcium, the best form of which is dolomities.

Vietnam's natural resources of calcium bearing limestone is very good according to a recently released study on limestones made by Pope, Evans and Robbins International Ltd. This report covers Project Number 1079 and is entitled "Basic Chemical Industry in Vietnam" made for US Agency for International Development, USAID Contract VN-58.

One of the better farmers of the three province Delta area visited reported soybean yields of 800 kg/ha for wet season soybeans which sold at VN$70/kilo or VN$56,000. If value is placed on family labor at the same rate as hired labor, total cost of production (not including rental value of the land) would be VN$59,000 or a loss of VN$3,000. On the other hand, dry season soybeans produced 1,400 kg/ha which sell at about VN$92 - total value of VN$128,000. No estimate of additional

cost of this larger crop was secured. This added cost would probably be limited primarily to harvesting, drying and threshing labor. Disregarding this added cost, the net for the wet season crop is VN$69,800. At the same time this grower receives about VN$130,000/ha net from cabbage, with other vegetables returning as much or more net per hectare as did soybeans.

The above referred to Third Quarterly Report of the Chinese Agricultural Technical Group to Vietnam reported soybean prices on February 7, 1971 as follows: Farm VN$80/kg; Wholesale VN$110/kg; and Retail VN$130/kg. Converted to MT these prices are VN$80,000, VN$110,000 and VN$130,000. By way of comparison, prices of No. 1 yellow soybeans, Chicago, May 1971 was US$3.03 per bushel or US$110 per metric ton. Using the June 21, 1971 currency rate quoted in a Saigon Retail Prices report for June of US$1 green to VN$378, the above quoted Chicago price for U.S. soybeans would be VN$41,580/MT.

The above calculations indicate such a wide disparity in prices received for soybeans for use as a vegetable in Vietnam and that received for oil use in U.S. that the production of soybeans for oil in Vietnam at the present time with the current levels of yields and prices does not appear economically feasible. Material increase in yields and lowering of the cost of production would change this situation. It should be recognized that some price incentive will probably be needed at either the production or processing level to assure the establishment of a

viable vegetable oil processing industry. Current prices for soybeans have been influenced somewhat by the reduced production during the recent war years. The return to a more normal situation should result in a shift of both vegetable and vegetable oil seed crops into those areas in which they were formerly produced and soybean and peanut yield will probably show a slight increase in yield.

Based on the assumption that vegetable production will move more closely to the major Saigon market area since the Delta area South and West of Saigon has been made more secure, it is expected that much of the Delta area now used largely for fresh vegetables in Chau Doc, An Giang, and Phong Dinh provinces will, within one or two years, be available for soybean production. Soybean production should then increase and the relative price should decrease.

RECOMMENDATIONS FOR SOYBEANS

In connection with efforts to expand both hectarage and yield of soybeans, it is recommended that:

A. That serious consideration be given to the allocation of larger areas of farm land to each farm family so as to encourage the use of more farm machinery in order to reduce total labor needs per hectare and to increase yields of all crops. The area available to most producers discourages equipment ownership and in many case, no doubt, makes custom hiring of equipment

difficult and often impractical. Crop land area of ten or more hectares per family would make a movement toward more farm mechanization much more practical.

B. Research in production of soybeans be expanded to screen a large number of varieties from countries of comparable latitude and similar soils. This work should be done with such numbers of varieties and plot size to make reasonable success in locating acceptable varieties in two to three years. Currently, varieties used do not appear to have the production potential needed to establish a successful oil extraction industry.

C. An extensive training program be established for at least one agronomist and one engineer in a country of comparable latitude and similar soils to develop expertise in cultural practices, including fertilization (and liming), chemical weed control, use of machinery, insect control, irrigation, seed drying and storing, and seed inoculation.

D. If any immediate effort is made to establish soybean oil process facilities in-country, it should be based on securing soybeans on the worldmarket to supplement local production with the idea of gradually increasing use of in-country produced soybeans as they may become available.

E. That immediate work be started in establishing a grading and pricing system for in-country produced beans. These standards

could be fashioned after the official standards for soybeans, revised effective September 1, 1955, as published in the "Soybean Digest Blue Book Issue", March 1971, the Soybean Digest, Hudson, Iowa 50643, USA. At least in the beginning, for in-country use the standard may well be set at a less stringent level than the above. (See Appendix II)

F. Any pricing system should be at such a farm price level, based on production progress being made by the producers in increasing their yield, so as to provide enough return to assure that ample production would be forthcoming. Increase production should be promoted to assure ample supplies above the need for direct consumption to utilize the capacity of any oil producing facilities that are established. Soybean meal would be available for supplying a part of the protein supplement for the expanding feed and livestock industries. Bulk per short ton price of US soybean meal (44% protein) is currently priced at about US$85. Meal prices at about 80% to 90% of the cost of a ton of soybeans, depending on the supply and demand situation at the time, appear to be about in order, while bulk refined oil wholesale prices from processing plant should normally fall, in the range of about 2.8 to 3.2 times the price of soybeans.

G. At such time as in-country production of soybeans for oil and meal processing may be started, it will be necessary to estab-

lish warehousing or storage facilities. Central storage should be at the processing plant, fully equipped for protection of the soybeans from insects and possible in-storage damage from moisture. Silo type storage with full automation for filling, emptying and in-storage aeration and drying will be the most appropriate in the long run. Smaller and less expensive storage, less automated, with necessary weighing scales, grading facilities and at least a reasonable protection from rodent and other losses should initially suffice in the production areas. Both the processing plant and the hamlet or village storage should be located on water, rail or highway arteries to assure ease and economy in transportation. (Note: The team failed to locate information on storage problems that may be associated with silo type storage for soybeans (high humidity problems) and this matter should be thoroughly checked before such facilites are constructed).

H. That the production of agriculture limestone be initiated at the earliest practical time. Calcium provided by limestone is essential to good production of most vegetables and all legumes.

Soybean plants examined during this study had very few viable nitrogen-fixing nodules on their roots. This could have been because of molybdenum deficiency in the soil, or

the soil acidity may have made molybdenum unavailable to the plant. Test in the mountain section of Georgia (USA) show that the raising of the soil pH from 5.6 to 6.4 increased the soybean yield from 31.7 to 41.7 Bu. per acre. The application of 0.4 pounds of molybdenum on a 5.6 pH soil gave the same increase..

I. Soybean test should be expanded in areas other than the Chau Doc, An Giang, and Phong Dinh provinces. The soils of The Tay Ninh, Hau Nghia, Binh Duong, and Long Khanh province area appear to offer possibility for soybean production. These provinces were producing the best peanuts seen on our visits (see peanut recommendations section). However, in these areas some soil leveling and provisions for irrigation should be considered. Additionally, because of production problems, particularly from diseases where peanuts and soybeans are grown in the same rotation, it is recommended that no attempt should be made to produce both these crops on the same soil area.

J. With serious efforts at increasing yields and hectares of soybeans, it is believed that within five to seven years up to 10,000 MT of soybeans can be made available for oil and meal production (See Appendix IV).

PEANUTS

The area offering the best opportunity for the successful production of peanuts for oil and cake production included the Tay Ninh, Hau Nghia and Binh Duong provinces. However, there is evidence that much of this area may be best used for soybean and peanut production primarily for direct consumption in the large Saigon market. The northern provinces (I and II CORP) have areas that are marginal in rice production that could successfully produce peanuts. Much of the suitable soils observed there would, for high production, require some land leveling and/or provision for irrigation and use the lime and more fertilizer.

Peanuts, like soybeans, are most productive on the lighter loamy soil (not the deep sandy soils as found near the coast) that are well drained. Legumes, (as are peanuts and soybeans) do not produce well on very wet waterlogged soil. Soils that are well adapted to rice normally are not good soils for legumes. Frequently they are more acid and the waterlogged soils do not provide enough aeration to permit the development of nitrogen-fixing nodules essential for successful legume production. However, reworking of soil slopes for successful irrigation and applying sufficient lime to raise the pH level would make many of these soils suitable for peanut and/or soybean production.

Provinces in III CORP appear to be the location of a large part of the peanuts produced and used as a vegetable (edible as nuts) for the Saigon market. This tends to establish a price that is normally prohi-

bitive for purchasing of peanuts for oil extraction and meal production. In fact at least one cottage type log oil extraction operation visited had closed down this year because, it was reported the price of peanuts was too high for his operation to be profitable.

In I and II CORPS, peanuts are produced for both the direct edible trade and for oil extraction by the log extraction method.

In all peanut producing areas one or more of the following dispositions were made of the nuts by the growers.

1. Owns an oil extraction log and produced his home needs of oil and peanut cake (used cake primarily as fertilizer for tobacco and, in some cases, for hog feed). Surplus oil and cake frequently sold to neighbors.
2. Had part of his crop processed for oil and cake on a custom basis at a cost of approximately VN$45/kilo of oil. Sold those not needed for own family use to processor or merchant.
3. Sold peanuts to peanut buyers who were purchasing for a sheller and/or extractors. Price received by grower frequently ranged from VN$75 to VN$80/kilo with an occasional report of VN$90/kilo.

Operators of log oil extractors secured their supply of peanuts as follows:

1. Some grew part of peanuts they used and purchased balance of needs.

2. Some purchased all peanuts needed, frequently employing services of a buyer to go into the peanut area to purchase the peanuts from the grower. The processor, as in the case of one operation visited near Saigon, may shell peanuts and sell some whole nuts to the Saigon market and extract oil from others. In this one case the sheller-log extractor operator custom shelled peanuts for the farmer at VN$50/bag, used some hulls as fuel in his extraction processing and the balance to farmers for VN$30/bag and sold the cake at VN$100/kilo to processors of soy sauce and other uses.

In most case the farm price at harvesting time ranged from VN$50 to VN$60/kilo and as the processing season advanced the price increased to about VN$75 to VN$85/kilo and occasionally higher. The harvest season in-shell price would range on the above basis, from 50,000VN$ to 60,000VN$/MT. By way of comparison, the US Department of Agriculture in its June 1971 "Fats and Oil Situation" reports shows that the US Southeast Spanish peanuts, farmers stock #1 (edible, not oil peanuts) price has been set at minimum of US$13.35/100 lbs. or US$293.70/MT. This would, on the June 21, 1971 exchange rate of VN$378/US$1 equal to VN$111,018/MT. However, this is for No. 1 edible peanuts. While no current prices of US peanuts for oil stock are available, it will probably be in the range of US$145 to US$150/MT or the equivalent to VN$54,810 to VN$56,700/MT.

Thus the prices received by the Vietnam growers of peanuts is not as much different from the U.S. oil stock prices as are the prices received by the growers of soybean. This may reflect the relative disadvantage of soybean production due to relatively low yields. While records show that some soybeans are imported due to this favorable price, no peanut imports are recorded in available records.

However, I could find no real differences in prices paid the farmer for peanuts for edible trade and those used for oil extraction. Apparently, there is no uniform grading system. One sheller we visited separated the small and immature nuts to go into oil extraction leaving the more uniform and larger nuts for the edible trade. But so far as I could determine, this was done on no fixed uniform grading basis.

As with soybeans, peanut prices have been largely established, though to a lesser degree, upon the value as a food crop. Any increases of production for the expansion of peanut oil extraction will be at a price that is affected by the higher food product. That will be especially true during the early part of an expansion program and until the production for oil more closely meets the needs of established extraction plant capacity.

Peanut yield per hectare appears to range from an estimated 0.8 to 1.5MT/ha. (The Chinese Agricultural Technical Group to Vietnam reported the average yield in 1970 to be 1.0 MT/ha).

To meet the needs for directly consumed peanuts and establish a viable peanut oil extraction industry, it is imperative that steps be taken to increase yields to a level substantially above current rates. However, it appears that soil resources are such that a 50 to 75% increase in yields over the next few years is not impossible. Such increases, along with the allocating of additional hectares for peanut production (also, additional hectares per farm family - See "A" under Recommendations for Soybeans), can be the basis of meeting a reasonable increase of direct consumption and establishing an oil and meal processing industry. It will require more than merely increasing the land alloted to peanut production. The following recommendations will increase much of the additional outputs needed to accomplish this desired goal.

RECOMMENDATIONS FOR PEANUTS

Based on soil conditions; the potential of allocating additional land to peanuts as it is reclaimed for production following the improvement of security in the areas involved; the current yield of peanuts; the current method of extracting oil; current peanut price situation and many other factors, the following recommendations are made:

A. That consideration be given to establishing a peanut oil extraction facility of approximately 30,000 ton annual in-take capacity. This would require the establishment of the necessary processing facility, storage at plant, temporary storage in

producing area, transportation facilities, container supply and products marketing channels and the final decision must weigh very carefully the cost of the extraction facilities.

B. That immediate plans be developed and implemented that will:

1. Provide advanced training for at least one outstanding young scientist trained in agronomy and one in engineering. Training for these scientist would be most meaningful if it is accomplished at an out of country institution where outstanding research in peanut production has been accomplished. This training should be on an actual-work-study basis and at an institution with as similar soils and climate as possible. Their work-study program should include (but not necessarily be limited to) -

a. Agronomist

Field plot techniques; peanut fertilization; liming; culture; harvesting; insect control; chemical weed control; seed storage and peanut production and harvesting equipment.

b. Engineer

Irrigation equipment and techniques; cultural, harvesting, drying and storage equipment and facilities; drying techniques; seed processing equipment and techniques.

C. Develop and implement immediately a comprehensive testing program of promising varieties, particularly those which have been developed in countries with similar soils and climate.

D. Several of the most promising varieties indicated in the program of "C" above, should be immediately placed in replicated test of response to fertility levels, and liming rate, and irrigation.

E. Plans should immediately be developed to start utilizing part of Vietnam's limestone resources in agriculture. Lime is very essential in the production of legumes-peanuts, soybeans, etc., and many other important crops of Vietnam should show good response to liming. Vietnam's soils range from moderately to very acid soils, with most of them having a pH of 5.4 or less. Peanuts and soybeans are most productive on soils of 5.8 to 6.4 pH. There appears to be very little information on the effect that the pH level of Vietnam soils has on the availability of some of the minor element essential to plant growth. The development of this type of information is a slow process but is very essential in the long time development of a nation's soil resources.

F. That plans be initiated to develop a grading system for peanuts. This grading system could well be patterned after the U.S. Standards for Farmers' Stock White Spanish Peanuts (in the shell)

as issued by the Agriculture Marketing Service, U.S. Department of Agriculture, March 30, 1958 and U.S. Standards for Shelled Spanish-Type Peanuts issued by the Agricultural Marketing Service, U.S. Department of Agriculture, August 31, 1959, the basic parts of which are attached hereto. (See Appendix III).

While the peanuts being currently produced in Vietnam more nearly resemble the Spanish-type than the other type of peanuts produced in the U.S., the screen sizes used in the above referred to standards will probably need to be adjusted.

G. Farm pricing at the present level probably cannot be maintaned for peanuts for oil extraction. However, it is suggested that as much difference between edible peanut prices and oil seed prices as now in the U.S. Pricing system may not be practical, at least until the production is materially expanded. Also, protective steps should be taken thru a grading and marketing system to prevent the purchase of farmers' peanuts at oil stock prices and reselling at edible peanut prices.

GVN inspected and bonded storage facilities will do much to assure that proper grading and pricing systems are conducted.

H. That if a peanut processing facility is planned, the Danang-Quang Ngai area appears to be the most logical location. Thru the Extension and other educational programs, work towards the expansion of peanut area and the increase of yield through out

the provinces north and south of the proposed plant location area. As security is improved and roads are reopened and developed, peanuts could be drawn from a larger area and possibility from as far south as northern parts of the northernmost provinces of III CORP.

I. Central storage for peanuts to go into oil and meal production can best be provided at the site of the processing facility and should be provided as part of the plant's capital requirement. Since much of the country's best peanut production area is not immediately adjoining water ways, highways will become an important part of the transportation system.

Central storage should be of the concrete silo type equipped with ample power lodding, unloading and in storage aeration. Smaller, less expensive storage facilities will need to be developed at convenient transportation sites as the centers of production become more clearly defined. (Note: See note Section "F" under Soybeans. The same applies to peanut storage).

J. The market structure, at least until the industry is well developed, should be relatively simple. A two step movement of peanuts from the - (1) grower to the oil processors representative and (2) from the processors representative to the processor - will be ample to start if the processing equipment

is in close proximity to the peanut producing area and in-shell transportation cost are not prohibitive. If the oil processing facilities are located some distance from the major source of peanuts - say 150 kilometers or more, the first processing step of shelling might be advantageously placed in the center of the producing area with shelled peanuts going into the processing plant. In that case, the market structure would involve another step and becomes grower to buyer, to sheller to processor.

K. That immediate detailed study of land leveling and irrigation requirements of the lighter soils of Tay Ninh, Binh Duong and Hau Nghia provinces be made. These are the provinces containing the greatest among of soil, near the Saigon market which has good potential for peanut and soybean production. This area will probably produce all the needs for direct consumption of this market. Peanut variety and fertilizer test referred to in C and D above should be conducted in this area, as well as in I and II CORP provinces.

L. Develop means of financing that will be required to provide necessary land level and irrigation facilities (canals, lift pumps, etc.). The Agricultural Development Bank recources appear to be the appropriate source for such development. Other possibilities would include the provision of special land development funds. These developments cost will vary widely

in different areas depending on type of soil, leveling needed, distance to source of irrigation, etc., and no attempt has been made to estimate the range of these cost.

SUMMARY

The production and processing of vegetable oil seed can be of significant value to Vietnam's agricultural and national economy. There are yet too many unanswered questions related to the feasibility of producing ample supplies of oil seed crops to recommend a large and complex system of oil processing plants. The fact that there are already plants without available raw material indicates that production has not been expanded to meet the processing capacity.

Recommendations have been given in detail under the general headings of Soybeans and Peanuts in the body of this report. Briefly these recommendations are summarized herein: It is recommended that a 10,000MT (in-take) processing favilities for soybean oil and cake be considered at this time based on soybean production potential in the area of An Giang, Chau Doc, and Phong Dinh provinces. Secondary plans to import part of the soybeans needed for processing during the first year or two to supplement in-country supplies until in-country production can meet full needs of the plant should be considered. It is recommended that research on soybean production be expanded so as to better meet the needs for soybeans for direct food consumption and raw materials for soybean oil and meal cake production; that at least two young agricultural scientist

be given speical training; that a grading system be established and that variety and fertilizer test be enlarged and strengthened.

It is recommended that consideration be given to establishing peanut oil and meal production facilities based on the peanut producing potential of the area including provinces north and south of the Danang-Quang Ngai area; that certain facets of peanut production research be immediately started and/or enlarged; that grading standards be established; that immediate specialized training be provided for at least one agronomist and one agricultural engineer; that comprehensive variety, fertilizer and lime tests be established; that a peanut grading system be established.

APPENDIX

EDIBLE OIL SEED FEASIBILITY STUDY
PRODUCTION SECTION

I. Areas of Production, and Potential Production Soybeans and Peanuts - Oil Meal and Edible (All Areas Generalized)

II. Official Grain Standards of the United States for Soybeans

III. U.S. Standards for Farmers' Stock White Spanish Peanuts

IV. Model for Determining Farm Price of Soybeans and Peanuts and Prices at which Products Must Sell to have a Profitable Operation

V. Sources of Certain Preprocessing Equipment for Oil and Other Seeds

VI. References

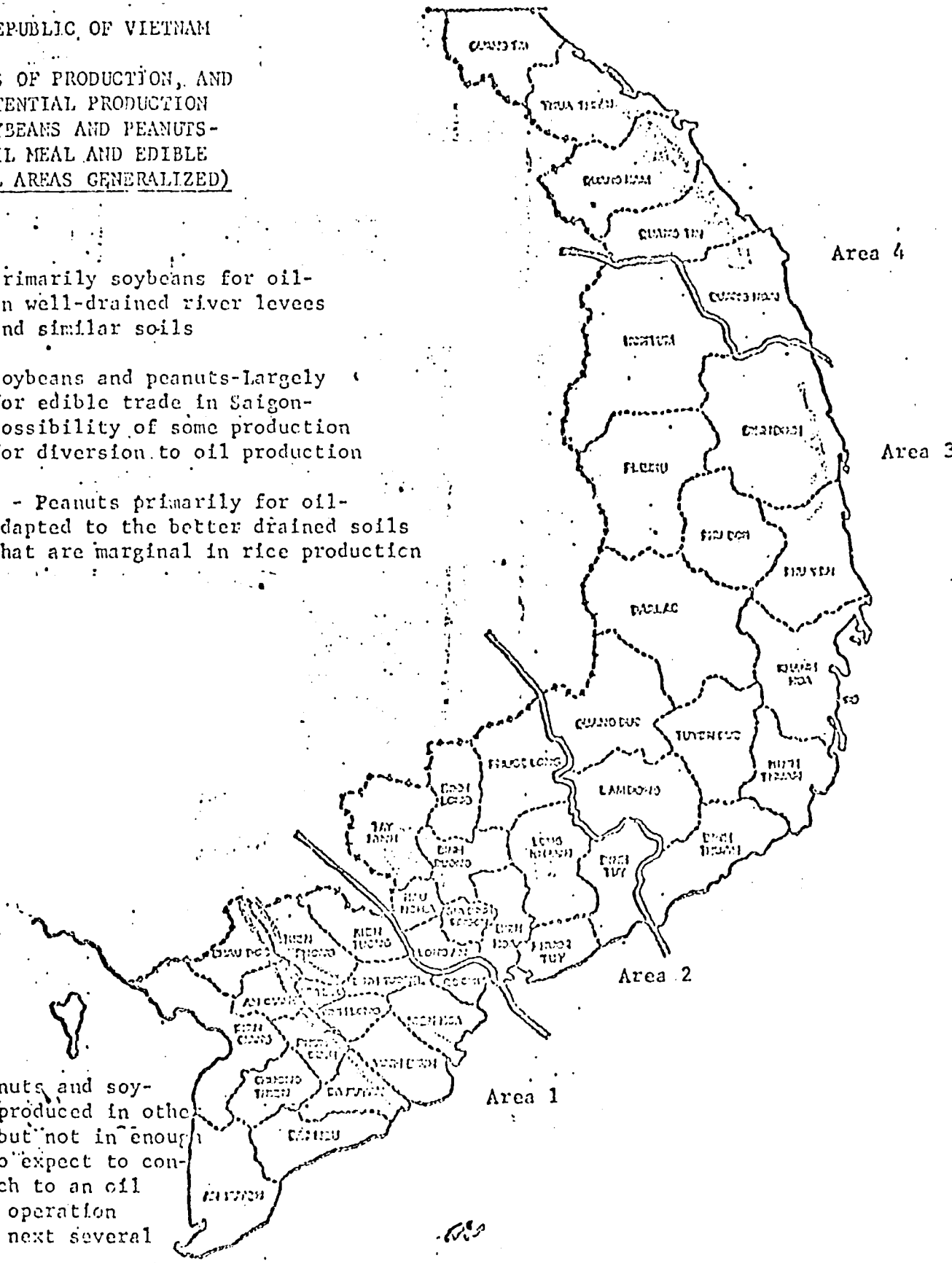
REPUBLIC OF VIETNAM

AREAS OF PRODUCTION, AND POTENTIAL PRODUCTION SOYBEANS AND PEANUTS-OIL MEAL AND EDIBLE
(ALL AREAS GENERALIZED)

Area 1 - Primarily soybeans for oil- on well-drained river levees and similar soils

Area 2 - Soybeans and peanuts-Largely for edible trade in Saigon- Possibility of some production for diversion to oil production

Area 3 & 4 - Peanuts primarily for oil- Adapted to the better drained soils that are marginal in rice production



NOTE: Peanuts and soybeans are produced in other provinces but not in enough quantity to expect to contribute much to an oil extraction operation within the next several years.

APPENDIX II

OFFICIAL GRAIN STANDARDS OF THE UNITED STATES FOR SOYBEANS[1]

EFFECTIVE SEPTEMBER 1, 1955

§ 26.601 Terms defined

For the purposes of the official grain standards of the United States for soybeans:

(a) Soybeans. Soybeans shall be any grain which consists of 50 percent or more of whole or broken soybeans which will not pass readily through an 8/64 sieve and not more than 10 percent of other grains for which standards have been established under the United States Grain Standards Act.

(b) Classes. Soybeans shall be divided into the following five classes: Yellow soybeans, green soybeans, brown soybeans, black soybeans, and mixed soybeans.

(c) Yellow soybeans. Yellow soybeans shall be any soybeans which have yellow or green seed coats, and which in cross section are yellow or have a yellow tinge, and may include not more than 10 percent of soybeans of other classes.

(d) Green soybeans. Green soybeans shall be any soybeans which have green seed coats, and which in cross section are green, and may include not more than 10 percent of soybeans of other classes.

(e) Brown soybeans. Brown soybeans shall be any soybeans with brown seed coats, and may include not more than 10 percent of soybeans of other classes.

(f) Black soybeans. Black soybeans shall be any soybeans with black seed coats, and may include not more than 10 percent of soybeans of other classes.

[1] The specifications of these standards shall not excuse failure to comply with the provisions of the Federal Food, Drug, and Cosmetic Act.

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(g) Mixed soybeans. Mixed soybeans shall be any mixture of soybeans which does not meet the requirements of the classes yellow soybeans, green soybeans, brown soybeans, or black soybeans. Bicolored soybeans shall be classified as mixed soybeans.

(h) Grades. Grades shall be the numerical grades, sample grade, and special grades provided for in § 26.603.

(i) Bicolored soybeans. Bicolored soybeans shall be any soybeans with seed coats of two colors, one of which is black or brown.

(j) Splits. Splits shall be pieces of soybeans that are not damaged.

(k) Damaged kernels. Damaged kernels shall be soybeans and pieces of soybeans which are heat-damaged, sprouted, frosted, badly ground-damaged, badly weather-damaged, moldy, diseased, or otherwise materially damaged.

(l) Heat-damaged kernels. Heat-damaged kernels shall be soybeans and pieces of soybeans which are materially discolored and damaged by heat.

(m) Foreign material. Foreign material shall be all matter, including soybeans and pieces of soybeans, which will pass readily through an 8/64 sieve and all matter other than soybeans remaining on such sieve after sieving.

(n) Stones. Stones shall be concreted earthy or mineral matter and other substances of similar hardness that do not disintegrate readily in water.

(o) 8/64 sieve. An 8/64 sieve shall be a metal sieve 0.032 inch thick perforated with round holes 0.125 (8/64) inch in diameter with approximately 4,736 perforations per square foot.

§ 26.602 Principles governing application of standards

The following principles shall apply in the determination of the classes and grades of soybeans:

(a) Basis of determination. Each determination of class, splits, damaged kernels, and heat-damaged kernels, and of black, brown, and/or bicolored soybeans in Yellow or Green Soybeans, shall be upon the basis of the grain when free from foreign material. All other determinations shall be upon the basis of the grain as a whole.

(b) Percentages. All percentages shall be upon the basis of weight. The percentage of splits shall be expressed in terms of whole percents. All other percentages shall be expressed in terms of whole and tenths percents.

(c) Moisture. Moisture shall be ascertained by the air-oven method prescribed by the United States Department of Agriculture, as described in Service and Regulatory Announcement No. 147, issued by the Agricultural Marketing Service, or ascertained by any method which gives equivalent results.

(d) Test weight per bushel. Test weight per bushel shall be the weight per Winchester bushel as determined by the method prescribed by the United States Department of Agriculture, as described in Circular No. 921 issued June 1953, or as determined by any method which gives equivalent results.

U. S. Standards[1] for Farmers' Stock White Spanish Peanuts

GRADES

U.S. No. 1 shall consist of unshelled white Spanish peanuts which are mature, dry, and practically free from damage. When shelled, the sound and mature kernels shall not be less than 70% of the total weight of the sample; provided, that all shriveled kernels which pass through a screen having $^{15}/_{64}$ x $^{3}/_{4}$-in. perforations shall be excluded from the shelled stock. Sound, plump kernels which pass through such a screen shall not be excluded from the shelled stock. In addition, after shelling, not more than 2% of the total weight of the sample may consist of damaged kernels; provided, that for each fractional per cent of sound and mature kernels above 70%, there may be an equal percentage of damaged kernels about 2% but in no case shall the damaged kernels exceed 3% in U.S. No. 1 (see explanation).

U.S. No. 2 shall consist of unshelled white Spanish peanuts which are mature, dry, and practically free from damage. When shelled, the sound and mature kernels shall not be less than 65% of the total weight of the sample; provided, that all shriveled kernels which pass through a screen having $^{15}/_{64}$ x $^{3}/_{4}$-in. perforations shall be excluded from the shelled stock. Sound, plump kernels which pass through such a screen shall not be excluded from the shelled stock. In addition, after shelling, not more than 2% of the total weight of the sample may consist of damaged kernels; provided, that for each fractional per cent of sound and mature kernels above 65%, there may be an equal percentage of damaged kernels above 2% but in no case shall the damaged kernels exceed 5% in U.S. No. 2 (see explanation).

U.S. No. 3 shall consist of unshelled white Spanish peanuts which are mature, dry, and practically free from damage. When shelled, the sound and mature kernels shall not be less than 60% of the total weight of the sample; provided, that all shriveled kernels which pass through a screen having $^{15}/_{64}$ x $^{3}/_{4}$-in. perforations shall be excluded from the shelled stock. Sound, plump kernels which pass through such a screen shall not be excluded from the shelled stock. In addition, after shelling, not more than 2% of the total weight of the sample may consist of damaged kernels; provided, that for each fractional per cent of sound and mature kernels above 60%, there may be an equal percentage of damaged kernels above 2% but in no case shall the damaged kernels exceed 6% in U.S. No. 3 (see explanation).

U.S. Sample Grade shall consist of unshelled white Spanish peanuts which do not meet any of the foregoing grades.

DEFINITIONS OF TERMS

As used in these grades:

"Sample" means the total quantity of material taken for examination including all shelled and unshelled stock and foreign material.

"Practically free from damage" relates to unshelled peanuts. No appreciable amount of nuts with cracked shells shall be noticeable.

"Damaged kernels" are: (a) Kernels which are rancid or decayed; (b) Moldy kernels; (c) Kernels showing sprouts over $^{1}/_{4}$ in. long. However, all sprouted kernels, the separated halves of which show decay, shall be classed as damaged; (d) Dirty kernels where the surface is distinctly dirty and the dirt ground in; (e) Wormy or worm-injured kernels; (f) Kernels which show a yellow discoloration when the skin

[1] Issued by Agricultural Marketing Service, U.S. Department of Agriculture, March 30, 1938.

is removed; (g) Kernels having skins which show dark-brown discoloration, usually netted and irregular and affecting more than 25% of the skin. Kernels having skins which are paler or darker in color than is usually characteristic of the variety, but which are not actually discolored shall not be classed as damaged.

EXPLANATION

Farmers' stock peanuts often contain varying amounts of loose shelled kernels and foreign material. Such kernels and material are objectionable and in making inspections their weight shall be included in the total weight of the sample but the loose shelled kernels shall not be included with sound and mature stock in determining the grade.

Table showing requirements of U.S. standards follows.

PERCENTAGE BASED ON TOTAL WEIGHT OF SAMPLE

Grade	Tolerance for Other Varieties	Sound Kernels	Tolerance for Damaged Kernels
U.S. No. 1	1%	With 70% sound	2% allowance
		With 71% or more sound	3% "
U.S. No. 2	1%	With 65% sound	2% "
		With 66% "	3% "
		With 67% "	4% "
		With 68% or more sound	5% "
U.S. No. 3	1%	With 60% sound	2% "
		With 61% "	3% "
		With 62% "	4% "
		With 63% "	5% "
		With 64% or more sound	6% "

MODEL FOR DETERMINING FARM PRICE OF SOYBEANS AND PEANUTS AND PRICES AT WHICH PRODUCTS MUST SELL TO HAVE A PROFITABLE OPERATION

Determining, with great accuracy the prices at which raw products can be bought and products can be sold three to five years from now, is of course an impossible task. However, the setting up of a fiscal model at certain assumed levels of price and cost, including cost of processing can be of great help in determining the feasibility of an operation and at the general level toward which costs and prices must be directed.

The following table shows two sets of raw material cost i.e. at the level of U.S. and at the level (not on organized market price) which appears to be approximately the harvest season prices of soybeans and peanuts in South Vietnam in 1971. If the processing cost can be determined then cost of production can be calculated at the given raw material cost levels (cost of processing will vary widely with size, type and location of the plant equipment. Also used are the wholesale prices of U.S. refined oils (bulk), and mill prices of oil meal.

Obviously, of course, prices (cost and return) at any level can be "plugged" into this type calculation, along with the price to be received for the finished products.

The basic value of such a table is the processing cost which are tied to investment cost in plants and facilities and operational cost (labor, repairs, power, etc.). Given this figure one can then establish the price at which he must sell his product with a fixed cost of raw product; or the price he can afford to pay for raw products if the selling price of his finished product is relatively fixed. Calculations of this type are of necessity based on certain assumptions.

In the tables below the following assumptions are made:

1. That the VN$is maintained stable at the rate of VN$350 to US$1.
2. That for peanuts column 1:
   a. Farm Price of peanuts is at the equivalent of US$150/MT (the assumed value of U.S. oil seed stock).
   b. That brokerage and transportation cost from farm to processing plant will be approximately 3% of the farm value of the peanuts.
   c. That the price of the oil produced will be approximately the same as bulk U.S. prices of oil at production plant (US$0.206/lb.).
   d. That the price at which the meal will sell will be approximately the same as bulk prices at point of production, U.S. meal (US$75.75/S.T. or US$83.32/MT).

3. That for peanuts, Column 2:

   A. All factors remain constant except the price of peanuts at the farm at-harvest are VN$60,000 (an approximation of the harvest price as determined by the Oil Seed Team). The use of this price will of course change the total brokerage fee.

4. That for soybeans, Column 1:

   a. Farm prices of soybeans are the same as US#1 grade at point of production (US$3.00/Bu or US$109.80/MT).

   b. That brokerage and transportation cost from farm to processing plant will be approximately 3% of the farm value of soybeans.

   c. That the bulk price of the oil produced will be approximately the same as bulk oil at production plant U.S. (US$0.15/lb. or US$0.286/kilo).

   d. That the bulk price at which the meal will sell will be approximately the same as bulk U.S. prices at point of production (US$93.50/MT).

5. That for soybeans, Column 2:

   A. All factors constant as in Column 1, except that the farm price of soybeans is set at VN$70,000/MT, the most quoted wet season price in the oil seed team's discussion with growers. Dry season soybeans, of higher quality apparently sold for VN$15 to VN$25 per kilo higher. The lower price

is used in this table. Even the est season price appears to be high and it should be remembered that this price is based on a "vegetable" market and not an oil extraction market and that the supply for vegetable purposes is not adequate for the market needs (some imports). The use of this price increases the total brokerage over Column 1.

PEANUTS
MODEL OF COST TO PROCESSOR, PROCESSOR COST AND VALUE PRODUCTS UNDER CERTAIN ASSUMPTIONS
(CALCULATION BASED ON 30,000MT AVAILABLE FOR PROCESSING BY 1976, VN$350 TO US$1)

	Price to Grower Based on US Oil Stock of US$150/ST = US$115/MT = VN$57,750/MT	Price to Grower Based on Approx. Current Price to Vietnamese Grower (At Harvest) VN$60/KG = VN$60,000/MT
Farm Value - 30,000 MT	VN$1,732,500,000	VN$1,800,000,000
Brokerage fee (including transportation) to processor @ 3% of value	51,975,000	54,000,000
Processing Cost		
Shelling and Oil Extraction 20,000MT shelled nuts x VN$7,000	140,000,000	140,000,000
Refining - in Bulk Cost 10,000MT oil x VN$7,000	70,000,000	70,000,000
Total Cost at processing plant - 10,000MT oil & 10,000MT Meal (Bulk)	1,994,475,000	2,064,000,000
Value (Bulk at Plant - Basis U.S. Oil (US$20.6/lb. @ Plant = VN$158.6/kilo = VN$158,600/MT	VN$1,586,000,000	VN$1,586,000,000
Meal - Basis U.S. at mill, S.E. Price of US$75.75/ST = US$83.32 = VN$29,162/MT	291,620,000	291,620,000
Total Value - Bulk @ Plant	VN$1,877,620,000	VN$1,877,620,000
LOSS	VN$ 116,855,000	VN$ 186,380,000

EXHIBIT

SOYBEANS

MODEL OF COST TO PROCESSOR, PROCESSOR COST AND VALUE OF PRODUCTS UNDER CERTAIN ASSUMPTIONS

(CALCULATIONS BASED ON 10,000MT AVAILABLE FOR OIL AND MEAL PRODUCTION BY 1976 VN$350 TO US$1)

	Price to Grower Based on US Farmer Price Equivalent US$109.80/MT =VN$38.430MT	Price to Grower As Received Wet Season 1971 of VN$70,000/MT
Farm Value of 10,000MT	VN$384,300,000	VN$700,000,000
Brokerage Fee (including transportation to processor) 3% of Farm Value	11,529,000	21,000,000
Extraction Plant Cost 10,000MT x VN$7,000	70,000,000	70,000,000
Refining Cost 2,000MT x VN$7,000	14,000,000	14,000,000
Total Cost - (Oil & Meal in Bulk)	VN$479,829,000	VN$805,000,000
Product Value - Bulk at Plant		
Oil (Based on US Price-US$.13/lb: Tank, refinery=US$28.6/kg= VN$100,100/MT x 2,000MT)	VN$200,200,000	VN$200,200,000
Meal - 8,000MT Meal US Equivalent MT Bulk at plant, US$93.50/MT = VN$32,725/MT	261,800,000	261,800,000
Total Value	VN$462,000,000	VN$462,000,000
VALUE - COST	VN$ 17,829,000	VN$343,000,000

Example

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PEANUTS
MODEL OF COST TO PROCESSOR, PROCESSOR COST AND VALUE OF PRODUCTS UNDER CERTAIN ASSUMPTIONS
(CALCULATION BASED ON 30,000MT AVAILABLE FOR PROCESSING BY 1976, VN$350 TO US$1)

	Price to Grower Based on US Oil Stock of US$150/ST: -US$115/MT = VN$57,750/MT	Price to Grower Based on Approx. Current Price to Vietnamese Grower (At Harvest) VN$60/KG = VN$60,000?MT
Farm Value - 30,000 MT	VN$1,732,500,000	VN$1,800,000,000
Brokerage fee (including transportation to processor) 3% of value	51,975,000	54,000,000
Processing Cost Shelling and Oil Extraction 20,000MT shelled nuts @ VN$		
Refining - in Bulk Cost 10,000MT oil @ VN$		
Total Cost at processing plant - 10,000MT oil & 10,000MT Meal (Bulk)	VN$	VN$
Value (Bulk at Plant - Basis U.S. Oil (US$20.6/lb. @ Plant = VN$158.6/kilo = VN$158,600/MT	VN$1,586,000,000	VN$1,586,000,000
Meal - Basis U.S. at mill, S.E. Price of US$75.75/ST = US$83.32 = VN$29,162/MT	291,620,000	291,620,000
Total Value - Bulk @ Plant	VN$1,877,620,000	VN$1,877,620,000
LOSS	VN$	VN$

SOYBEANS

MODEL OF COST TO PROCESSOR, PROCESSOR COST AND VALUE OF PRODUCTS UNDER CERTAIN ASSUMPTIONS

(CALCULATIONS BASED ON 10,000MT AVAILABLE FOR OIL AND MEAL PRODUCTION BY 1976, VN$350 TO US$1)

	Price to Grower Based on US Farmer Price Equivalent US$109.80/MT =VN$38,430MT	Price to Grower As Received Wet Season 1971 of VN$70,000/MT
Farm Value of 10,000MT	VN$384,300,000	VN$700,000,000
Brokerage Fee (including transportation to processor) 3% of Farm Value	11,529,000	21,000,000
Extraction Plant Cost 10,000MT x VN$		
Refining Cost (2,000MT X VN$		
Total Cost - (Oil & Meal in Bulk)	VN$	VN$
Product Value - Bulk at Plant		
Oil (Based on US Price-US$.13/lb: Tank, refinery=US$28.6/kg= VN$100,100/MT x 2,000MT)	VN$200,200,000	VN$200,200,000
Meal - 8,000MT Meal US Equivalent MT Bulk, at plant, US$93.50/MT = VN$32,725/MT	261,800,000	261,800,000
Total Value	VN$462,000,000	VN$462,000,000
VALUE - COST	VN$	VN$

Sources of Certain Preprocessing Equipment for Oil and Other Seeds

CONVEYORS, ELEVATORS

Denver, Colo. 80223—MACHINERY DEVELOPMENT INC., 2000 S. Cherokee St. "E-Z LIFT" Carriage conveyor for moving bulk or packaged materials; "E-Z Lift" field loader.

Miami, Fla. 33169—AMERICAN DRYING SYSTEMS INC., 1135 N.W. 159 Drive. Affiliate of Atlas Metal Industries; subsidiary of Mercury Aircraft. Bucket elevators, screw conveyors.

Chicago, Ill. 60644—FLEXIBLE STEEL LACING CO., 4607 Lexington St. Manufacturer of conveyor belt lacing and accessories such as belt cutters, clamps, etc.

Chicago, Ill. 60609—LINK-BELT MATERIAL HANDLING EQUIPMENT DIVISION, FMC Corp., Dept. 588-71, 300 W. Pershing Rd. Conveyors and elevators of all types.

Evanston, Ill. 60204 — BURROWS EQUIPMENT CO., 1316-7 Sherman Ave.

Hammond, Ind. 46320 — SCREW CONVEYOR CORP., 757 Hoffman St. Hammond "Screw-Lifts" (vertical screw elevator); "Super-Flo" conveyor (drag-type conveyor); helicoid and sectional flight screw conveyors; screw conveyor troughing and accessories; "Tite-Seal" screw conveyor box "U" edging and cover clamps; a complete line of standardized units including elevator buckets and bucket elevators.

Des Moines, Iowa 50315—CORN STATES HYBRID SERVICE, 6139 Fleur Drive.

Des Moines, Iowa 50307—ELECTRICAL ENGINEERING & EQUIPMENT CO., 1201 Walnut St. Enclosed flight conveyors, belt and screw conveyors, bucket elevators.

Red Oak, Iowa 51566—RED OAK MFG. CO., div. of Douglas & Lomason Co., 2700 N. Broadway. Office 5600 Lincoln Ave., Detroit, Mich. 48203. Bulk conveyors, elevators.

Dodge City, Kans. 67801—SPEED KING MFG. CO., INC., P. O. Box 1438. Belt-Veyor tubular conveyors, bucket elevators, under-car conveyors, belt conveyors, augers.

New Orleans, La. 70150—NADUSTCO, INC. Claiborne, Poland, Derbigny and Kentucky Sts. P. O. Box 52079. Pneumatic conveying equipment.

Saginaw, Mich. 48602—A. T. FERRELL & CO. div. of J. P. Burroughs. Elevator heads and boots, complete elevating legs in superduty steel construction, standard steel construction, wood construction, super-duty steel construction. Vibrating pits, vibrating conveyors, belt conveyors.

Minneapolis, Minn. 55426 — THE BUHLER CORP., 3925 Wayzata Blvd. All mechanical and pneumatic handling equipment, including conveyors loading and unloading barges and ships.

Minneapolis, Minn. 55415—CARTER-DAY CO., 655 19th Ave. N.E. Pneumatic conveying and vibratory conveying systems.

Minneapolis, Minn. 55429 — MIAG NORTH AMERICA INC. Complete line of pneumatic and mechanical conveyors.

Greenville, Miss. 38701—REED-JOSEPH CO., Hwy. 1 No. Affiliate of International Systems & Controls Corp., Houston, Tex. Conveyors.

Gering, Nebr. 69341—LOCKWOOD CORP. Conveyors; 16-ft. sack loader, model SL12318-16.

Raleigh, N. C. 27602—AEROGLIDE CORP., P. O. Box 1839, 7100 Hillsborough Rd. Also plants at Emporia, Kans., and Orlando, Fla. Bucket elevators standard up to 10,000 b.p.h.

Columbus, Ohio 43216—JEFFREY MFG. CO., 799 N. 4th St. Conveyors and bucket elevators.

Muncy, Pa. 17756—SPROUT, WALDRON & CO., INC. Screw, sliderbeard belt, chain drag conveyors; bucket elevators; Pneu-Vac negative, Pneu-Flo positive; Pneu-Pac package pneumatic bulk materials handling systems; Portaflow portable pneumatic system; Feed Piper pneumatic bulk trucks; pressurized bulk truck.

Salem, S. Dak. 57058—FETERL MFG. CO. Conveying equipment.

Memphis, Tenn. 38102 — DABNEY-HOOVER SUPPLY CO., 45 W. Virginia. Screw conveyors, belt conveyors, bucket elevators, vertical screw lift, portable conveyors.

Memphis, Tenn. 38106—HAGAN MFG. CO., 1598 Texas St. Steel fabricator, conveyors, elevators, elevator buckets.

Fort Worth, Tex. 76101—FORT WORTH STEEL & MACHINERY CO., 3600 McCart St. Screw and bucket elevators, screw conveyors and accessories.

Fort Worth, Tex. 76109—HAYES & STOLZ INDUSTRIAL MFG. CO. INC., 3521 Hemphill St. Office, P. O. Box 11217, Fort Worth. Bucket elevators, screw feeders.

DRYING AND AERATION EQUIPMENT

FARM DRIERS

Morengo, Ill. 60152 — CHICAGO EASTERN CORP., 200 N. Prospect. Manufactures dryers, bins.

Beane, Iowa 50036—GEORGE A. ROLFES CO., INC., P. O. Box 458. Natural air drying systems for farm storages. Fans and supplemental heaters with built-in controls. Aeration systems for all sizes and types of grain storage facilities.

Farm driers

Columbus, Nebr. 68601—BEHLEN MFG. CO., subsidiary of Wickes Corp. Heated-air batch grain drier, complete with handling equipment; on-the-farm and commercial models. Sizes 260, 375, 500, 750 bu. Dries soybeans, small grain, corn and other crops. Continuous flow driers—capacities up to 900 bu. per hour (removing 10 points of moisture).

Raleigh, N. C. 27602—AEROGLIDE CORP., P. O. Box 1839, 7100 Hillsborough Rd. Also plants at Emporia, Kans., and Orlando, Fla. GBS grain and bean driers—batch and continuous-flow models (50 to 300 bushels per hour capacity).

GRAIN DRIERS

Miami, Fla. 33169—AMERICAN DRYING SYSTEMS INC., 1135 N.W. 159 Drive. Affiliate of Atlas Metal Industries; subsidiary of Mercury Aircraft. Manufacture and sale of crop drying equipment.

Crystal Lake, Ill. 60014—MATHEWS CO., 500 Industrial Ave., P. O. Box 70. 6 model sizes, M-C continuous flow grain driers—farm and commercial models.

Lake Zurich, Ill. 60047—AMERICAN FARM EQUIPMENT CO., 340 E. Main St. Affiliate of AFE Industries Inc. Completely automated grain driers.

Attica, Ind. 47918—DRIALL DRIERS, INC., P. O. Box 309. DriAll continuous flow grain driers.

Des Moines, Iowa 50317—CAMPBELL INDUSTRIES, INC., 3121 Dean Ave. Manufactures custom-designed grain driers.

Saginaw, Mich. 48602—A. T. FERRELL & CO., div. of J. P. Burroughs. Clipper Town & Country screen driers for soybeans, grains, and rice. Continuous flow capacities from 300 bushels to 6,000 bushels per hour.

Minneapolis, Minn. 55418—CARTER-DAY CO., 655 19th Ave. N.E. Large capacity Hess, Shanzer, HC driers.

Raleigh, N. C. 27602—AEROGLIDE CORP., P. O. Box 1839, 7100 Hillsborough Rd. Also plants at Emporia, Kans., and Orlando, Fla. Commercial grain and bean driers, batch or continuous types, 350 to 6,000 bu/hr capacity.

Memphis, Tenn. 38106—HAGAN MFG. CO., 1598 Texas St. Steel fabricator.

Memphis, Tenn. 38118—N. HUNT MOORE & ASSOCIATES, 3951 Senator St. Soybean driers, sales and engineering. For processing control and storage.

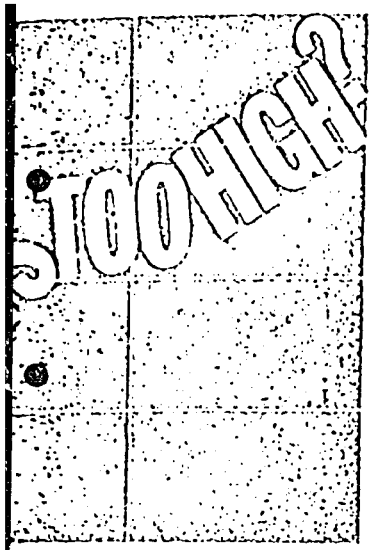
Milwaukee, Wis. 53216 — CUTLER-HAMMER, 4201 N. 27th St. Crop drier controllers, available in two sizes—60 and 90 amp, convertible from single to three-phase operation.

MEAL DRIERS

Los Angeles, Calif. 90058—STANSTEEL CORP., subsidiary Allis-Chalmers Mfg. Co., 5001 S. Boyle Ave. Rotary conditioners, driers, and coolers.

Decatur, Ill. 62525—SUPERIOR WELDING CO., 900 E. Division St. Rotary conditioners, driers and coolers—new units and modification and repair of existing units.

Davenport, Iowa 52803 — DAVENPORT MACHINE & FOUNDRY CO., 1628 W. 4th St. "Rotary" meal driers, meal coolers, soybean conditioners.



GRAIN GRADING EQUIPMENT, MOISTURE TESTERS

Evanston, Ill. 60204—BURROWS EQUIPMENT CO., 1316-7 Sherman Ave. Moisture testers.

Saginaw, Mich. 48602—A. T. FERRELL & CO., div. of J. P. Burroughs. Hand testing screens; Clipper office size cleaner.

Minneapolis, Minn. 55429 — MIAG NORTH AMERICA INC.

Florham Park, N. J. 07932—OHAUS SCALE CORP., 29 Hanover Rd. Moisture testers.

Fishkill, N. Y. 12524—FOSS AMERICA INC., Rt. 82. Manual and automatic moisture meters.

West Nyack, N. Y. 10994—RANK PRECISION INDUSTRIES INC., 260 N. Rt. 303. Microwave moisture meter.

Oklahoma City, Okla. 73127—SMICO INC., 500 N. MacArthur Blvd. Manufacturing.

Memphis, Tenn. 38102—DABNEY-HOOVER SUPPLY CO., 45 W. Virginia.

Memphis, Tenn. 38106—HAGAN MFG. CO., 1598 Texas St. Steel fabricator.

GRINDING AND MIXING EQUIPMENT

New Haven, Conn. 06509—ENTOLETER INC., P. O. Box 1919. Subsidiary of American Mfg. Co. Inc.

Atlanta, Ga. 30318—DAVIDSON-KENNEDY CO. 1090 Jefferson St. N. W., P. O. Box 2427. Toasters, cracking and flaking rolls, bean heaters cookers, D.T.'s, hull packers.

Chicago, Ill. 60650—PRATER INDUSTRIES INC. 1517-49 S. 55th Ct. Dust screen pulverizers fo oilseed meal. Fiber grinders for hulls and fibrou materials. Mills from 5 to 200 hp, 1,200 to 3,60 rpm.

Cedar Falls, Iowa 50613—ROSKAMP MFG INC., 624 Grand Blvd. Roskamp-Longhurst 20x6 240 t/day flaking mill.

Neola, Iowa 51559—JENSEN HAMMERS. Self sharpening and wearsharp hammermill hammers Patented "Snap-Lox" hammer pins and locks.

Minneapolis, Minn. 55426 — THE BUHLER CORP., 8925 Wayzata Blvd. Complete line of see preparation equipment.

Minneapolis, Minn. 55429 — MIAG NORTH AMERICA INC.

Minneapolis, Minn. 55414—TWIN CITY MA CHINE CO., 527 2nd Ave. S. E. New rolls fo cracking and flaking.

Silver Creek, N. Y. 14136—S. HOWES CO., INC Eureka granulators, hammermills, scourers for de hulling, and mixers.

Columbus, Ohio 43216—JEFFREY MFG. CO., 77 N. 4th St. Hammermills (swing or rigid ham mers), crushers, pulverizers.

Springfield, Ohio 45501—BAUER BROS. CO Subsidiary of Combustion Engineering Inc. Labora tory mills, attrition mills, hammermills, hullers exhausters, crushers for seed cakes, feeders breakers. Facilities for experimental projects.

BEST AVAILABLE COPY

Nitragin Sales Corp., Milwaukee, Wisc.

MIXERS—SEED OR FEED
Burrows Equipment Co., Evanston, Ill.
Duplex Mill & Mfg. Co., Springfield, O.
Gump Co., B. F., Chicago 50, Ill.
Howes Co., S., Silver Creek, N. Y.
Iowa Portable Mill Mfg. Co., Inc., Oelwein, Iowa
Nitragin Sales Corp., Milwaukee, Wisc.
Rankin Co., Inc, Keokuk, Iowa
Seedburo Equipment Co., Chicago, Ill.
Sidney Grain Machinery Co., Sidney, Ohio
Speed King Mfg. Co., Dodge City, Kans.
Sprout, Waldron & Co., Muncy, Pa.

MOISTURE TESTING EQUIPMENT
Burrows Equipment Co., Evanston, Ill.
Erickson Prod., E. L., Brookings, S. D.
Hance Mfg. Co., J. W. Westerville, Ohio
Hart Moisture Meters, W. Islip, N. Y.
Hygrodynamics, Inc., Silver Springs, Md.
Ingersoll & Assoc., Wheaton, Ill.
Kel Instruments, New Brunswick, N. J.
Mater Machine Wks., Corvallis, Ore.
Motomco, Inc., Clark, N. J.
Radson Eng. Div., Morton Grove, Ill.
Seedburo Equipment Co., Chicago, Ill.
Tagliabue Corp., C. J., Newark 5, N. J.
York Foundry & Eng Wks., York, Neb.

MUSTARD SEPARATORS—SPIRAL
Cleland Mfg. Co., Minneapolis, Minn.

OAT CRIMPERS, CRUSHERS
Barnard & Leas Mfg. Co., Cedar Rapids, Iowa
Duplex Mill & Mfg. Co., Springfield, O.
Howes Co., Inc., S., Silver Creek, N. Y.
Roskamp Huller Mfg. Co., Cedar Falls, Iowa
Sprout, Waldron & Co., Muncy, Pa.
W. W. Grinder Corp., Wichita, Kans.

OAT SIZING—LENGTH & THICKNESS
Carter-Day Co., Minneapolis, Minn.

PACKAGING MACHINERY—FEED
Aseeco Corp., Los Angeles, Calif.
Bemis Co., Inc., Mpls., Minn.
Burrows Equipment Co., Evanston, Ill.
Diederichs & Griffin Co., Chicago, Ill.
Gump Co., B. F., Chicago 50, Ill.
Howe-Richardson Co., Clifton, N. J.
Howes Co., Inc., S., Silver Creek, N. Y.
Karstrom Co., Menomonee Falls, Wisc.
St. Regis Paper Co., New York, N. Y.
Stoker Co., H. L., Claremont, Calif.
Winborns, Williamsburg, Iowa

PACKAGING SCALES
Bemis Co., Inc., Mpls., Minn.
Burrows Equipment Co., Evanston, Ill.
Detecto Scales, Inc., Brooklyn, N. J.
Diederichs & Griffin Co., Chicago, Ill.
Exact Weight Scale Co., Columbus, Ohio
Gump Co., B. F., Chicago 50, Ill.
Howe-Richardson Co., Clifton, N. J.
Karstrom Co., Menomonee Falls, Wisc.
Pack-Rite Machines, Milwaukee, Wisc.
St. Regis Paper Co., New York, N. Y.
Seedburo Equipment Co., Chicago, Ill.
Stoker Co., H. L., Claremont, Calif.
Troemner, Henry, Philadelphia, Pa.
Winborns, Williamsburg, Iowa

PACKERS
Barnard & Leas Mfg. Co., Cedar Rapids, Iowa
Bemis Co., Inc., Mpls., Minn.
Gump Co., B. F., Chicago 50, Ill.
N. J.
Howes Co., Inc., S., Silver Creek, N. Y.
Karstrom Co., Menomonee Falls, Wisc.
Stoker Co., H. L., Claremont, Calif.
St. Regis Paper Co., New York, N. Y.

PACKET FILLING
Ballard Seed & Packeting Mach. Co., Harvard, Mass.
Burrows Equipment Co., Evanston, Ill.
Gump Co., B. F., Chicago 50, Ill.
Hoeller, Gebr., Bergisch-Gladbach, West Germany
Kansteiner Mach. Co., Walter H., Chicago, Ill.
Karstrom Co., Menomonee Falls, Wisc.
Seedburo Equipment Co., Chicago, Ill.
Trescott Co., Inc., The, Fairport, N. Y.
Ulbeco, Inc., Paramus, N. J.

PLANTERS
Mitchell, J. L., Oxnard, Calif.

PLANTERS
(For germination and greenhouse flats)
Erickson Pdts., E. L., Brookings, S. D.

REELS
Oliver Mfg. Co., Rocky Ford, Colo.

SAMPLE BAGS
Bemis Co., Inc., Minneapolis, Minn.
Chase Bag Co., New York, N. Y.
Dayton Bag & Burlap Co., Dayton, O.
Disbrow Envelope Corp., Jersey City, N. J.
Mil-An Mfg. Co., Brooklyn, N. Y.

SAMPLE CASES
Burrows Equipment Co., Evanston, Ill.
Heller & Co., Montpelier, Ohio
Seedburo Equipment Co., Chicago, Ill.

SAMPLE ENVELOPES—SEED
Bemis Co., Inc., Minneapolis, Minn.
Cupples-Hesse Corp., St. Louis, Mo.
Disbrow Envelope Corp., Jersey City, N. J.
Heinrich Envelope Co., Minneapolis, Minn.
Stecher-Traung-Schmidt Corp., Rochester, N. Y.

SAMPLE PANS
Burrows Equipment Co., Evanston, Ill.
Erickson Prod., E. L., Brookings, S. Dak.
Seedburo Equipment Co., Chicago, Ill.

SAMPLER—SEED—GRAIN (Hand or Boerner)
Burrows Eqpt. Co., Evanston, Ill.
Erickson Pdts., E. L., Brookings, S. D.
Newark Scale Works, Union, N. J.
Ohaus Scale Corporation, Union, N. J.
Radson Eng. Corp., Morton Grove, Ill.
Seedburo Equipment Co., Chicago, Ill.

SCALES—AUTOMATIC
Detecto Scales, Inc., Brooklyn, N. Y.
Exact Weight Scale Co., The, Columbus, Ohio
Gump Co., B. F., Chicago 50, Ill.
Howe-Richardson Co., Clifton, N. J.
Karstrom Co., Menomonee Falls, Wisc.
Pack-Rite Machines, Milwaukee, Wisc.
Stoker Co., H. L., Claremont, Calif.
Torsion Balance Co., Clifton, N. J.
Troemner, Henry, Philadelphia, Pa.

SCALES—BAGGING
Bemis Co., Inc., Mpls., Minn.
Burrows Eqpt. Co., Evanston, Ill.
Detecto Scales, Inc., Brooklyn, N. Y.
Gump Co., B. F., Chicago 50, Ill.
Howe-Richardson Co., Clifton, N. J.
Karstrom Co., Menomonee Falls, Wisc.
Pack-Rite Machines, Milwaukee, Wisc.
Stoker Co., H. L., Claremont, Calif.
Winborn's, Williamsburg, Iowa

APPENDIX VI

REFERENCES

1. Peanuts in Georgia, Cooperative Extension Service, University of Georgia, Bulletin 640-February 1965.
2. Soybeans in Georgia, Cooperative Extension Service, University of Georgia, Bulletin 639, Reprinted February, 1971.
3. U.S. Standards for Farmers' Stock White Spanish Peanuts, issued by Agricultural Marketing Service, U.S. Department of Agriculture, March 30, 1958.
4. Official Standards for Soybeans, Soybean Digest, Hudson, Iowa, Zip Code 50643.
5. Third Quarterly Report (January 10-April 9, 1971) Chinese Agricultural Technical Group to Vietnam.
6. Basic Chemical Industry in Vietnam for the U.S. Agency for International Development USAID Contract VN-58, Project No. 1079, 1970.
7. Five-Year Rural Economic Development Plan, 1971-1975, Ministry of Land Reform and Agriculture and Fishery Development.
8. Mekong Delta Development Program Working Paper, MD-6, Nov. 1968.
9. Economic and Engineering Study Grain Storage and Marketing System Vietnam, United States Agency for International Development - by Wildman Agricultural Research Inc. March 1970.

§ 26.603 Grades, grade requirements, and grade designations

The following grades, grade requirements, and grade designations are applicable under these standards:

Soybeans

(a) *Grades and grade requirements for Soybeans.* (See also paragraph (c) of this section.)

Grade	Minimum test weight per bushel	Maximum limits of—					
		Moisture	Splits	Damaged kernels		Foreign material	Brown, black, and/or bicolored soybeans in yellow or green soybeans
				Total	Heat damaged		
	Pounds	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
1	56	13.0	10	2.0	0.2	1.0	1.0
2	54	14.0	20	3.0	0.5	2.0	2.0
3[1]	52	16.0	30	5.0	1.0	3.0	5.0
4[2]	49	18.0	40	8.0	3.0	5.0	10.0
Sample grade	Sample grade shall be soybeans which do not meet the requirements for any of the grades from No. 1 to No. 4, inclusive; or which are musty, sour, or heating; or which have any commercially objectionable foreign odor; or which contain stones; or which are otherwise of distinctly low quality.						

[1] Soybeans which are purple mottled or stained shall be graded not higher than No. 3.
[2] Soybeans which are materially weathered shall be graded not higher than No. 4.

Grade Designation

(b) The grade designation for soybeans shall include in the order named the number of the grade or the words "Sample grade," as the case may be; the name of the class; and the name of each applicable special grade. In the case of mixed soybeans, the grade designation shall also include, following the name of the class, the approximate percentages of yellow, green, brown, black, and bicolored soybeans in the mixture.

Special grades for Soybeans

(c) Special grades, special grade requirements and special grade designations for soybeans—(1) Garlicky soybeans (i) Requirements. Garlicky soybeans shall be soybeans which contain 5 or more garlic bulblets in 1,000 grams.

(ii) Grade designation. Garlicky soybeans shall be graded and designated according to the grade requirements of the standards applicable to such soybeans if they were not garlicky and there shall be added to and make a part of the grade designation the word "garlicky."

(2) Weevily soybeans—(i) Requirements. Weevily soybeans shall be soybeans which are infested with live weevils or other live insects injurious to stored grain.

(ii) Grade designation. Weevily soybeans shall be graded and designated according to the grade requirements of the standards applicable to such soybeans if they were not weevily, and there shall be added to and made a part of the grade designation the word "weevily."

Interpretations [Added]

§ 26.901 Interpretation with respect to the term "distinctly low quality"

The term "distinctly low quality", when used in the official grain standards of the United States, shall be construed to include grain which contains more than two crotalaria seeds (Crotalaria spp.) in 1,000 grams of grain.

§26.902 Interpretation with respect to the term "purple mottled or stained"

The term "purple mottled or stained" when used in the official grain standards of the United States for soybeans (see §26.603(a)) shall be construed to include soybeans which are discolored by the growth of a fungus; or by dirt; or by a dirtlike substance including nontoxic inoculants; or by other nontoxic substances.

OFFICIAL GRAIN STANDARDS OF THE UNITED STATES FOR MIXED GRAIN[1]

EFFECTIVE DECEMBER 1, 1960

§26.451 Terms defined

For the purposes of the Official Grain Standards of the United States for Mixed Grain:

(a) Mixed grain. Mixed grain shall be any mixture of grains for which standards have been established under the United States Grain Standards Act, or any mixture of such grains and wild oats, or wild oats, provided that such mixture does not come within the requirements of any of the standards for such grains, and that such mixture or wild oats does not contain more than 50 percent of foreign material.

(b) Grades. Grades shall be "Mixed Grain," "No. 1 Mixed Feed Oats," "No. 2 Mixed Feed Oats," "Sample grade Mixed Grain," and special grades provided for in §26.453.

(c) Wild oats. Wild oats shall be the seeds of Avena fatua and A. sterilis.

(d) Cultivated oats. Cultivated oats shall be the seeds of Avena sativa and A. byzantina.

(e) Mixed feed oats. Mixed feed oats shall be any Mixed Grain which contains not less than 75 percent of wild oats, or not less than 75 percent of wild oats and cultivated oats in combination, which combination shall include more than 25 percent of wild oats; and which contains not more than 7.0 percent of foreign material, not more than 15.0 percent of damaged kernels, and not more than 3.0 percent of heat-damaged

[1] The specifications of these standards shall not excuse failure to comply with the provisions of the Federal Food, Drug, and Cosmetic Act.