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REPORT ON MEETING WITH POTENTIAL SPICE GROWERS IN GUATEMALA

Assignment Number: ST/87-19

Contract Number: 596-0108-C-00-6060-00

SUBMITTED TO:

Regional Office for Central America and Panama (ROCAP)
U.S. Agency for International Development
Guatemala City, Guatemala

Submitted by:

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through

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March 30-31, 1987

To: CHEMONICS, International Consulting Division, 2000 M St., N.W., Washington, D. C. 20036

Date: March 30-31, 1987

Subject: MEETING WITH POTENTIAL SPICE GROWERS IN GUATEMALA

From: ELMO W. DAVIS, 1650 Vallejo Drive, Hollister, Calif. 95023 U.S.A.

In Guatemala I met with a group of people representing various organizations interested in growing, processing and shipping the finished product to the United States for market:

Oficina de Proyectos de Emergencia
Sr. Peter Jipp
Ministry of Agriculture investigating crops for Guatemala

Mayacrops
Salvador Cordon
Interest: Ornamental plants and saffron

Agrogan
Victor Hugo Garcia and Alberto Sandigo
Interest: Sesame seed and annatto

Comision Roya del Cafeto
Carlos Luna
Interest: Sesame seed

Consultores Agroindustriales
Fernando Garcia Salas and Sr. Rosenfelo
Commission to select 15 potential crops for Guatemala

Crops discussed in the general meeting as possible spice crops for Guatemala were:

Saffron
Onions and garlic for dehydration
Sesame seed
Tabasco peppers and other capsicums not paprika
Annatto
Seed Herbs cumin and others
Leafy herbs such as basil, sage, Origanum spp. etc
Black pepper for local consumption
Shallots for export

There is no question that most herbs and spices can be grown in Guatemala. Unless trials are conducted it is not possible to predict accurately the yield, quality or consistency of production.

In general the world is supplied with a adequate quantity of herbs and spices. Unless a group of individuals in a country can produce a quality and quantity needed by the trade and do it consistently and at a competitive world price they cannot expect to have a profitable enterprise.

Before large scale growing is done some agency or individual needs to conduct trials to obtain the best possible selections for growing and to determine the best cultural methods for that area to produce a high quality product for the market. No crop should be grown at the request of an individual or company without some evidence of the crop being successful in the area unless they are willing to assume some of the risk.

Sr. Salvador Cordon was interested in saffron. He is approaching the task in a proper manner. He plans to plant small plots at various elevation in Guatemala to determine the best location for growing. He is doing his research before going into full scale production. He does need a market contact for his crop.

Sr. Garcia Salas was interested in ginger, garlic, peppers, tiny ear corn, Belgian endive and shallots. The Belgian endive may be a successful crop but he needs the technology to grow a quality product, then a market for his crop. This is true of all crops discussed.

Julio Fairiu (?), Coop "4 Pinos", Santiago, Sacatepequez has dehydrated parsley on a small scale. He dries at 65-75 degrees C. for 2.5 hours. He gets 7% yield and is only doing 200 kg dry weight/day. He is interested in dehydrating onions and did try once. His yields of the local varieties were low. I advised him to obtain seed of short day dehydration types from Sunseed [formerly Arco Seed formerly Dessert Seed Company]. He should get 16% recovery with some of these varieties instead of less than 10% with the local variety.

He expressed an interest in dehydration of garlic, onion and leafy herbs. I would predict less than a 50% chance of success in entering the US market with dehydrated onion or garlic. The local variety of garlic is planted in October or November and harvested February to April. I did not hear of any date of planting trials to determine the optimum planting date and yield. It may be possible to ship fresh market garlic to the United States.

He also expressed an interest in using solar heat as a source of energy for dehydration of his crops. He needs to obtain plans of a relatively inexpensive unit. Perhaps the University of Arizona will have such plans.

Many of the spice crops could be grown in Guatemala for local consumption for the Central American market. During this time the grower could be learning how to grow and produce for the export market.

Sesame seed is already grown on the pacific side of Guatemala. The

grower involved was nearer the El Salvador border. The variety is a local Guatemalan variety with a straight single stem planted in December. Harvest is by hand. There is no rain during the growing season or during the harvest. They dedend upon the moisture in the soil. The yield quoted was about 1200 kg/ha in 72 days of growing. That is a very good yield in such a short time. The seed color is tan to white. They market through a local collector. Brokers and producers collect seed from the farmers. The price to the grower was Q65/cwt (about 24 cents U.S./lb). The price is comparable to that in Honduras. They may need a better marketing system than that currently available or they may need better cultural practices.

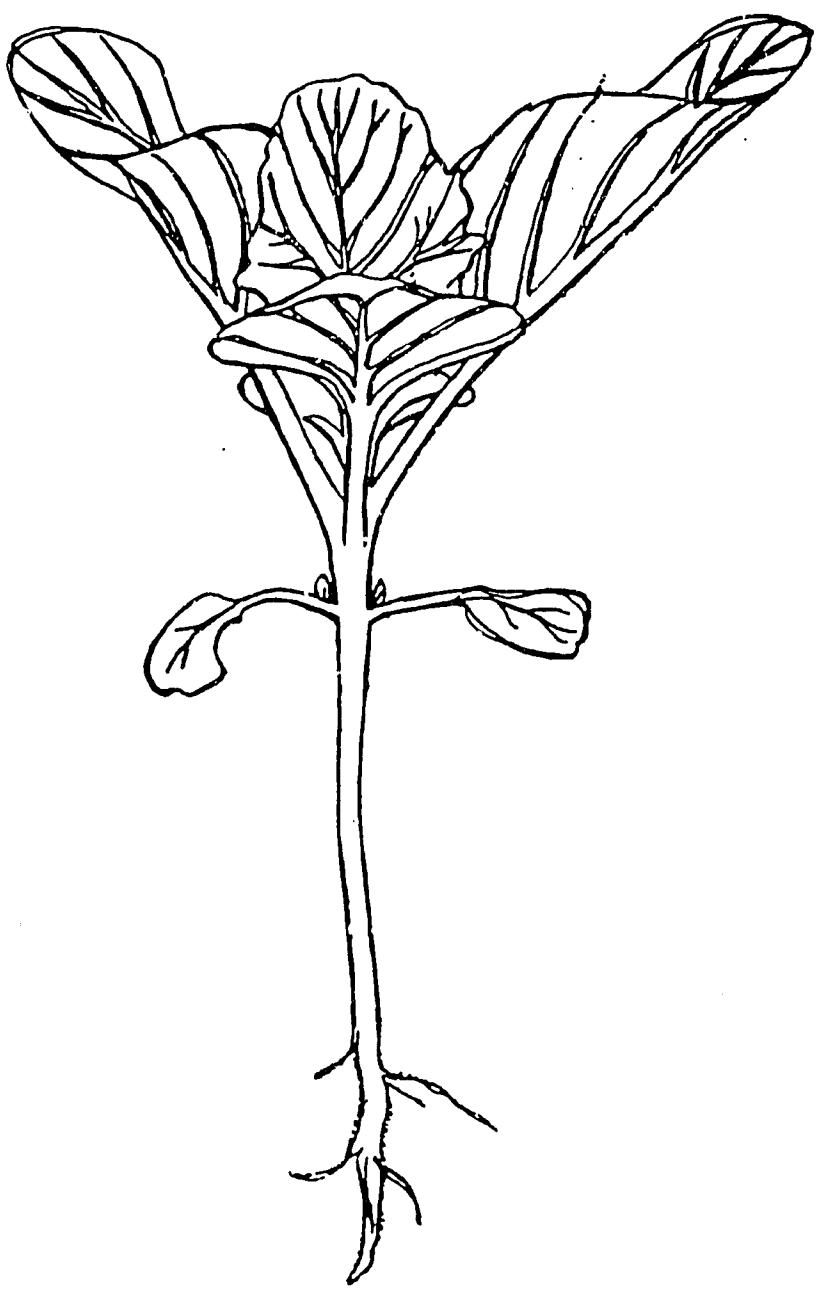
I was not able to get into the field in Guatemala so could not see the field conditions. There is a great interest in new crops. The people need someone with expertise who can keep in contact with them for long periods of time and someone to visit their operation so that they can ask questions and obtain advise on improving their operation. Frequent changes in advisory personnel may be disrupting to the project.

GROWING SHATTER-RESISTANT SESAME IN THE DESERT SOUTHWEST

March 1986

PACIFIC SOUTHWEST SEED AND GRAIN

SESACO CORPORATION



WHAT IS SESAME?

Sesame is one of the oldest cultivated crops in the world. Indian literature dates the crop growing between 2500 and 1400 B.C. Assyrian tablets, collected in the British Museum, describe Assyrian Gods drinking sesame wine before going into battle, and, in fact, loans in ancient Assyria were negotiated in either silver or sesame seed. Ancient customs using sesame as a good luck charm still persist in some countries.

But sesame is much more than an ancient good luck charm and a modern-day baker's garnish. Today over two million metric tons of sesame are grown in China, India, Sudan, Mexico, Burma, Nigeria and Venezuela, and a host of other Asian, African, and South American countries. Only 11% of the world-wide production of sesame is exported to countries not producing sesame; the remaining 89% is consumed where it is produced.

What are the qualities of sesame which account for its popularity? Primarily, sesame is grown as an oilseed, containing at least 50% edible oil of the finest quality. In its oil form, sesame is also used to some extent in cosmetics and as a pharmaceutical carrier/base. Its basic use, however, is as a cooking oil and in derived products such as margarine. The second desirable characteristic of sesame is its high protein content. Sesame seed is 16-32% protein. Once the oil has been removed, the remainder (now 50% protein) can be of great value as a meal, a flour or a protein isolate. A third use of sesame, and the one most familiar to the U.S. consumer, is that of a confectionary nature. Sesame is used in sticks, rounds, bread, rolls, buns, cookies, crackers, breadsticks, health foods, Halvah, etc. In other countries it is added to a variety of foods and sweetmeats, drinks and milkshakes. The crop also has byproduct utility as an animal food, etc.

Sesame seed is a prized commodity. As U.S. food processors are provided with a dependable domestic supply, the use of sesame as seed, oil, and meal is increasing dramatically. It is this demand for sesame and the improved higher yielding varieties that are assuring sesame a position as a domestic crop. With increasing yields sesame has become an attractive commodity for export from the U.S.

BACKGROUND AND PURPOSE

Although sesame is the oldest cultivated oilseed crop in the world, it is just now beginning to attain commercial significance in this country because SESACO's research has reversed its inherent shattering nature. When the traditional varieties dry, the pods open and the seed is lost. SESACO began a research program in Yuma, Arizona, in 1978 with the purpose of developing sesame varieties that minimize seed loss and thus could be fully mechanized.

SESACO has made breakthroughs in plant breeding and cultural practices that enable it, in conjunction with Pacific Southwest Seed and Grain (PSW) to release these newly developed shatter-resistant varieties.

Because sesame varieties and farming techniques are improving, this pamphlet should only be taken as a general guide for farming sesame. SESACO and PSW representatives will be available to consider individual applications and share any relevant experience as questions occur. Since many farmers in this area have planted sesame, your neighbor is probably a good source of information as well. The cultural practices described below are for producing sesame as a summer double crop in the Desert Southwest irrigated (and similar) regions.

SOIL CONDITIONS

Sesame grows best on medium, fertile, well-drained soils. Soils with neutral pH are preferred, but good results have been obtained on slightly alkaline soils. Where soil is of a lower fertility, heavier applications of commercial fertilizers are required for satisfactory production.

TIME OF PLANTING

Optimum planting dates are between May 15 and July 15. Sesame can be planted earlier if there is warm weather, and sesame planted after 15 July can be affected by unseasonably cool weather at flowering or harvest. Soil temperatures above 75 degrees and night temperatures above 65 degrees favor quick germination and fast growth.

ROW SPACING

Sesame has grown successfully on single row 20", single row 30", double and triple row 40"/42", and drill. There may be a yield reduction on single row greater than 30" with the present varieties. Drill populations have provided good yields, but mulching operations, precision planting and weed control require additional attention. Sesame can be planted flat or raised on beds. A primary consideration on bedding is the effect on harvesting. The beds must be low enough so there is no appreciable difficulty and loss in the furrows when the plants are swathed and then picked up. The major advantages of bedding are the ability to follow moisture down when mulching and the control of sensitive irrigation on heavy soils. If in doubt, bed up.

LAND PREPARATION AND FERTILIZATION

Wheat straw can be either disked well under or burned off. For areas with heavy soils, the land may have to be ripped to alleviate compaction problems. Fertilizer may be

applied dry or with the preplant irrigation. The total amount of fertilizer for sesame is still under study, but initial indications are that 40-80 units of nitrogen provide good yields; use less fertilizer if following produce or alfalfa and more fertilizer if on sandy soils or if there is straw from the previous crop. Subsequent fertilizer can be water-run or injected. Too much fertilizer on early plantings will promote vegetation. Under some later planting conditions beneficial results from a preplant application of nitrogen phosphate or ammonium polysulfide have been observed.

The preirrigation for mulch planting should be the heaviest of all irrigations; if possible, 6 to 8 inches of water per acre should be applied. This irrigation must be heavy enough to provide moisture for the young sesame plants for 2 to 4 weeks, depending on soil conditions. On lighter soils two preirrigations have been used to maximize weed control. In some cases, farmers mulch between preirrigations; in other cases, farmers apply the second preirrigation to provide a 10-12 day period between the first preirrigation and the mulching for maximum weed germination.

Sesame will germinate quickly if it is seeded into warm moist soil. To assure proper moisture it is necessary to mulch just as soon as it is possible to get on the ground. At this hot time of year, it is better to be mulching the ground a little on the wet side rather than on the dry side. The finished mulch of dry soil should be anywhere from 1/2" to 1 1/2" deep. Anything that will prepare a smooth mellow seed bed with finely broken soil is acceptable. The best mulcher to date has been a rod weeder without cultipacker. Other mulchers in order of preference are a crawler pulling a hay renovator with duck feet set at 1" depth with a log and cultipacker behind, mechanical (i.e., rotomulcher), bed shapers, LIGHT mulching disk (well-controlled) with cultipacker, Lillistons, and harrows. Schmneissers are being tested this year.

PLANTING

It is important to stay close behind the mulching with the planting operation because in the summer the moisture can get away within 6 to 12 hours after mulching. Seed depth will vary depending upon soil type and soil condition. As a guideline, the seed should be placed in the moist soil with 3/4" to 2" of soil above it (this includes moist soil and dry mulch). In heavy soils the depth should be closer to 1" with a thin mulch. On sandy soils the depth should be closer to 2" with 1" mulch. The planting should be done in such a way as to not form a cap or crust of hard soil above the seed line. If the days are hot and the nights warm, sesame will begin to emerge in 3-7 days. The sesame will continue germinating and a full stand appears 7-10 days for row crops and 10-15 days for drill.

Sesame has been planted as deep as 3-3 1/2" in loose and crumbly soil and has partially germinated. However, the seedlings are smaller, fewer and weaker when they break through the surface. As a result, they take longer to start another spurt of growth, giving the weeds a chance to catch up. Sesame has been planted under ideal conditions as shallow as 1/4 - 1/2" on very hot days (105-115 degrees) with seedlings appearing within 24 hours. However, this depth requires perfect moisture and depth control on both the mulching and planting. If the seed does not have enough moisture to germinate, it will wait and germinate at the first irrigation. The result is a stand with plants of two different maturity cycles, with resulting problems all season and loss at harvest. This problem also prevents successful spot replants.

Seeding rates for mulch planting depend in part on row spacing as follows:

Row Spacing	Pounds per Acre
single row 20"	2.5 to 3
single row 30"	2 to 4
double row 40"	2.5 to 5
drill	6 to 10

The low rate should be used in May and high rate in July. High populations in May and early June will lead to tall, thin plants that are susceptible to lodging. Low populations in late June and July can lead to low production.

The major advantages of drill are higher populations, quicker cover, and lower operational costs. The major advantage of bedding is reduction of scalding. The major advantage of flat planting is minimal loss of plants in furrows at harvest. This year several farmers are trying new variations that take advantage of the different cropping systems. They are planting in miminal beds that will reduce scalding while minimizing the depth of the furrows at harvest. Farmers are also compromising the distance between drill and rows in order to increase population while still providing the capability to cultivate.

Ideal population per acre has still not been determined. There are approximately 180,000 seeds per pound of sesame. The number of seeds to be planted per foot is highly dependent on planting conditions. Germination is higher at higher temperatures (particularly night temperatures), at shallow depths (but with sufficient moisture), and in loose soil. Many farmers strive for an emergence of 1 seedling per inch with a final mature stand of 5-8 plants per foot. Each farmer must experiment with

the effects of his soil type, mulcher, and planter to determine how many seeds per foot are required to provide the proper stand. Under good planting conditions, 15 -22 seeds per foot is recommended. Sesame will do some self-thinning, but when planted too thick within a row, the plants can become leggy and susceptible to lodging and inhibit branching-on-branching varieties. There are indications that increasing populations by planting at closer row spacings is better than increasing the population by planting more plants within a row.

The most critical aspects of planting are timing, depth, cover and proper mulching. Any planter that can operate accurately in a shallow mulch is acceptable. JD 71, JD 7100, and IH 800 series planters have been used successfully. The planter should be set to distribute the seed evenly and at a consistent depth. The following planter boxes and settings have been used:
JD 33 box with B28036 plate (tomato seed plate) and Planet Junior with #6 or #7 hole on single row 30". Temik boxes and IH 185 planters have also been used, although these are not recommended. On a drill, small seed boxes are highly recommended to keep down the seeding rate to 6-10 lbs. per acre. Getting a good stand of sesame is the key to high yields. If there is a poor stand, there is nothing that can be done to get a high yield. The main causes of a poor stand are: mulching too deep, irregular mulching depths, mulching too dry, not putting the seed in the moisture, and planting too deep.

HERBICIDES

There are no herbicides registered for sesame. There are efforts in progress to approve Caparol and Treflan. Presently, weeds are being controlled through proper mulching and cultivation. Sesame cannot compete with bermuda grass, careless weed, ground cherry, morning glory or most aggressive weeds. Established bermuda grass must be controlled prior to planting or the stand of sesame will be non-existent in the grass patches, which will later complicate the drying down process at harvest. Careless weeds, ground cherry, and morning glory must be controlled by cultivation/hoe crews. A good stand of sesame after a good mulching job has competed against water grass, nut grass, jimson weed, and purslane. However, these weeds can become a major problem with a poor mulching job or a rain right after planting.

PESTICIDES

There are no pesticides registered for sesame. Sesame comes out of the ground with very small cotyledons. Some leaf eating insects (e.g., army worms) will attack the sesame seedlings, but sesame can sustain considerable damage and recover completely. We have found the best resistance

to pests to be a full, strong sesame stand. The sesame will thin itself somewhat as it gets older and in its early development the multitude of plants will give the best insect protection.

CULTIVATION

Generally, sesame grown in rows is ready for cultivation at three weeks. Aside from killing weeds, this cultivation stimulates growth by stirring the soil and giving the roots oxygen. On long flat runs, it may be beneficial to attach a small furrow opener to every other row of the cultivator. This makes a shallow groove in one row while leaving a flat area in the other row. These furrows help the irrigation water to move across the ground more quickly and also keeps the water from standing at the base of the plant. The flat surface allows a drier area similar to a raised bed, and provides a smooth surface for windrowing. On the second cultivation, generally a week after the first irrigation, some soil has been thrown against the plant without apparent distress, although there is some question on the advisability of this practice on heavy soils.

IRRIGATION PRACTICES

A sesame stand 'scalds' something like alfalfa and can be killed by a heavy application of water which results in water standing at the base of the plant, particularly on a hot still day (similar to safflower or alfalfa). Depending on soil types and weather, the first irrigation to the plants should be from 2 1/2 weeks to 4 weeks from the date of planting. This watering will promote the development of the feeder root system. Extreme caution should be used if temperature is above 110 degrees Fahrenheit. A good indicator for the first irrigation is when the plant turns a darker shade of green.

The next irrigations should be applied as needed. No benefit has been demonstrated by stressing sesame after the first irrigation. Plant stress can be anticipated by watching changes in the status of the flowering head and wilting of the leaves. The flowering head that lacks visible growth of at least two inches is heading for stress. This sign is good until the plant nears maturity when the flowering head is normally smaller. The leaves will often wilt on hot afternoons as the plants near the next irrigation. If the leaves start wilting before noon, there is stress that can reduce yields. Sesame can recover from severe stress and look as healthy, but close examination of the pods that were formed in that stress period shows poor pod and seed set.

A regular irrigation schedule of 7-12 days can be used once the response to particular soils is established. Irrigations should be continued until the plant begins

dropping its leaves. If the weather is unseasonably hot in late August/early September more irrigation is necessary so that the field matures evenly. Once the plants lose their leaves, the plant cannot transpire as effectively; thus, any subsequent irrigations mean that it will take longer to dry out the soil for swathing.

SWATHING

Sesame is ready for harvest 95-130 days after planting, depending on the varieties, the time of planting and temperatures. Early plantings will take longer to mature. Hot temperatures and other stresses will accelerate maturity and cold temperatures will delay maturity. Frosts will kill the plants. If there is a killing frost, the crop should be swathed immediately. When the plant begins dropping its leaves, the seed is approaching physiological maturity. The plants can be swathed when the seed in pods 2/3 of the way up the plant have seed color and the seam on the back of the seed can be seen. Immature seeds are milky white. Previously it was believed that the farmer could either swath the crop when the bottom pods began to open, or wait until the upper seed reached maturity. However, recent research shows that only 57% of the flowers on the upper third of the plant will set pods and none of the last 3-5 flowers will set even under optimum conditions. Therefore, the plants should swathed before the lower pods begin to open.

Off-the-shelf draper swathers and modified augers have given the best results. A cam action or down grain reel should be used. It should be noted that some of the larger JD units may not have this type of reel as standard equipment. An IH suspended auger (twin auger) has been used and the under the auger header may work if set properly. Rotary swathers and mowers may work, but have not been tried.

COMBINING

Generally, the plants are ready for combining 5 to 12 days after they have been swathed, depending on the temperature, humidity, etc. The seed must have less than 6% moisture or it will spoil. The threshing of the pod must not damage the seed. Since sesame is high in oil content, overly aggressive threshing will bruise the seed. Bruised seed causes rancidity, lower germination, and higher losses from breakage.

Any combine that will seal well enough not to lose seeds and can be set for delicate crops can be used. The swathed plants have generally been picked up with a belt pickup header; but down-grain reels and specially built spiked cylinders have been successful. Air headers appear to have increased yields 15%-20% with current varieties. The air headers are particularly effective after rain on

stopped. During cooler weather there is a 5 to 8 day leeway in leaving the plant standing without considerable shatter loss.

OTHER CONSIDERATIONS

Many rotations have been used successfully with sesame. Sesame can follow wheat, barley, produce and alfalfa. The following crops have followed sesame: wheat, barley, late produce, alfalfa, and cotton.

Sesame requires less fertilizer if it follows late produce, alfalfa, or if the wheat straw has been burned off. There will be sesame volunteers in late produce and October alfalfa, but the plants will rarely get above 3 inches and will die when the temperatures begin getting lower. Volunteers can be found in cotton if there is a warm spell at cotton planting time, but most of the time the sesame volunteers will germinate later and can be cultivated easily. Alfalfa needs a bit more fertilizer after sesame to overcome the effects of the sesame straw. The large sesame varieties with extra plant material (SESACO 4 and SESACO 8) need extra fertilizer to break down the straw. Following sesame, farmers have generally reported excellent tilth and drainage, with no troubles handling the rapidly decomposing crop residue.

SUMMARY

Sesame is a good double crop in the desert Southwest. Yields have been increasing every year. Improved varieties have been released and many promising varieties are in the final testing and purification stages. Significant advances in equipment and agronomic practices have been made by farmers and custom operators. Experience has given farmers a better working knowledge of the sesame plant and how it responds to different conditions, so that these conditions can be manipulated to the best advantage. Because of all of these improvements, yield, quality and dependability are improving each year. With improved yield, quality and dependability comes better marketing capabilities. Sesame buyers from the major sesame importing countries in the Far East, Middle East, Europe and the U.S. have been monitoring the progress made and are now looking to this area to become a major source of sesame in the world.

windrows, in weedy fields, or if the optimum pick-up time has passed. The swathing/combining should be coordinated to lay down the plants in a pattern where it is convenient for the combine to pick up the plants top first. This minimizes the loss of seed as the plants are fed into the combine. Conventional combines with wide open concaves, 325 rpm, 5/32 screens and light air have been successful. Rotary combines have also been used quite successfully. The combine bin must be emptied before the seed piles above the auger or the seed will be damaged by churning.

DELIVERY

Harvested sesame will be delivered to specified delivery points in bulk. There a sample will be taken for measurement of purity and moisture. The grower will be paid upon receipt of the seed analysis. The basis for payment will be for 99% clean, dry seed, 5% moisture. Loads over 15% in dockage plus foreign material, over 6% moisture, or over 3% broken seed are considered out of condition. These loads will be handled separately with costs being assessed to the grower. If the seed is so out of condition that it cannot be stabilized, it will be sold for salvage value.

HARVEST MANAGEMENT

Harvest planning should begin before planting; otherwise too much sesame will become mature at the same time. If planting two varieties, plant the early one first and the late one last. If planting on different soils, plant on light soils first and heavy soils later to spread harvest timing.

If it appears that too many fields are going to mature at the same time, cutting off irrigation early can accelerate maturity; adding fertilizer in the last scheduled irrigation or adding an extra watering can delay maturity. If these measures are not effective, some of the acreage should be cut early. There is significantly greater yield loss in swathing a week later than the optimum maturity than in swathing a week earlier than optimum. Swather breakdowns and schedule delays have caused significant yield reductions in the last five years.

One common mistake is to swath in the same field order as planting. Fields that have lighter soil will dry down faster than those with heavier soils. In assessing fields, the whole field should be checked since the edges and heavy soil areas are greener. In streaky fields, the farmer must balance the proportion of dry and green sesame. Cutting too dry will result in seed loss at swathing and cutting too green will produce immature seeds.

An important consideration in swathing is only to cut as much in a day as can be combined in a day. During hot weather there is only 2 to 3 day leeway on optimum swathing time, particularly if the last irrigation was when flowering