General Production Information

Production: Sugarcane is a perennial tropical grass that originated in southeast Asia, was introduced to Hawaii by Polynesian cultures, and brought to the Americas by European colonists. Sugarcane is produced by planting one-meter lengths of stalks horizontally in the soil. New roots and shoots are regenerated each year from nodal bands. The first year's crop is called "plant cane" and is harvested a year or more after planting. In succeeding years, stubble or "ratoon crops" are harvested from the regrowth. Yields decline with successive stubble crops. Land is commonly rotated to other crops before sugarcane is replanted. Field production and milling are closely linked because both require high capital investments and attentive management. Poor weed control impacts tonnage in the field and sucrose recovery in the mill.

Products: Sugarcane stalks are crushed to extract juice, which is then boiled and evaporated to produce a thick syrup from which sugar granules form. Sugarcane also produces two byproducts: molasses and bagasse. Molasses is a thick syrup from which no more sugar can be removed and is used as a livestock feed or is fermented into fuel alcohol or interesting beverages. Bagasse is the fiber constituent remaining after the juice is expressed. Bagasse is burned for steam generation to power the mill equipment and generate electricity. Excess bagasse is used in industrial fiber products.

Summary Facts on Texas Sugarcane

- Several insects, mostly borers, infest Texas sugarcane. Several bio-control agents, resulting from prior research investments, suppress these pests. Insecticides are not applied due to low economic benefits.
- Diseases are suppressed by planting resistant varieties, cultural practices, and some hot water treatments. No fungicides are applied.
- Weeds impose major losses and require repeated tillage (6 to 8 times per season). Rotations with cotton and other crops are practiced. Herbicides are applied based on scouting and field histories; most important are atrazine and pendimethalin. Herbicide use in Texas totals 140,600 pounds and averages 3.3 pounds per acre per year.

Sugarcane in Texas

The Crop Profile/PMSP database, including this document, is supported by USDA NIFA.
The sugarcane industry in Texas is located in the Lower Rio Grande Valley (LRGV) in the counties of Cameron, Hidalgo, and Willacy, and is the fourth largest source of U.S. sugarcane. Sugarcane is produced on 43,000 acres, with 1.5 million tons harvested annually. Sugarcane growers in Texas organized the Rio Grande Valley Sugar Growers, Inc. as a farmer-owned cooperative. Approximately 140 farmers grow sugarcane today. The most common varieties are CP 72-1210 (65%) and TCP 87-3388 (24%). Sugarcane provides a $64 million economic impact for the state.

Yields vary due to weather and adverse factors such as freezes, drought, salt accumulation in the soil, heavy rains at harvest, diseases, and weed and insect problems. Precipitation in the LRGV averages 26 to 28 inches annually. Texas is highly dependent on irrigation water from dams along the Rio Grande River. Water rights and conflicts with Mexico have adversely impacted the industry.

Cultural Practices

Worker Tasks and Reentry Interval Issues

- REI overview for plant cane and ratoon (re-growth) cane - summarized in Table 3.
- Production of sugarcane is one of the most mechanized of all field crops. Rows are wide (6 ft. or more), farm equipment is "high clearance" to avoid breaking stalks, and climate-controlled cabs.
- Insecticides or fungicides are not applied - costly, not effective, or not available.
- Herbicides - applied with ground sprayers, usually high clearance spray rigs.
- In-field worker tasks include:
  - setting irrigation lines/ tubes at ends of field.
  - spot spraying around ends of field, irrigation risers, or in field.
  - field checks on weed status and insect predators and parasites.
- Hand weeding and hand harvesting are not practiced.

<table>
<thead>
<tr>
<th>Crop/Season</th>
<th>Worker Tasks/REI</th>
<th>Pesticide Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant Cane</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer - Preplant</td>
<td>● Heavy tillage - destroy previous crop&lt;br&gt; ● Bed up, finish land preparation&lt;br&gt; ● Tillage or glyphosate to kill weeds</td>
<td>Glyphosate</td>
</tr>
<tr>
<td>Season/Stage</td>
<td>Activities</td>
<td>Herbicides/Agents</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Summer - Plant</strong></td>
<td>• Open furrows, plant stalks</td>
<td>Prowl and/or Atrazine</td>
</tr>
<tr>
<td></td>
<td>• Soil-applied herbicides for seedling weeds</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Monitor field, spot spray perennial grasses</td>
<td></td>
</tr>
<tr>
<td><strong>Fall/Winter</strong></td>
<td>• Plant cane monitored for weeds</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Moved into &quot;Ratoon Cane&quot; system</td>
<td></td>
</tr>
<tr>
<td><strong>Ratoon Cane</strong></td>
<td>• Rows formed, fertilized, irrigated</td>
<td></td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td>• Soil-applied herbicides sprayed</td>
<td>see Table 2</td>
</tr>
<tr>
<td></td>
<td>• Irrigated and scout as needed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Cultivation - done in advance or with early-season herbicide application</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Post emerge herbicides applied</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Spot spray perennial grasses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Lay-by herbicides</td>
<td></td>
</tr>
<tr>
<td><strong>Summer</strong></td>
<td>• Continue irrigation</td>
<td>see Table 2</td>
</tr>
<tr>
<td></td>
<td>• Harvest stalks, scheduled through Oct. - Jan.</td>
<td></td>
</tr>
<tr>
<td><strong>Sept.- Oct.</strong></td>
<td>• Rows reformed; weeds spot sprayed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Prepare for spring growth</td>
<td></td>
</tr>
<tr>
<td><strong>Fall/Winter</strong></td>
<td>• Monitor for insects for biocontrol agents</td>
<td>no insecticide applied</td>
</tr>
<tr>
<td><strong>Plant and Ratoon</strong></td>
<td>• Diseases - assess impact; may harvest early</td>
<td>no fungicide applied</td>
</tr>
<tr>
<td><strong>Spring and Summer</strong></td>
<td>• Monitor for insects for biocontrol agents</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Diseases - assess impact; may harvest early</td>
<td></td>
</tr>
</tbody>
</table>
Overview

Less than 1% of the total sugarcane acreage in Texas is treated with any insecticide. Borers are the key insect pest in Texas. The Mexican rice borer infests about 20% of the sugarcane in Texas. The sugarcane borer was a primary pest until parasitic control was established but is no longer an economic threat. Occasional insects include white grubs, aphids, cicada, pink mealy bugs, and west Indian cane flies. See the text below and Table 1 for more details.

Mexican Rice Borer

Mexican rice borers (MRB) (Eoreuma loftini) cause damage each year but chemical control is not effective since MRB larvae enter the stalk early and plug their tunnels with frass. Over twenty parasites have been imported to control the insect and several parasites have been established (see Table 1). Chemical control is not practiced because contact insecticides do not reach the MRB inside the stalk and repeated applications would be necessary for suppression.

Sugarcane Borer

The sugarcane borer (Diatrea saccharalis) (SCB) was considered the worst insect in sugarcane until a parasitic wasp Cotesia flavipes (Cameron) was introduced for bio-control.

This wasp was released in the LRGV in the early 1980s and has been a great success. Periodically new releases need to be made to reintroduce the parasite after severe winters. See White and Regan (1999), and Wiedenmann and Smith (1995) for more details.

Other Insect Pests

Other pests occur occasionally in sugarcane but are not economically damaging. White grubs (several species) feed on roots and crowns but are suppressed by natural predators and weather. Yellow aphids (Sipha flava) peak in spring and again in late summer and reside on undersides of leaves. Damage includes reddening of leaves, yellowing of plants, loss of photosynthetic tissue, and eventual leaf death. Ladybugs and lacewing flies may reduce aphid populations. Secretions of the West Indian cane fly cause a black mold to collect on cane leaves and reduce photosynthesis.

<table>
<thead>
<tr>
<th>Pest</th>
<th>Control Agent</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mexican Rice Borer</strong></td>
<td><strong>Biological Control:</strong> ( I = Introduced, N = Native)</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Allorhogas pyralophagus</em> (I)</td>
<td>Established but not highly effective</td>
</tr>
<tr>
<td></td>
<td><em>Alabagrus stigma</em> (I)</td>
<td>Became established but not effective</td>
</tr>
<tr>
<td>Insect</td>
<td>Biological Control</td>
<td></td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Sugarcane Borer</td>
<td><strong>Cortesia flavipes</strong> (wasp) Parasitic wasp, highly effective, re-released after severe winters</td>
<td></td>
</tr>
<tr>
<td>White Grubs</td>
<td>Natural predators Suppressed by soil predators &amp; weather</td>
<td></td>
</tr>
<tr>
<td>Yellow aphids</td>
<td>Lady bugs Reduces population on leaves</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lacewing flies Reduces population on leaves</td>
<td></td>
</tr>
</tbody>
</table>

### Weeds

**Overview**

Weeds cause more economic loss in sugarcane than all other pests combined. Weeds cause the loss of tonnage in the field, reduce sucrose recovery in the mill, and shorten ratoon lives. Weeds reduce solar heating of soil needed for early growth, extract soil water, reduce light, rob soil nutrients, and serve as
reservoirs for numerous insect and disease pests. Other than harvesting and irrigation, weed control is the most costly component of sugarcane production.

Ratoons are maintained for more than three years if perennial grassy weeds (such as Johnsongrass) can be controlled. Stubble crops continue longer if weed control can be sustained.

Crop rotation with cotton and other crops help control weeds because tillage and alternative chemicals can be used for these alternative crops. The sugarcane industry is highly dependent on herbicides for profitable, environmentally sound production.

**Major Weed Problems**

Perennial grasses are THE major pest problem in Texas sugarcane. Weed problems ranked by Texas cane growers:

- perennial grasses: guineagrass, johnsongrass, bermudagrass, and nutsedge.
- annual weeds: sunflower, pigweed (careless weed), winter annual broadleaf weeds, annual grasses (Coloradograss), and morningglories/vines.

**Weed Management Strategies - Non-chemical**

- **Before Planting:** After four to eight years of production, cane land is either fallowed (tilled without a crop) or rotated to an annual row crop such as cotton or a grain crop which allows extra tillage and rotation of herbicides with the alternative crop.
- **At Planting:** Clean seed cane is covered with soil and then given a protective herbicide cover within two weeks to control weeds. Growers manage sugarcane for rapid canopy closure to suppress weeds. Practices include using improved varieties, water management, and early season weed control. A strong early overstory is ecologically important in suppressing weed growth.
- **In-Season Cultivation:** Growers use a variety of tillage and cultivation equipment for mechanical weed control in cane fields. Disk gangs tear down (bar-off) the sides of rows to re-shape beds, kill weeds, and move soil back to the cane. The rolling cultivator extends the period of residual chemical weed control. All growers practice mechanical weed control but do not consider them as a substitute for herbicides. **Tillage** is extensive and is practiced 1.5 times in preplant or pre-season, 3.4 times in the plant crop, and 3.1 tillage operations in the ratoon crop for an average of 6 to 8 trips per season.

**Herbicide Use in Sugarcane**

Herbicides are vitally important. Total use is summarized in Table 2 and notes on each chemical are itemized below, based on grower reports and practices.
Ametryn (Evik) has a short residual control for weeds, and is not an alternative for atrazine

- used to control broadleaf weeds and annual grasses
- average of 1 application/year at 2 lbs./acre, on 10% of Texas sugarcane
- relatively inexpensive, mixes easily in tanks with other herbicides

Asulam (Asulox)

- very effective on perennial grasses
- applied on less than 1% of crop due to extremely high cost

Atrazine (AAtrex) provides the basic residual herbicide to control weeds throughout the growing season. Growers consider atrazine essential in their weed control program.

- for broadleaf weeds and some annual grasses
- applied 1.4 times/season at 1 to 1.5 lbs./acre on 90% of the crop
- tank mixed with other herbicides 85% of the time
- easy to use, cost efficient, and reliable
- commonly applied in bands over the row

Dicamba (Banvel) is used in combination with other chemicals.

- average of 1 application/year at 0.6 lbs./acre on 15% of Texas sugarcane
- limited by wind conditions and the presence of other crops
- important for broadleaf weeds and vines

Diuron (Karmex)

- applied on 15% of Texas sugarcane at 1 lbs./acre
- limited use but still important

Glyphosate (Roundup) is used for spot treatment

- used by 25 to 35% of growers, but on very limited non-crop acres
- applied on turn rows and irrigation risers mostly for perennial grasses
- inexpensive and effective
- hooded sprayer - researched, but not used by growers
- if GMO Roundup ready cane became available, use would increase

Hexazinone (Velpar)
• effective but costly

Paraquat (Gramoxone)

• applied on less than 1% of treated acres at 1.0 lbs. per acre

Pendimethalin (Prowl) is widely used.

• primarily for grass control, important in early control of weeds
• long lasting control, easy to apply, and mixes readily with other chemicals
• average of 1 application/ year at 1.5 lbs./acre on 85% of the cane

Trifluralin (Treflan)

• applied on 10% of sugarcane acreage at 1.5 lbs./acre
• pendimethalin considered easier to use

2,4-D (several trade names) 0% treated in Texas cane due to nearby susceptible crops.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Trade Name</th>
<th>Avg. No. App./Year</th>
<th>Avg. lbs/ai/ac/yr</th>
<th>% of Acres Treated</th>
<th>Total lbs. Applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ametryn</td>
<td>Evik</td>
<td>1.0</td>
<td>2.0</td>
<td>10</td>
<td>8600</td>
</tr>
<tr>
<td>Asulam</td>
<td>Asulox</td>
<td>1.0</td>
<td>0.75</td>
<td>.5</td>
<td>200</td>
</tr>
<tr>
<td>Atrazine*</td>
<td>Atrazine</td>
<td>1.4</td>
<td>1.5</td>
<td>90*</td>
<td>56,900</td>
</tr>
<tr>
<td>Dicamba</td>
<td>Banvel</td>
<td>1.0</td>
<td>0.6</td>
<td>15</td>
<td>3,900</td>
</tr>
<tr>
<td>Diuron</td>
<td>Karmex</td>
<td>1.0</td>
<td>1.0</td>
<td>15</td>
<td>6,500</td>
</tr>
<tr>
<td>Glyphosate**</td>
<td>Roundup</td>
<td>2.0</td>
<td>2.0</td>
<td>40**</td>
<td>1,400</td>
</tr>
<tr>
<td>Hexazinone</td>
<td>Velpar</td>
<td>1.0</td>
<td>0.5</td>
<td>1</td>
<td>200</td>
</tr>
<tr>
<td>Paraquat</td>
<td>Gramoxone</td>
<td>1.0</td>
<td>1.0</td>
<td>4</td>
<td>1,700</td>
</tr>
<tr>
<td>Pendimethalin</td>
<td>Prowl</td>
<td>1.0</td>
<td>1.5</td>
<td>85</td>
<td>54,800</td>
</tr>
<tr>
<td>Trifluralin</td>
<td>Treflan</td>
<td>1.0</td>
<td>1.5</td>
<td>10</td>
<td>6,400</td>
</tr>
</tbody>
</table>

State Totals 140,600

* 50% of the atrazine applications are banded on 40% of the area.
** Spot sprayed on 2% of the head-row land around 40% of crop.
Herbicide Application

Methods: Broadcast on 70% of the crop, and sprayed as a directed post on 48% of treated acres. Spot treatment is performed on 25% of sugarcane acreage, and aerial application on 2%. Grower applies herbicides 98% of the time. All spray planes have enclosed cockpits and over 80% use GPS and/or engineered control systems for precise delivery. Aerial application is reserved for wet periods.

Time of Application: 100% of acreage is treated at planting; 50% of ratoon acreage shortly after harvest. 20% of acreage is treated with herbicides from December to February. During the spring green-up season, 100% of planted acres receive a herbicide application. Mid-season spot application occurs on 30% of sugarcane acreage. Through May and June, or the layby period, 75% of sugarcane is treated.

Historical Perspectives: Time requirements to control weeds have reduced from 20 to 80 hours per hectare to 5 to 10 minutes per hectare. Hand hoeing with iron and steel hand tools traditionally required 20 to 80 hours per hectare. Cultivation with animals and implements was 8 to 12 hours plus some hoeing. Tractor cultivation with power implements required 1 to 2 hours per hectare plus some hoeing. Herbicides applied with hand sprayers required 2 to 6 hours per hectare. Weed killers applied with tractor sprayers take 10 to 20 minutes and with aerial application, weed control can be accomplished in 5 minutes per hectare.

Diseases

Overview

No fungicides are applied to Texas sugarcane. The primary controls for diseases are cultural practices and genetically resistant varieties. Approximately 5% of Texas sugarcane is planted with seed stock that has been immersed in hot water for disease control purposes.

Ratoon Stunting Disease (RSD) (Clavibacter xyli subsp. xyli)

Yield losses can be substantial, depending on the variety and age of the ratoon. When severe, ratoons are destroyed and fields are replanted. No fungicides are used. The disease may get re-introduced by the use of infested plant cane or mechanical introduction. To prevent introduction, seed cane is immersed in hot water for two hours at 50 degrees Celsius before planting. Implements should be cleaned and chemically disinfected with Lysol or Dowcide before being moved to different fields.

Leaf Scald (Xanthomonas albilineans)

Bacteria is kept out by quarantine of varieties from other growing areas. Seed cane is subjected to a hot
water treatment prior to planting. Not seen in Texas fields and no chemicals are used for treatment.

**Rust** (*Puccinia melanocephala*)

Rust is not a major problem. Rust resistance is bred into most varieties. Sugarcane is not chemically treated to control rust.

**Smut** (*Ustilago scitaminea*)

Smut is controlled through the use of resistant varieties and is not chemically treated. Less than 3% of Texas sugarcane is infected. Long, black whip-like structures appear later at the stalk tip. Whips can be physically removed to reduce spread. Smut can be avoided by planting non-infected seed pieces.

**Yellow Leaf Syndrome**

No measurable yield loss in Texas. Sugarcane is not treated. Yellow leaf is caused by a virus infection. Leaves yellow and eventually die.

**Vertebrate Pests**

The **Cotton Rat** (*Sigmodon hispidus*) is a fairly small animal, but sometimes causes significant economic loss to Texas sugarcane growers. The rat is herbivorous and sugarcane is part of their diet. Rats are found in 4% of sugarcane fields but are seldom treated. These rats reside mostly in coastal areas where the humidity levels are higher. Rats create problems by eating stalks which causes lodging. Good weed control helps to suppress rats, who like to feed on weed seeds as a source of protein. Severely impacted areas of fields (usually near the edges) may be treated with zinc phosphide baits. Rats are more common where human housing is close to can fields. **Fetal hogs**, nutria, and other pests are sometimes noted but problems tend to be isolated.

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References


