A STORY OF—

SUGAR CANE MACHINERY

EMILE A. MAIER

This book is written for and dedicated to
our grandchildren, yours and mine
who may wish to know something of the
machinery which has been used in
the cane fields of Louisiana.

Sugar Journal
806 Perdido St.
New Orleans, Louisiana

Printed in the United States of America by
American Printing Co., New Orleans, U.S.A.

FOREWORD

As Man Learns From Other Men, So An Industry Can Learn From Another Industry.

EMILE A. MAIER

The Author.

Graduated from the Louisiana State University in Agriculture, spent his first years in the industry aiding in the development of the Florida Sugar Industry. Today he is in the employ of Louisiana's largest sugar company. His specialty to assess the various types of equipment used in land preparation, planting and harvest. Spare times he doubles as the Agricultural Editor of the Sugar Journal.

This is the story of man and machine in the Louisiana cane fields, a story which traces agricultural machinery from its earlier stages to what it is today. This is the story of how an industry became completely mechanized, how and why Louisiana discarded and started many new practices. This book is therefore an excellent attempt to describe these things. Written in a practical vein this book is not didactic. It is but an explanation of how and why we do certain things. This book though written about Louisiana will be most useful to the many regional readers as they, like we in Louisiana stumble along the road to complete mechanization. Albeit if this book but points the way or clears the path, its mission will be accomplished.

This book, though dedicated to all of us who love the noble cane, is actually aimed at the field superintendent and plant overseer but should be of special value to those who dictate policy—the investors, directors, and managers of large corporations.

Knowledge to the industry field technologist is like water to the cane plant. Without water the cane plant will wither and die. Without knowledge the industry will wither and die. This therefore, we hope, will be of some assistance to the field man is only solace to let him know that his problems and trials are not unique.

The cover picture is to symbolize the personality of the overseer over everything that happens on the plantation. All work is under his direction or in his shadow.

FORT PIPES, JR., *Publisher*

TABLE OF CONTENTS

Pages

Chapter 1 3
Louisiana Cane Growing Area
Soil Moisture—Drainage—Pumping Plant—Plantation Layout—The Cane Rows

Chapter 2 7
The Introduction of Implements
First Cane Implements—1883 to 1893—1890 to 1910—Modern Tractor Implements

Chapter 3 11
Tractive Power
Early Tractors—Developments Period—All Purpose Tractor—The Modern Tractor

Chapter 4 14
Preparation for Sugarcane
Cut Crowning—Grass and Weeds—Organic Matter—Corn & Legumes

Chapter 5 18
Planting Sugarcane
Fall Plant—Summer Plant—Spring Plant—Plowing & Preparation—Opening the Rows—Cutting the Seed—Loading Seed Cane—Planting Cane—Covering the Cane

Chapter 6 22
Early Spring Work
Mud & Trash—A Stand of Sugarcane—Modern Shavers—Off-barring with Tractors—Mule Power vs Tractor Power

Chapter 7 26
Fertilizer
Early Fertilization—First Experiment Station—Sources of Nitrogen—Application—Modern Fertilization—Anhydrous Ammonia—Rates of Application

Chapter 8 30
Cultivation
Early Cultivatiton—Principles of Cultivation— Dirting the Cane— Transition to Modern Implements—Tractor Cultivators—Modern Cultivation

Chapter 9 34
Special Machinery
Drain Cleaner—Ditch Bank Implements—Aeroplane Dusting—Herbicide Sprayers—Flame Cultivators—Rotary Hoes

Chapter 10 38
Cutting Sugarcane
Cane Knives—Piling Cane—Windrowing—Early Cane Cutters * "Hurry-Cane" Harvester—Thornton Harvester—Burning and Piling—Harvester—Loaders

Chapter 11 42
Loading Cane
Slings and Tripbars—Early Loaders—Gasoline Loaders—P & H DCL—Modern Castagnos Loader—Thomson "Hurry-Cane" Loaders—Link Belt Loader—Naquin Loader—Babin Loader and Ditcher

Chapter 12 46
Transportation
Cane Wagons—A Load of Cane—Hauling Distances—Derricks and Field Hoists—Hoisting Power—Truck Trailers—Maintenance

Chapter 1

LOUISIANA CANE GROWING AREA

Soils of the Louisiana sugarcane area were formed for the greater part by the deposition of rich sediments carried down by the Mississippi River and its tributaries. Nearly half of the states of the Union have contributed some of their soils to the formation of this rich alluvial area. On the western edge of the sugarcane district, a relatively small strip was formed from Coastal Prairie sediments of the Gulf Coastal Plain. These were deposited at an earlier date than the Mississippi Alluvium First Bottom Soils which are found in the eastern and southern parts of the sugarcane growing region. The soils of the northern part of the district were formed from the overflow of the Red River and those of the central and western portion from that of the Atchafalaya. Numerous bayous which in turn overflowed their banks to deposit material, radiate from these rivers.

Soil particles of every size, from coarse sands to the finest clays were carried mechanically in the rapidly moving current. When the river overflowed its banks, the coarse sand particles were deposited first close to the banks; as the water spread, its rate of flow decreased and smaller soil particles were deposited. When the swamps were reached the stagnation of the water permitted the deposition of the finest clay particles. In these swampy areas, smaller or secondary bayous carried the excess water to lakes and bays which in turn emptied into the Gulf of Mexico. Systems of levees were constructed along the Missisippi and the streams which carried overflow from it. These were built to protect the land which had been brought into cultivation against inundation. At various periods of time the rapid thawing of snow and ice in the North combined with spring rains throughout the river basin caused periodic breaks in the levees. When this occurred a channel was often cut in the topsoil which had been deposited years before and a different deposition of material was made governed to a large extent by the amount and velocity of the water which came through the break.

For practical purposes we may say that the soils of the sugarcane area range as to size of the soil particles from the coarse sands, termed light soils, at the streams; through mixed land to the heavy clay soils at the swamps. Because of breaks in the levee system at different places and at different periods of time the lay of the land on every property is not always a gentle slope with sand at the stream and heavy, stiff clay at the swamp. It is often possible to find two or more soil types within a single field.

In early times the mode of travel was by boat and for this reason early housing facilities were constructed to face the streams. Land was traded on the basis of so many arpents fronting the stream. The part of the property along the water was usually known as the front of the property. Since all of the streams in the sugarcane area twist and turn on their way toward the Gulf of Mexico, the points of the compass are not considered in the layout of a plantation. Because the surface of the land is relatively flat, the primary consideration in the layout of cane fields is

Photo No. 1
Thomson Cane Loader—Ditching Attachment.

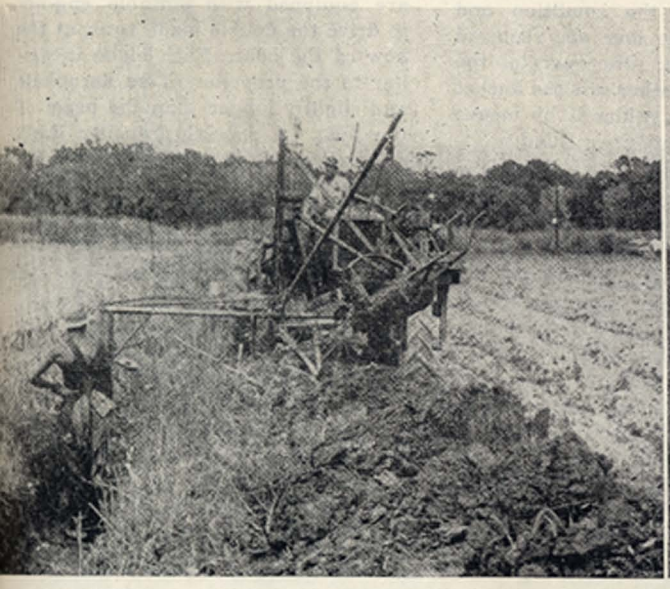
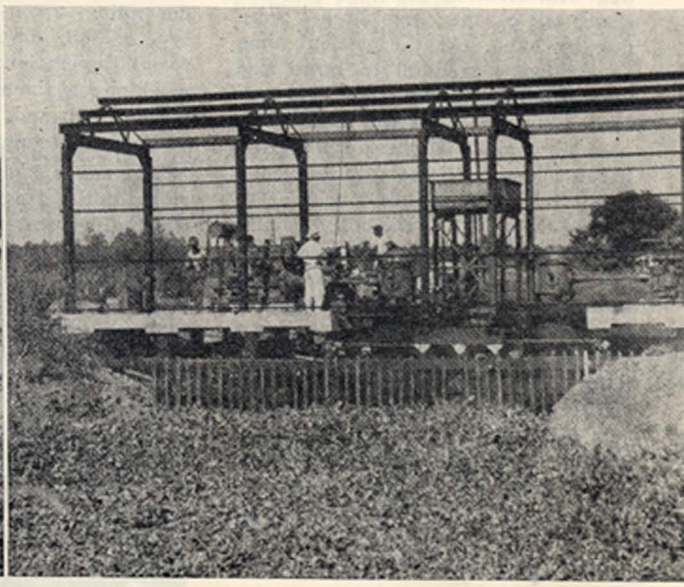


Photo No. 2
Drainage Plant with Buda Engines and Fairbanks Morse Pumps.



that of drainage.

Soil Moisture

Soil moisture is the most important factor governing the planting, growth and development of sugarcane in Louisiana. Some irrigation work has been tried both at cane planting time and during the cultivation season at times of protracted drought. No irrigation practice has proved out commercially as the amount of money spent on it has barely been returned in profits from increased yields. The average annual rainfall of some 58 inches is more than enough to produce a crop of sugarcane. Provision must be made to carry off excess water, which falls during that part of the year when the crop is unable to use it, as the ground is not able to store it for future use.

Natural drainage is hampered by the relative flatness of the soil surface, the small elevation above sea level, and the rounded particles of the soil structure. The soil particles, rounded by their turbulence in the waters which brought them downstream, explain to a great extent the need for elevated cane rows. These rows not only provide individual furrows to carry off excess water but permit plowing and subsequent cultivation that will incorporate and maintain sufficient air space in the soil for the proper development of the cane plant. Where sugarcane or any other crop is planted on the flat, the soil is soon compacted by heavy rains and by settling.

Drainage

When new land is taken into cultivation, the first operation is the digging of canals and cross ditches to carry the water to the bayous. Some years ago only the larger canals were dug with floating dredges and practically all of the cross ditches were dug by hand. At the present time nearly every medium to large size plantation has at least one dragline. In the summer time the dragline is used for making ditches. During the harvest season it is used to load cane from field wagons into trucks or to unload the trucks at the mill. A number of special buckets with sloping sides are now available. They assist in maintaining the proper slope for the sides of the ditches being dug.

These buckets were designed especially to clean out existing lateral ditches, but they also do a very good job of constructing laterals in new ground. Draglines with wide treads are used, as these are able to straddle the lateral ditches which are being cleaned out.

Lateral ditches are three to four feet wide at the top, one and one-half to two feet wide at the bottom and two to four feet deep. They are placed so as to be parallel to the rows of cane, which are six feet apart, with eighteen to twenty-five rows between ditches. Rains during the cultivating season carry some soil into the lateral ditches, so they must be cleaned out or "Plugged" every two or three years. When these ditches were cleaned out with hand shovels, a thousand acre plantation would normally keep two men busy plugging ditches the year round with the exception of the harvest season, when all man power was used to bring in the crop.

At present nearly all ditching work, at least on the larger plantation units, is done by machinery. There is a tendency to dig lateral ditches a little deeper with machinery so that they will not need to be cleaned out as often. A few manufacturers of cane loaders now provide attachments for plugging out lateral field ditches These are usually of light construction and are not especially suited for the digging of new ditches.

An outrigger boom is fastened to the frame of the tractor at the front, and extends over the ditch to permit a direct pull on the bucket as it is being loaded. To keep the tractor steady while the machine is digging, an anchor is hinged in the front of the tractor which trails as the tractor moves.

The hoisting drum of the loader is usually modified to provide a slower speed with increased pulling power for the main cable. Some ditching attachments use power directly from the tractor takeoff.

This attachment will clean out 1200 to 2400 lineal feet of ditch per day depending upon the condition and type of soil. Two men are required for the operation. One operates the machine and the other sets the bucket in the ditch and guides it by means of the handles until it is filled.

The sections of drain tile to the right of the dragline are used every 500 to 1000 feet for putting culverts in the headland crossings of the lateral ditches. These headlands are quite necessary in sugarcane fields to haul the cane from the fields to the hoist or mill, as rains may be expected during the harvest season Years ago when timber was available in the woods at the back of the plantation, the crossings at the latera ditches were wooden bridges. The culverts which are used now are mad on the plantation of concrete re-enforced with woven wire.

Pumping Plant

The smaller plantation units usually take in the largest possible area of land, providing the natural elevation of the tract is sufficient to provide proper drainage by means of open lateral ditches. The area covered by many large plantations embraces land which is too low for adequate gravity drainage and it is necessary to install a pumping station The plantation as a whole is then divided into two parts: the first part takes in land of sufficient elevation to drain off properly by gravity and the second part takes in the low land which is drained by pumps.

Right photo on preceding page pictures a pumping station under construction. It was taken the day the pumps were first tested. This station consists of two Fairbanks Morse low lift Pomona type pumps, each driven by a 104 HP Buda Natural Gas engine. The pumps are 4 inch pumps and are rated to discharge 37,000 to 38,000 gallons per minute. The aquatic growth floating in the foreground is Water Hyacinth (Eichornia crassipes), which was pulled to the station by the flow of the water. The pumping plants do not operate continuously, but only after heavy rains, to take off excess water and thereby maintain a certain water table in the soil.

The water hyacinths reproduce so rapidly that in a comparatively short time they seriously impede the flow of water to the pumps. To control them, 2, 4-D (2, 4-dichlorophenoxyacetic acid) or other herbicide is used either dusted or sprayed from an aeroplane or from a boat. In bayous or canals where hyacinths are especially thick, small boats having a beam of three feet and a length of ten to fourteen feet are used. These are equipped with suitable engine to drive the double blade rotor at the bow of the boat. Each blade is similar to the propeller of an aeroplane and slightly longer than the beam of the boat. A special propeller shaft drives one blade clockwise and the other counter clockwise. The blades chop up the hyacinths into small pieces as they pull the boat forward.

Plantation Layout

A single field unit contains eighteen to twenty-five rows six feet apart with a lateral ditch on one side running parallel with the cane rows. The rows are 500 to 1000 feet long, forming a unit area of one and one-half to three acres. Such units are grouped with ten to fifteen units side by side to form a section or "cut". This grouping permits the lateral ditch to drain excess water

from two field units, one on either side. Such a cut is bounded by a headland or turnrow on each of the four sides. Each field unit has three or four quarter drains, which run at right angles to the cane rows, the width of a shovel, deep enough to lead the excess water from the middles to the lateral ditches. The headlands or turnrows are eighteen to twenty-four feet wide. Groups of cuts form fields of cane, and fields of cane comprise plantations. From the high land on the front of the plantation to the low lands in the rear, the fall in elevation is gradual, usually three to five feet, seldom more than eight feet.

Lateral ditches are usually known as two foot ditches as the average width would be about that amount. They will seldom carry water efficiently for a distance of more than 2400 to 3200 feet depending upon the natural fall of the land. After very heavy rains, water from the high elevations will rush down to that part of the lateral ditch which is the lowest and cause some flooding of adjacent cane areas.

Photo No. 3
Above: Jackson Machinery Company Special Ditching Bucket.

Photo No. 4
Below: P & H Dragline Constructing a Lateral Ditch.

To insure efficient carry off, cross ditches are placed at right angles to the lateral ditches at approximately 2500 foot intervals. These ditches vary in width from four to eight feet depending upon the amount of runoff to be handled. Drainage water from the cross ditches flows directly into secondary bayous where these are available. Where blocks of large acreage are involved, special canals, twenty to forty feet wide are usually dug to carry the water to suitable secondary bayous.

Efficient drainage of the individual cane rows is dependent upon having sufficient capacity through each individual course which the water must

follow as well as the proper fall in each step from row, to middle, to quarter drain, to lateral ditch, to cross ditch, to canal, to secondary bayou, on to the Gulf of Mexico.

The Cane Rows

Sugarcane is a tropical plant grown in Louisiana under sub tropical conditions. The average number of days per year without a killing frost is about 280 days throughout the cane growing area. It is vitally necessary that everything possible be done to help the cane plants get started in the spring and to produce as much growth as possible during the summer months.

Visitors from other parts of the world where cane is grown are amazed at their first sight of a Louisiana cane field and invariably ask: "Why do you grow sugarcane on such high rows?" The answer is a simple one: Having a suitable media for root development, a deep alluvial soil, rows spaced six feet apart with middles nine to fourteen inches deep permits cultural practices that will assist in furnishing optimum conditions for the five prime requisites of plant production; namely;

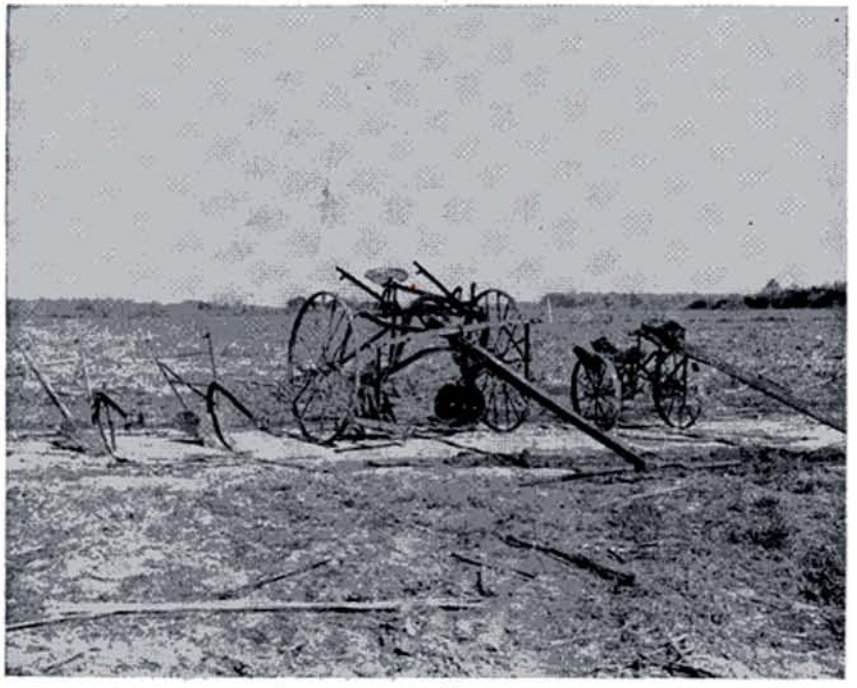
1. Light
2. Heat
3. Food
4. Air
5. Water

The only control that the operator has upon cane maturity is to plug out the quarter drain in the lowest part of the cut of cane after the crop has been laid by. Plugging out a quarter drain means spading four to eight inches lower than the normal drain bottom. Well shaped rows help the water to get to these drains.

During the harvest season some wet weather is always encountered. The "high" rows assist in getting the water off as rapidly as possible so that hauling in the cane may be accomplished with the least time loss.

Chapter 2

THE INTRODUCTION OF IMPLEMENTS



No. 6
John Deere P 10 Turn Plow.
John Deere Mouldboard.
Avery Disc Cultivator.
Moline Walking Cultivator.

The cultivation of sugarcane in Louisiana prior to the Civil War was performed almost entirely by hand labor. The preparation of the land consisted of plowing with a crude plow, drawn by one or two mules, and harrowing with a drag harrow made of brush or poles. All other cultivation was done with hand hoes and shovels.

The Creole cane used prior to 1830 permitted the use of narrow rows usually 2½ to 4 feet. This fitted in well with conditions at the time as there was an abundance of hand labor (almost entirely slave labor on the large places) and a scarcity of mule plows, and mules to hitch them. The hand tools consisted of the cane knife, shovel and hoe. At that time only the light, sandy soils along the rivers and bayous were cultivated. These could be drained readily and were easily worked, usually with a one mule plow.

Cane planting then was done in the spring, usually on land planted to corn the previous year. The land had been plowed in January so there was no need for an extensive working of the cane middles. The cultivation was shallow, so shallow in fact that coco grass became quite a pest in the cane fields. About 1832, with the introduction of Ribbon and Purple canes, it was found necessary to increase the width of the rows to 5 or 6 feet. This increase in the width of the rows helped the new types of cane to mature and permitted the use of two mule plows for cultivating which resulted in deeper work and better control of coco grass.

With the narrow rows one mule carts were used to haul the cane to the mills. When the going was heavy a second mule was often hitched ahead of the shaft mule or placed to pull alongside of the cart mule.

When the wider rows were used the axles of the carts were widened to conform to the size of the row and three mules were used to pull them: one mule in the shafts and one on either side. Use of the two wheel cart was continued, as it permitted the load to be dumped when it arrived at the mill and did not necessitate lifting the load out of the cart to feed the carrier, as in those days, the carrier, if it may be called by that name, was fed mostly by women carrying the cane on their heads.

Some serious disadvantages were encountered when the three mule carts were introduced. No evener was provided for the mules so it was the driver's responsibility to see that each mule carried its share of the load. The shaft mule had to be a sure footed animal, strong enough to support the load when the wagon was loaded too heavy in front, and heavy enough to keep the cart from raising the shafts when the load was too heavy at the rear. Possibly the greatest drawback was that the shaft mule walked on the cut stubble row. To alleviate this problem, some planters would plant two rows of cane and one row of corn. The corn would always be harvested before it was time to bring the cane to the mill which would leave a clear row, free of stubbles for the shaft mule to walk on. Interspacing cane rows with a row of corn allowed more sunlight to reach the adjacent cane rows during the ripening period, which some considered quite an advantage for the maturing of the cane.

The three mule carts were slow and also mule killers. They were built large enough and strong enough to carry two to four (short) tons of cane. In order to preserve the dump principle of the carts and have a vehicle that would permit greater speed with less harm to the mules, four mule carts were used. A cart pole which extended from the axle went between the two rear mules. A "Belly" pole suspended under the bellies of the rear mules supported the cart pole. The two front mules were hitched by means of a spreader bar to the end of the cart pole. The driver rode the left rear mule and guided the four animals by means of a single line fastened to the bit of the left front mule. These vehicles were known as "Bang-bellies," and were efficent cane carriers under conditions which are encountered in harvesting cane in Louisiana. Four mule wagons were introduced at a much later period of time and were in use until supplanted by the present equipment.

First Cane Implements

It was not until after the Civil War when labor was scarce that sugarcane implements as we know them today were introduced and developed. Up to that time about the only improvements were a replaceable iron tooth harrow, which in some instances was hinged at the center to better conform to the shape of the row, and a roller, usually made of logs to pack loose ground.

The hand hoe has come down the years to us practically unchanged. During the 70's and 80's two types of

hoes were in use. The short handled, narrow bladed hoe for "grubbing" stubble was usually 3 to 4 inches wide and the long handled weeding hoe had a blade 5 to 8 inches wide. Hoes having wide blades, some as wide as 14 inches were tried for scraping the dirt from plant cane but they were not satisfactory.

After the Civil War there was a scarcity of field hands. It was necessary to develop implements that would take the work from the backs of humans and place it on the mules. One of the first implements of this development period was the cane shaver or scraper. (Photo #5).

This implement was built on runners (slides spaced about fifteen inches apart) with a single knife blade attached between the runners at an angle across the row. A small rolling coulter slung under the frame split the row to facilitate the removal of the shaved stubble by the "V" drag at the rear. This machine was pulled by a pair of mules; the driver sat on the small wooden seat on top of the frame and straddled the frame beam. The slide shaver in Photo #5 is still in use today.

Some slide shavers were built with two straight knife blades extending one from each runner at an angle which lapped the row in the center. The knives were always in a fixed position and the slide shaver could only be used following the offbarring operation. This often delayed the shaving operation and sometimes retarded the development of the cane. Great precision was necessary in the offbar plowing operation as the furrow on each side of the cane bar had to be the same depth and the bar had to be uniform in width for the shaver to operate properly.

As more land was cleared and cultivated to produce sugarcane the capacities of the mills were increased to grind a larger volume of cane in the time available for harvest. This meant that the distance to haul the cane from the fields to the mills became longer. During dry weather it was a matter of using more wagons. In wet weather, hauling cane in the mud was a real problem. About 1880 following a very wet grinding season the narrow gauge railroad came into popular use. This made necessary different types of hoists, slings and chain bars to lift the cane from the carts into the cars.

1883 - 1893

The ten year period from 1883 to 1893 saw the development of mule drawn implements and the adoption of methods which, with some slight modifications, we use today. The Advance or double mouldboard plow was followed by the stubble digger, and many types of drag harrows made their appearance in quick succession. The rotary harrow, spring tooth, side harrows and "A" frame were made in various sizes and shapes to suit the fancy of the builders.

The left hand plow was introduced to help in the covering of seed cane and subsoil plows were used to some extent ahead of bedding for cane during cultivation. Larger turn plows, built to be drawn by four mules, entered the scene in an effort to break the land deeper in order to prepare a better seed bed. As more land was taken into cultivation the fields began to extend further back from the rivers and bayous, through the mixed soil types into the heavy black lands. It was necessary to use the four mule plows to plow the black land properly.

Late in this period the Mallon Rotary Hoe was introduced. This machine completely changed the method of farming cane in use up to that time. The first Mallon Hoe consisted of a number of paddles radiating

No. 8
Iron Tooth Drag Harrow, "Butter-fly," Seed Cane Hook.

The earliest implement

about an axis in a fan shaped arrangement, to work on both sides of the cane row. It was designed to take the place of "cross hauling" or building up the rows by hand with hoes. James Mallon is credited with the invention of many of the implements introduced during this period. He was not a sugar planter himself but was a visitor on a friend's plantation. Watching the field laborers at work inspired him to design machines that could relieve them.

The Mallon Hoe was followed by the disc cultivator and disc harrow, which we would find difficult to omit from our list of necessary implements today. This period also produced what was known in some places as a drag bar, the forerunner of our present walking cultivator or Moline. The peavine rake used in making hay was improved in design and made of iron instead of wood as the earlier rakes had been.

Photo #6, starting from the left, shows:

1. The John Deere P 10 turn plow. No tool has ever been built for the Louisiana cane field which has served its owner better or more faithfully. The plow prepared the land for planting cane, opened the furrow to drop seed pieces and in the early days performed most of the cultivation done with mules. It was used to run the drains after each cultivation and shape up the headlands after the crop was laid by.

2. Next to the P 10 plow is pictured the double mouldboard. This plow performed in one operation, opening a furrow or row, what had required two trips with the turn plow. Both turn plow and mouldboard were fitted with an adjustable clevis to permit setting the plow point for lateral position and desired depth of operation.

3. The riding cultivator, third implement in Photo #6, which was patterned after the Mallon Hoe always straddles the cane row. Each disc gang may be rotated a full 360 degrees, and set at any point. Provision is made for the adjustment of the angle of the disc gang axle with the ground. This machine is used to condition a row for planting and for tearing down or building up a row. The handle on either side of the driver's seat controls the depth of operation of each gang. The long coil springs are provided to maintain pressure on the discs when the handles are raised.

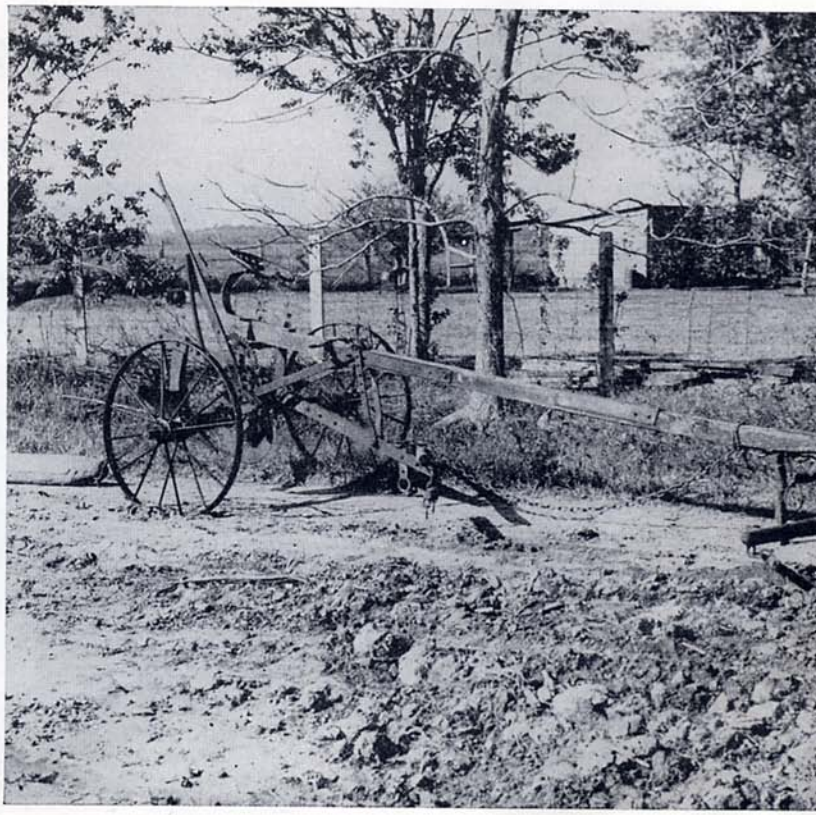
4. To the far right in Photo #6 is the Moline Walking Cultivator' This implement was used mostly during the early part of the cultivation period before the row of cane had been fully built up, either to straddle the row or be run between rows. The distance between the wheeels is adjustable but will not extend a full six feet. In the photo the two handles usually carried one on each bar leading from the wheel axles have been removed, and the bars were fastened together to use a small double mouldboard. Slots are also provided on each bar for shanks to hold 2 to 4 inch diamond points or small turn shovels instead of the mouldboard.

1890 - 1910

The twenty year period following 1890 produced refinements of the implements which had been introduced up to that time. Stubble shavers were built with disc blades instead of the straight knife blade. The corn and bean planters along with fertilizer distributors were developed. A rotary pick harrow was designed to pulverize cane middles more thoroughly and also to prepare the row ahead of the planters. The development of the Magnolia with its many attachments came at the turn of the century. The use of these implements which would go between rows as well as straddle them,

No. 5
especially for the cane field. a slide
shaver.

No. 7
Avery Magnolia.



brought about a general acceptance of the six foot cane rows.

Cane rows of various widths had been tried. Closer spacing of the rows usually produced the most tonnage. However, the additional tonnage produced from the narrow rows did not always justify the increased amount of seed needed for planting.

Photo #7 is a Magnolia frame fitted to open rows for planting cane. The axle extensions are in place to permit the machine to straddle a six foot row. The small rolling coulter hanging under the beam splits the row to ease the draft on the small double mouldboard at the rear. The log chained at the rear of the mouldboard and resting on the ground helps to pulverize the clods in the open furrow. The handles at the right of the driver's seat controls the depth of the implement being used.

Various attachments, such as scrapers to take the dirt off of plant cane and knife shavers similar to the one shown in Photo #5 for stubble, were designed to be used on the Magnolia frame. It was also possible to use larger sized mouldboards as well as a large 24 inch lister.

The machine received its name from an attachment known as a "Magnolia." This was a frame designed to accommodate six inch right and left hand plows, commonly called "rainbow plows," with a small middlebreaker at the rear. The wheels of the carrying frame were narrowed down to fit between the cane rows. It provided about the same choice of tools as the Walking Moline but was heavier and worked a full middle deeper than a Moline. The mules were usually hitched two on the pole and two in the front and were driven by the man on the machine.

1910—Modern Tractor Implements

Shallow cultivation, that is, less pruning of the roots during the growing season, was stressed during this period of time and the machinery which had been previously developed was quite suited to such operation. It was during this period that stress was laid on deep and thorough preparation of the land before planting cane. It was the time of the development of tractors which were excellent for land preparation.

The only cultural implement new to the cane fields was the "Butter-fly". (Center implement Photo #8). This contrivance was pulled through the cane middles after the row had been formed, and was designed to scrape away weed and grass growth which was starting to develop. It probably reached the zenith in shallow cultivation, penetrating the ground scarcely more than an inch. It was not used extensively and the idea has not been employed in tractor operations of today.

In Photo #8, starting on the left, we see:

1. Iron tooth, "A" frame drag harrow. This implement was originally designed to be pulled by mules. As pictured the wood beam across the top with a chain fastened to each end is ready to be fastened to poles extending rearward from a tractor fitted with a double disc chopper. It is used to smooth the row ahead of the planting of beans or corn.

2. The "Butter-fly".

3. A seed cane hook. This implement when used is pulled by a pair of mules and is designed to pull up cane which has been bedded for seed. It is used in the spring for planting spring plant cane. Some operators always preferred hand held hooks.

(Author's Note: The early chapters of this book attempt to give the reader a background knowledge of the beginning of the cane industry and how problems concerning the production of cane were met. Later chapters will deal specifically with machinery and methods in use at the mid point of the twentieth century, on plantations that are thoroughly mechanized. A few small farming units use mules entirely for cultivation at this time.)

Chapter 3

TRACTIVE POWER

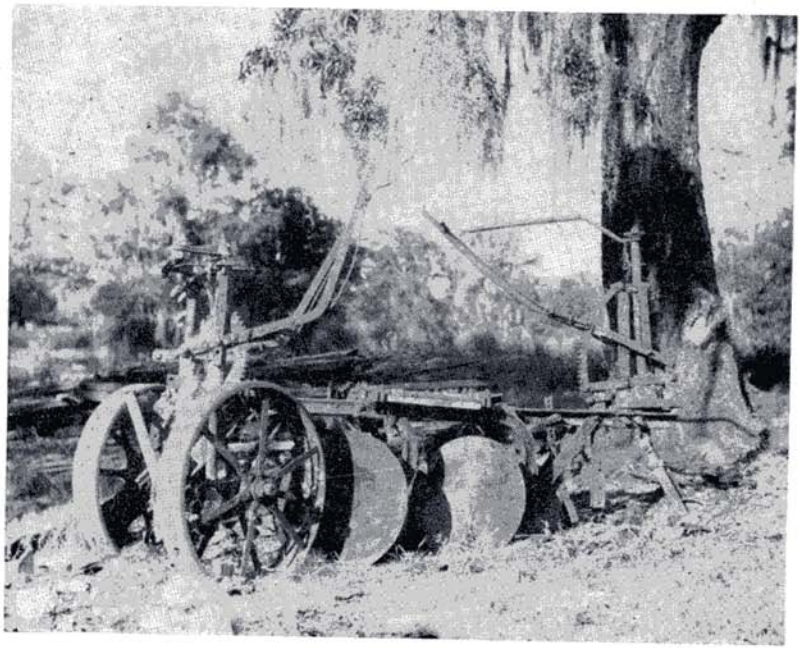
Large powerful mules had been a familiar sight in the sugarcane fields of Louisiana for more than a hundred years. In the very early days of cane cultivation, when only the light soils near the streams were planted, lighter mules were able to perform the operations satisfactorily. It was found, however, that heavier, stronger mules proved to be more economical even for the light soils.

As more land was taken into cultivation, cane fields were extended further from the streams into the mixed soils and then into the heavy black lands. These lands required far more power, especially for plowing and preparation. The one and two mule plows were not able to prepare the heavy black lands properly and four mule plows were introduced. In the rolling prairie lands of the corn belt of the central United States and further west in the large fields where wheat was grown, it was possible to use gang plows with a multiple hitch to which many horses or mules could be harnessed. These could not be used in the cane fields because of the necessity of setting up rows, or breaking up land which had been in rows.

The sulky or riding plow was not suited to the row cultivation necessary in the cane fields so the disc plow was never used as a regular cane-field implement. A number of the larger plantation units had a sulky disc plow which was usually used to plow wide ditch banks and turn rows, particularly where there was heavy sod or weed and grass growth.

The principal tool for plowing land of all soil types was the right hand, walking turn plow which had a share 12 to 14 inches in length. Occasionally it was pulled by three mules in the lighter soils: a lead mule in front, and two mules hitched to the plow. This permitted the plowman to drive the mules and to guide the plow at the same time. Usually four mules were hitched to the plow: two in the lead and two behind at the plow. This hitch required one man at the plow and another to drive the mules. A boy twelve to eighteen years of age was usually used to drive the mules because it meant less weight on the mule (the driver rode the left rear mule). This also provided an excellent opportunity to educate the boy in handling mules and in learning to do a good job of plowing under the direct guidance of an experienced plowman.

Photo No. 9. A very early Thomson Single Row Cane Plow.



Mules rather than horses were used in the cane fields for a number of reasons. The temperament of the mules and of the negros who were usually used to work the mules were compatible. Contrary to the opinion of some people the mule does not stand the heat of the summer any better than a horse. Horses usually pull more freely in the traces and will often pull until they drop from being overheated. The mule seems better able to take care of himself and will usually stop pulling before reaching the overheated stage. Mules get along better with each other when placed together in a large lot, and are not so particular about eating in a definite stall. When placed in the lot after a day's work the mule will roll in the dust, drink some water and cool off before eating. When the mule eats, no matter how hungry he is, he seldom bolts down his food.

Early Tractors

The writer has been told that the

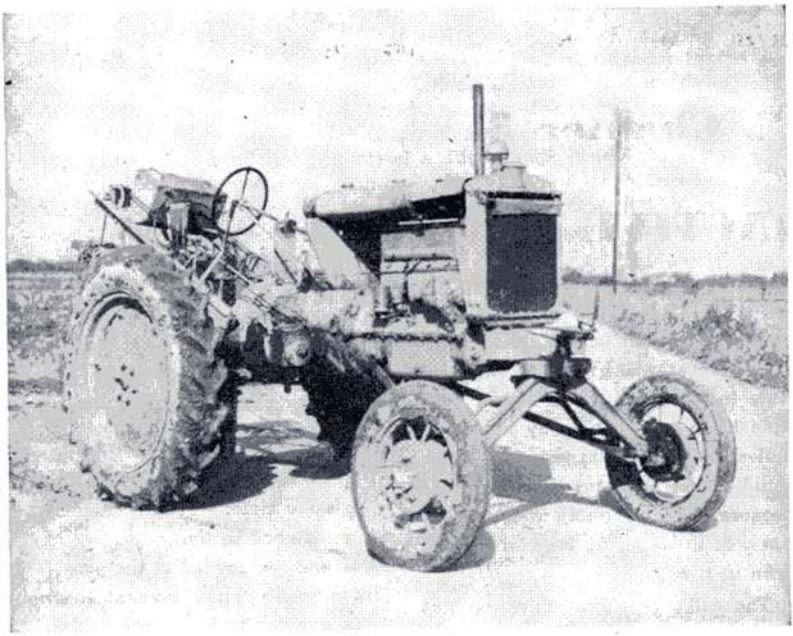


Photo No. 10. Model UC Allis Chalmers Tractor.

first tractor appeared in the sugarcane fields of Louisiana in the same year that the steam locomotive first ran on a track. This is quite understandable as the cane planters in Louisiana have always been ready to try a new machine, crop or practice which would help them to produce more sugar per acre.

The steam tractor did not survive, neither did the Rumley Oil Pull tractor nor many others which were introduced over a period of years. These machines were too heavy and, at best, could only be used for one operation: the preparation of the land for planting. The plan was to use large tractors to break the land deeply and thoroughly so that subsequent cultivation could be performed with mules. When these large tractors were tried it was the custom to plant cane in the spring and to plow the land on the flat before rows were set up for planting the cane.

These large wheel tractors were followed by track type tractors which gave a greater horse power pull at the drawbar with far less pressure per square inch on the land run over. About 1916 more cane was being planted in the fall. It was advisable to have a tractor drawn plow which would break out the existing row, on which corn or legume had been grown, and set up rows for the next cane planting.

In 1917 Mr. B. C. Thomson developed the cane plow (Photo #9) which required considerable drawbar power for its operation. It did break out a row completely, setting half a row up on either side of the plow. This was the first plow designed to plow out a complete row at one time. The Thomson plow consisted of two large discs, two smaller discs and a mouldboard behind. It was heavy and required a large turning radius but it did a good job of plowing.

Development Period

The large crawler type tractors used in pulling the early Thomson row plow were tried for cultivation but were not satisfactory primarily because they had a low clearance on the row. Narrow tread crawler type tractors were introduced which would run in the middles between the rows of cane for the cultural operations. Many different kinds of wheel type tractors which were used almost entirely for cultivation, were brought in about the same time.

A principal difficulty with the early tractors in cane field cultivation was that the implements were hitched behind the tractor. This required a man to drive the tractor and another man to sit on the implement to make any necessary adjustments at the start of the row, during the travel along the row or at the end. Such a hookup required a larger turning radius than was provided by the existing headlands and the result was badly cultivated row ends and mashed cane. To overcome this condition the Moline Universal was tried to some extent in the cane fields. This machine had the engine mounted between the two large drive wheels and a frame extending to the rear to which the implements were attached. This permitted the driver to sit on the implement to manipulate the controls and to drive the tractor at the same time. For cultivation this tractor performed very creditably in the mixed and lighter lands. It was strong enough to pull a two bottom plow, but not strong enough to plow out a complete row.

The few tractors used in the sugarcane fields prior to 1915 were for the most part on a trial basis. With the exception of a few heavy duty, crawler type tractors, when the original machines wore out or re-

Photo No. 11. Reduction Gear for Allis Chalmers Tractor.

quired such extensive repairs as to make renovation too expensive they were relegated to the scrap heap.

During the development period which lasted approximately from 1915 to 1928 it was found that it would be quite expensive to have one set of tractors for preparation and different tractors for cultivation. The expense would not be in the operation, as operational expenses are usually in proportion to the work accomplished, but it would be in the amount of capital tied up in machinery which worked only part of the year. A great deal of thought was given to the building of a tractor which could be used during the entire year.

All Purpose Tractor

To meet the minimum requisites, an all purpose cane field tractor must be so constructed as to:

(1) Have sufficient power to plow the land in rows or ridges for cane.

(2) Possess a minimum ground clearance to permit the machine to perform the necessary cultural operations during the growing season until layby time.

(3) Have such overall length with tools attached as will permit the machine to be turned on existing headlands.

(4) Be able to straddle the ridge at harvest time in order to haul the cane from the fields and not damage the stubble.

(5) Have selective speeds for the different operations with at least one speed that would permit fast enough travel on the headlands to insure throwing off by centrifugal force any mud clinging to the wheels when hauling in muddy fields.

The Modern Tractor

Today the majority of tractors in the cane fields are the same type as the one introduced in 1928 by Mr. B. C. Thomson. Mr. Thomson adjusted the tread on a high speed, high clearance tractor to fit a six foot cane row and attached a lifting device so that the tractor-drawn implement might be raised clear of the ground when not in use. In the fall of 1931, this type of tractor and two cane wagons were outfitted with rubber-tired wheels, instead of the all steel wheels in use at that time, and a new era started in Louisiana sugarcane production—an era that took the heavy labor from the backs of men and mules and placed it on tractors ready to run twenty-four hours a day.

Modern tractors are ruggedly built. They are strong enough to permit the attachment of tools at the front end, between the wheels or at the rear. To insure a short turning radius, a power lift was adopted so that the implements could be lifted clear of the ground at the end of the row before starting the turn. These lifts are now mechanically or hydraulically operated and permit a change in the depth of operation of the implement as it is working in the field. Provision is usually made on one side and at the rear for a power take off, so that power from the engine may be applied when necessary to an attached implement.

Many different makes of tractors are used in the Louisiana cane fields, including Allis Chalmers, International, Case and Minneapolis-Moline. All tractors used are standard models which had been developed for use in the North as general purpose tractors and were adapted to six foot row conditions by changing the front axle to accommodate two wheels with a six foot tread.

The tractor is powered by a four cylinder engine with removable cylinder sleeves; inserted valve seats; fuel, oil and air filters, governor control; 300 or more cubic inches piston displacement; and a high tension magneto ignition. Gasoline or distillate is used for fuel, or the motor may be equipped to burn kerosene, butane or propane.

Model UC Allis Chalmers (Photo #10) is very popular and considered standard in the cane area. This type tractor will pull a one row cane plow and perform any other work in connection with the production of sugarcane. It has four forward speeds, 2½ to 19 miles per hour, and one reverse speed. For some work, such as deep plowing in tough land, hauling cane under adverse conditions or odd jobs in which speed is not a factor but where a little extra draw bar power would prove most helpful, a reduction gear (Photo #11) is available for the Allis Chalmers UC tractor. This unit is an underdrive which drops down the revolutions of the drive shaft by 30%. It is placed between the motor block and the rear or transmission end of the tractor. A lever, conveniently located for the tractor operator, permits the optional use of the reduction gear unit.

A number of other models of tractors are used which do not have as much power as the Allis Chalmers UC model. These will plow satisfactorily with a standard single row cane plow, but they are usually used for other cultural operations.

Tires with spade grip lugs or having a special deep tread are used on the drive wheels of all tractors. To increase traction some operators fill these tires with water.

A few implements such as shavers, flame cultivators, dusting machines, etc., have their own wheels and are drawn behind the tractor.

The amount of tractive power needed to operate a sugarcane plantation is roughly calculated from an old formula: "One tractor and four mules for 250 acres in cultivation". At the present time, slightly more tractor power and less mule power is considered preferable, such as five to seven tractors and 10 or less mules per 1000 acres. The standard size or large tractor is regarded as equivalent to 14 mules; medium size, 11 mules; and small size, 6 or 7 mules.

A very large sugarcane acreage in Louisiana is now being grown with tractor power entirely. In fact, some plantations do not have a mule on the place at all. The present cane field tractor may be improved as time passes. In its present form it does perform the several operations necessary to produce a sugarcane crop with less man hours and less expense than it would be possible to do with mules.

Chapter 4

PREPARATION FOR SUGARCANE

Most of the land producing sugarcane today has been in cultivation for many years. This land was first brought into cultivation long before the era of machinery. The labor of clearing the native vegetation was performed by hand using such tools as the axe, side blade and mattox. Clearing land was a slow, costly operation even when labor was plentiful and the daily wage was low. To offset this expense a great deal of the land was cleared on a sort of rental basis. After the trees for timber had been felled and removed, a deal was made between the owner of the land and the renters or share croppers. The land would be furnished rent free for the first three to five years. The seed, mule power and hand tools were also furnished by the land owner. The renter for his part would clear as much of the growth on the land as possible in order to produce larger crops and greater profits for himself.

Today very little land is being taken into cultivation that has not been cultivated at some previous time. If land stands idle for a number of years brush and tree growth soon take over the land and it is necessary to clear up ahead of the plow again. A modern track laying tractor, such as the Caterpillar or International, equipped with a bulldozer does a rapid, economical job of clearing the top growth. The debris is then piled in windrows by the bulldozer where it is permitted to dry before burning. Then a root plow (Photo # 12) is used. The action of the root plow is relatively the same as that of a subsoil plow, and it conditions the land quite well for the plowing job which is to follow.

Cut Crowning

The alluvial soil formation comprising the land area upon which sugarcane is produced in Louisiana is quite flat. When lateral ditches were dug, the dirt from the ditches was deposited on either side of the ditch by the hand shovels used in the early days. Today the mechanical ditchers used are able to throw the dirt some distance from the ditch, but not far enough to keep the entire cut level.

After more than a century of farming, soil from the laterals has built up the level of the land at the ditches to such an extent that many of the fields are a good bit higher at the ditches than they are in the center. In such cases the quarter drains must be quite deep as they near the lateral ditches. This forces the tractors to curtail their speed as they cross over the deep quarter drains and presents a serious hazard for breaking axles and other parts of the equipment. When passing over deep quarter drains with a harvesting machine there is always the danger of the harvester turning over.

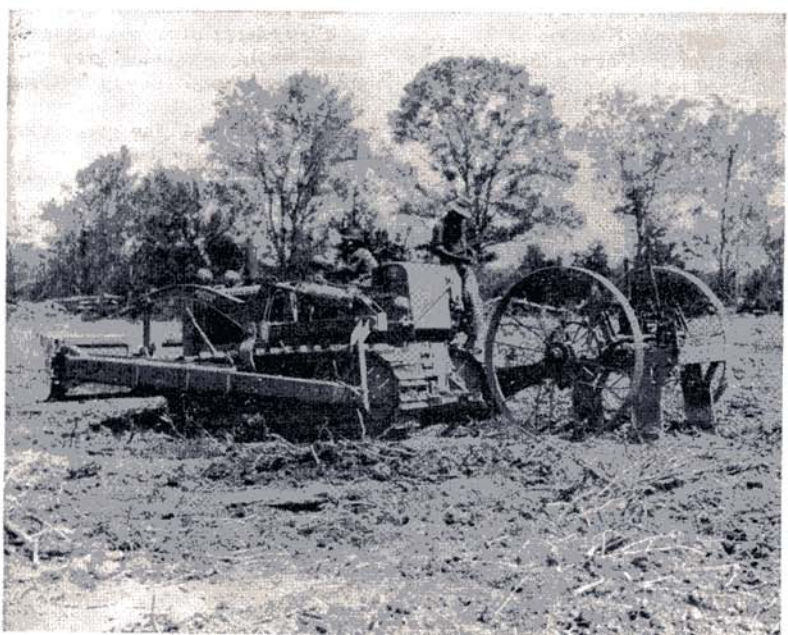
During the days of all mule cultivation the slight difference in the land elevation within the cut was not as objectional as it is today with our modern machinery. Skilled plowmen manipulated the plow to build up the proper shaped row as they moved along. In recent years a great deal of excellent research has been done on grading and leveling of sugarcane land by Mr. Irwin L. Saverson of the U. S. D. A. Soil Conservation Service. He has found that a grade of up to 13 inches per hundred feet has produced the best returns in yield of sugar per acre. This work is termed "cut-crowning" or "turtlebacking".

Moving dirt is expensive and the larger the quantity moved the greater is the expense involved. It can, however, be a great deal more expensive to continue to cultivate and fertilize a piece of ground which does not yield enough to pay operating costs.

A bulldozer and a motor grader used together have proven to be the best combination for crowning cuts of land to a definite grade. These machines are too costly for the small plantation owner to purchase so he must plan to use machinery that he can afford.

Gang plows with mouldboards or disc bottoms (Photo # 13) may be used to advantage. The disc gang is

Photo No. 12. International TD 14 equipped with Bucyrus Erie Bull Dozer pulling a root plow.



especially useful when plowing nearly cleared land. The Parson Whirlwind Terracing Plow (Photo # 14) is an excellent tool for grading up land. A scroll, power driven from the tractor takeoff replaces the plow moldboard. The soil is thrown for a distance of 12 to 20 feet. It is readily pulled with the standard field tractor and its cost is well within reach of the average sugarcane grower. This flat breaking of the land to the center is most helpful and when this practice is used regularly in the rotation, the field will in time acquire a good crown at the center.

When a field is being graded, it is well to consider the elevation of the headlands or turnrows in relation to the level of the field. What may have been fully adequate for harvesting operations when animal power was used, may not be quite right for tractor hauling of cane. Before planting the field, the width of the headlands should be adjusted, where necessary, to make them adequate for tractor hauling and especially for cane harvester operation.

Grass and Weeds

In some places where sugarcane has been grown for a number of years there is a tendency toward a buildup of grass and weed growth which the normal cultivation practices of sugarcane will not hold under control. The rhizomes of such troublesome pests as Johnson Grass (Sorkhum halepense) and Alligator Weed (Alternathera philoxerodides) often necessitates special cultural practices for their control or eradication.

Fallow plowing during the hot summer months in conjunction with the application of suitable herbicides very often reduces these pests to such an extent that they no longer act as a limitation on sugarcane production. Seven to nine plowings are needed to complete this practice. During the fallow plowing period it is usually possible to substitute a spray job followed by a thorough burning with a flame cultivator for one or more plowings.

A period of fallow plowing permits the crowning up of fields without additional expense. However, such plowing should be used with care, as it adds little or no humus to the soil but does tend to burn out the humus that is in the soil.

Organic Matter

Because of their origin, the soils of the Louisiana sugarcane growing area are quite fertile. The early planters soon realized that it would be far better to maintain the fertility

Photo No. 13. Thomson Disc Gang Plow.

of the soil by following good field practices (which were carried on in connection with the growing of sugarcane) than to deplete the soil of some element vital to cane production which would necessitate building the soil back up to good fertility.

In the early days there was a great pride in ownership of a plantation and many field practices were tried in an effort to improve the productive capacity of the soils. It was found that the best cane yields could be obtained by producing and plowing under a crop of legumes between cane plantings. The practice of growing cowpeas (Vigna sinensis) as a summer cover crop was generally adopted during the 1840's.

The growing of cowpeas fitted in well with the production of corn

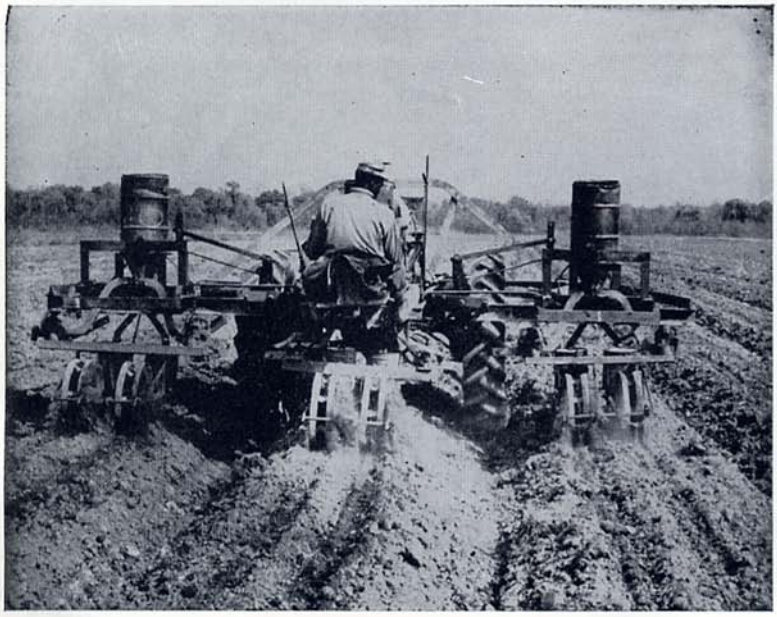
Photo No. 14. Parson's Whirlwind Terracing Plow.

Photo No. 15. Corn planting implement attached to an Allis Chalmers UC Tractor.

which was necessary for mule feed. Later on in the 19th century soybeans (Glycine max) were introduced into the sugarcane fields. By this time cowpeas were not producing as well as they had previously and since the seed necessary to plant an acre of soybeans cost less than the seed to plant an acre of cowpeas, operators used more soybeans. As the years passed, more cultural machinery was used in the fields to replace the mules and it was not necessary to grow as much corn for feed.

The combination of corn and cowpeas growing together worked well for both crops. The cowpeas were planted in the corn at the time the crop was laid by. The shade produced by the corn plants helped the tender young cowpea plants to get a good start. Then the shade from the growing cowpeas kept the hot sun from beating down on the lower parts of the corn plants. After the ears of the corn had been formed, the corn stalks provided support for the vining cowpeas which soon grew into a thick blanket covering which smothered not only the weed and grass growth in the cut but also thoroughly covered the lateral witches and in many cases the headland as well.

Photo No. 16. LeBlanc 3-row cultivator fitted with soybean planters to plant three rows.



Cowpeas do not produce well when grown alone and because of their vining habit of growth are not easily worked with modern machinery. On the other hand soybeans have an erect habit of growth and are readily cultivated with modern machinery.

Corn and Legumes

The production of a legume crop, with or without corn, is considered a part of the preparation of a field for the growing of sugarcane. It would probably be more advantageous to grow these crops on rows less than six feet wide, but as all machinery is designed for the production of sugarcane on six foot rows it is more convenient to produce these crops on six foot rows also.

If time and weather conditions permit, old stubble fields to be destroyed are capped out with a lister during November or December and lie out until time for plowing in the spring. The entire stubble row is plowed out in one operation with a single row cane plow. This means that the row of legumes will be on a ridge formed from half of each of two adjacent cane rows and will occupy the position of what was a former cane middle.

The plowed row is then thoroughly pulverized with a double disc chopper so as to produce a fine deep seedbed before the seed is planted. Rows prepared for corn planting usually do not have quite as high a ridge as those set up for legumes grown alone as corn must receive some dirting during subsequent cultural operations in order to produce an adequate root system.

Corn is usually planted early in March. Some operators plant corn alone and then add the soybeans, drilled or broadcast on either side of the corn row, at the time of the last cultivation or what is known as the layby. Other operators prefer to plant the corn and the soybeans at the same time, using a planter which will drop alternate hills of corn and beans. Very often a few more beans will be sown at layby time. Cowpeas are always planted in the corn at the time the corn is laid by.

Photo # 15 is a tractor fitted to plant corn. The seed bed has been prepared previously by plowing and discing. Immediately under the tractor at the front of the implement is a

small lister. This tool opens the top of the row and the disc gangs are set to work on each side of the row so as to reform the row opened by the lister. A "V" shaped drag fitted at the front of the planter removes any clods which may be on the top of the row and produces a smooth, level surface for the planter. The entire implement rig is hung from the power lift, which gives the operator some control over the depth of planting. When the rig is lifted at the end of the row, the planter does not drop any more seed.

At the present time Hybrid Corn is grown to a considerable extent. It is always necessary to use a type of corn which will be mature enough in August that it may be harvested in time to prepare the land for the next cane crop. In order to hasten corn maturity and protect the corn crop from strong winds and bird damage, the plants are topped or bent. Topping is cutting off the stalks above the ear after the corn has been well formed. Bending corn is bending the stalk just below the well formed ear before the stalk has reached the drying or brittle stage. After bending the stalk, the ear hangs downward about 18 to 20 inches above the top of the row.

When soybeans are grown alone they are planted in two rows 14 to 18 inches apart on a six foot row. Different varieties of soybeans suitable for the locality are used. One half to three quarters of a bushel of soybeans will plant one acre of ground. When cowpeas are planted, it is necessary to use one to one and a half bushels of seed per acre. At present the cost of cowpeas per bushel is about double that of soybeans.

In order to utilize the power available from a standard cane field tractor to plant soybeans, planters have been attached to the frame of a three row cultivator as shown in Photo # 16.

Two bean planters attached together replace each of the disc cultivator gangs. An adjustable hitch angling up to the main frame permits the planters to float, thus allowing for uneven elevation of the row tops. The planters are kept in gear and are raised at the ends of the rows to stop dropping seed and to permit turning for the next set of rows.

As the seed hoppers of the planters carry a relatively small amount of seed, a drum has been fastened above each set of planters, to supplement the amount of seed available for the planters between fillings. Seed from each drum is funneled to the planter hoppers by means of rubber hose. As the seed is used from the planter hoppers, it is replaced by seed from the drums. One man drives the tractor and the second man manipulates the levers where necessary, to adjust the outside planters for rows of uneven width.

The cultivation of corn and legumes is usually a "get to it when you can" proposition. As cane is the money crop the necessary cultivation is always given this crop first. The same implements which are used in cane cultivation (to be described in a later chapter) are used for corn and legumes. These are the double disc harrow and two row cultivator.

Corn usually receives three cultivations. The first, when the corn is four to eight inches high, is mostly to break the crust of the row which forms following a rain or rains. When mules were used this cultivation or "working" was performed with a walking moline cultivator. Now a double disc chopper (harrow) is used with the front set of discs set to draw dirt from the row and the rear discs set to build up the row again. For the second cultivation, disc harrows loosen the row and fertilizer is applied. Usually thirty to fifty pounds of nitrogen is used per acre. Then the two row cultivators work out the middles. The third or layby cultivation is again a loosening of the row with the double or single disc harrow and working out or opening the middles with a two row middle cultivator. After each cultivation the quarter drains are opened.

Soybeans receive two cultivations but no fertilizer. As the soybeans, when planted two rows on a six foot ridge, do not have as much space between the rows for cultivation as where corn is grown it is often necessary to take off the inside discs from each gang of both the double disc harrow and the two row middle cultivator. Soybeans are always planted on a higher ridge than corn as very little dirt can be thrown up at the bases of the soybean plants during cultivation.

Chapter 5

PLANTING SUGARCANE

At the present time sugarcane is planted in Louisiana from the 1st of August until the 1st of November. In the event that all of the cane planting to be done is not completed by the 1st of November, it is possible to windrow the seed cane and do the planting the following spring, usually during the month of March. There is no best time to plant the crop, as seasonal conditions after planting invariably influence the yield far more than does the time of planting.

Fall Plant

Cane planted between September 25th and October 15th is known as Fall Plant. By far the largest acreage is planted during this period of time. On land that has been planted to corn, the crop has matured sufficiently to be harvested in early August and the land is immediately plowed in preparation for cane planting. It is usually necessary to allow four to six weeks time to elapse between plowing the land and planting the cane, to permit decomposition of the crop residue turned under.

The entire stalk of cane is used for planting, and the cane to be used for seed has usually developed sufficiently so that one acre of standing cane will plant seven to twelve acres of land.

Before the general purpose tractors replaced mules for power there was usually sufficient labor available on the plantation to get all of the cane planted during the Fall Plant period just before the start of cane harvesting. This was especially true when a few tractors were available to properly plow the land during August when the ground is usually hard and the sun is hot. Since the advent of complete tractor mechanization there is usually not sufficient labor available to get all of the cane planted during the Fall Plant period.

Summer Plant

Planting during the month of August was first started as a means of increasing promising new varieties. Later it was found that some varieties in use commercially did well when planted between the 1st and 15th of August. As a rule the seed cane will germinate rapidly and develop a good root system with proportionate top growth before cold weather.

It is always necessary to do some weeding of the drill and cultivating of the row before cold weather so that the cane will not be smothered out. This is always light work as the cane is covered less deeply than in fall planting and the rows are not formed as high.

As the seed cane used in August has one month's less growth than it would have if it were planted in the Fall Plant period, it is not as tall. One reason for planting in August is that a larger percentage of eyes will germinate and produce mother stalks. It is thus possible to plant fewer stalks per row in August and still obtain as good a stand of cane as if it were planted during the regular fall period. Therefore an acre of seed cane will plant just about as much during either period.

Summer planting is especially recommended in certain localities where wire worms, Melanotus sp., Conodorus sp., Aeolus sp. or other soil insects attack the eyes of cane and produce considerable damage during the dormant period in the wintertime.

It is not possible to Summer Plant, following a crop of corn as the corn crop does not mature soon enough to permit the necessary plowing. Since tractors are used now and there is no need to grow food for them, many acres are planted to legumes alone. The summer legume crop may be planted early in March and will be advanced enough to plow under in late June or July.

Planting in the summer as well as in the fall does distribute the available labor over a longer period of

---

Photo # 17 International MV Tractor harrowing down soybeans.

Photo # 18 Thomson Single Row Plow

Photo # 19 International double disc Chopper

Photo # 20 Allis Chalmers tractors opening rows for Cane Planting

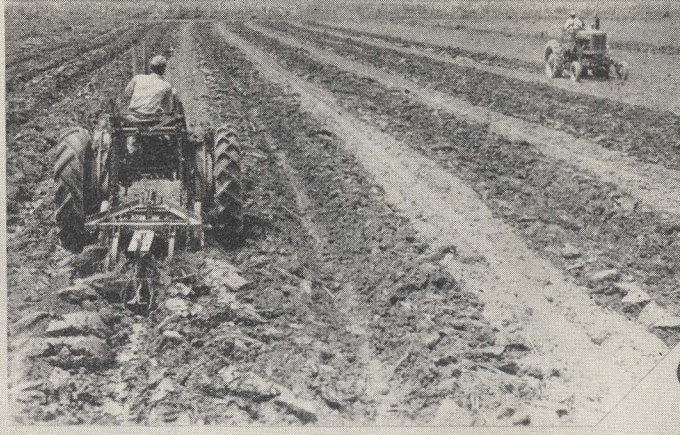
Photo # 21 Hurry-Cane Harvester cutting Seed Cane

Photo # 22 Howard Cane Loader

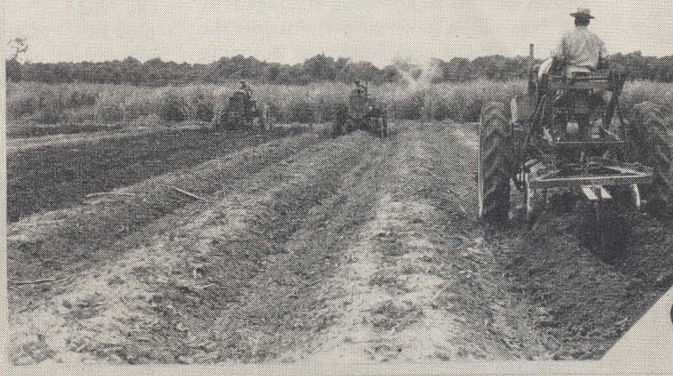
Photo # 23 Planting Sugar Cane

Photo # 24 Covering Cane with Thomson Single Disc Chopper

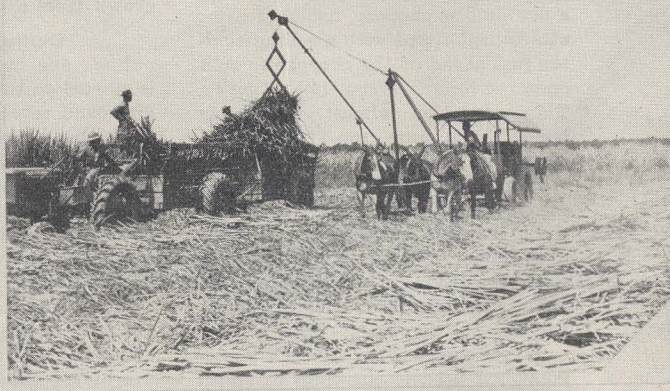
17



19



21



23

time. In some localities it has been found practical to start planting about August 20th and to continue to plant until the mills start to grind cane about October 10th to 15th. Weather permitting, some cane may be planted during the grinding season.

Spring Plant

Very little cane is planted in the spring at the present time, primarily because varieties now in use and available machinery permit a satisfactory job of planting which will survive the dormant period during the winter months and produce a satisfactory stand the following spring.

When spring planting is to be done, it is necessary to windrow the seed before it has been damaged by a freeze. Windrowing is cutting the stalks at the base only and dropping them lengthwise in the adjoining middle with all of the butts pointing ahead. Then the flag or top of the stalk dropped will cover the stalk dropped previously. It is then necessary to apply a furrow of dirt from either side so as to cover the windrowed cane.

There is always a great deal of loss of seed due to damaged eyes. An acre of windrowed seed rarely plants more than four to six acres. This practice involves a great deal of hand labor to take the seed out of the windrow for planting.

Plowing and Preparation

Soybeans are harrowed down with a double disc chopper, having a lister attachment fitted with a rolling coulter just ahead of the chopper to split open the top of the row. (Photo #17). This operation almost completely buries the legume crop ahead of the plow.

What is left of the corn or legume row is then split open in one trip down the row by the one row cane plow (Photo #18). The plow consists of a lister in front followed by right and left plows and a middlebreaker in the rear. Four rolling coulters, one in front of each implement, are used to cut vines or stalks in the row and to cut the hard ground to lighten the draft on the plows. Plowing is done just as deeply as soil conditions will permit, and rows are thrown up six feet apart with middles twelve to eighteen inches deep.

After plowing, the row is thoroughly disced with a double disc chopper (Photo #19). Land is often plowed twice, and disced as many as four or five times to produce a good seedbed. A lister attachment can be used just in front of the double disc choppers to open the top of the row and the discs following close this furrow.

Opening the Rows

The right and left hand plows and coulters are removed from a single row cane plow, leaving the front and rear middlebreaker to open rows for planting the cane. The depth of opening is regulated by the power lift of the tractor, which may be raised or lowered while running, or set at any certain point.

Soil type and drainage are the governing factors in determining the depth of planting cane. In stiff, black land, the cane is not planted quite as deeply as in loamy, well drained soils. In relation to mean ground level, that is the level of the field if the land were "flush plowed" (flat), cane is usually planted at mean ground level to two inches above mean ground level. So we may say that the cane is really planted on the flat, and the dirt is scooped from the middles to build a row over the cane.

Photo #20 shows the rows being opened. Shallow planting usually produces a larger plant cane crop. However, since the cost of planting cane is quite an item in field costs of producing sugar, an effort is usually made to plant the cane so as to produce as many years of profitable stubble crops as possible. The weather, as well as subsequent cultivation, will influence the number of stubble crops or ratoons that can be grown from a planting.

Cutting Seed Cane

The cane harvester (Photo #21) is started on the second row from the ditch and returns on the second row from the ditch on the opposite side of the cut. Then each succeeding round is cut as the machine works toward the center of the square. This procedure is followed so that all tops will be on one side of the heap and all butts on the other. When cutting seed for summer planting, the cane has not reached its full height and is aften not tall enough to permit the use of the cane crossing attachment (the inverted U shaped attachment on the right side of the harvesting machine). Then the cut cane must be crossed by hand to make heap rows, so that the cane loader can be used.

Some planters, particularly on the smaller plantations, top the cane to be used for seed three or four days before it is severed from the ground. This is done to induce the eyes to swell and speed up germination. If the eyes have swelled and sprouted appreciably before planting, the cane must be handled with great care to prevent breaking the tender little sprouts.

Two men are used to operate the cane harvester, and a crew of eight to twelve is used to cut the ditch bank rows and cross the cane behind the machine. If the ditch bank rows are not too close to the ditch it is often possible to cut them with the machine.

Loading Seed Cane

The cane is crossed from three to four rows to piles in a single cane middle. This permits the loader to straddle the cane row on one side of the pile and the wagons straddle the cane row on the other side. Photo #22 shows a Howard Cane Loader, one of the earliest types used in the Louisiana sugarcane fields.

For planting, the cane is loaded in the wagons with the butt end down. This is an operation which requires a skilled loader operator. It is necessary not only to load the wagon fully, but also to have the stalks so placed that they can be planted directly from the wagon with a minimum of effort. If the cane is permitted to roll when it comes from the grab, the leaves adhering to the stalks will tangle the bundle and it will be difficult to plant out in two stalks or singly as necessary.

Planting Cane

A planting crew, Photo #23 consists of two men in the wagon and three men on the ground following the wagon. Two rows are planted as the tractor goes down the row, one row on either side of the wagon. The tractor hauling the cane moves along at a slow steady pace, and the men in the wagon drop the cane along the rows. The men on the ground following the tractor straighten out the cane that does not lie straight in the furrow, pull out cane where it has been dropped too heavy and add cane where there is not enough. This picture was made of a crew planting summer plant, when the cane used for seed is usually straight, and short enough that it does not need to be cut in the furrow. When fall cane is planted the stalks are longer and often crooked. Then it is necessary for the men on the ground to carry cane knives so as to be able to cut the cane enough that it will lie straight in the planting furrow.

Cutting or "whacking" the cane in the furrows into pieces which contain three to six eyes does stimulate the eyes to germinate more rapidly. The cut ends of the cane stalks, however, are more readily attacked by soil animals and, under adverse soil

moisture conditions, permit the cane to dry out under dry conditions or become water logged when too much moisture is present. Many planters feel that excessive cutting of the seed cane offers more inroads for root rot complex and other disease organisms. In general, the practice followed is to cut the stalks sufficiently so that the cane will lie straight when covered, to permit it to be off-barred in the spring without pulling out a great deal of cane.

Most fall plant cane is planted "two running stalks with broken joints" or "two stalks and a lap". That is, in the first case the butt of one stalk is placed just ahead of the top of the preceding stalk in a continuous line and another line is placed parallel and adjacent to the first line so that with the first stalk half a length ahead, the butt and top of the first line meets the center of each cane in the parallel line. When two stalks and a lap are planted, two stalks are laid down side by side and the next two stalks are dropped so that the butts make a four to six inch lap with the tops of the preceding stalks. Summer plant cane may be planted as little as one stalk and a lap.

Covering the Cane

A single disc chopper is usually used to cover the cane as shown in Photo #24. In heavy land a double chopper is often used to insure sufficient dirt to cover the cane properly. Enough dirt is placed on fall plant so that after the dirt has settled, the cane will be covered with four inches of dirt. Summer plant is covered with one and a half to two inches of dirt.

After cane seed is dropped it should be covered just as soon as possible to preserve the moisture in the cane furrow and prevent drying out of the seed cane. A roller of some sort is universally used, particularly on fall planted cane as late September, October and November are usually dry and seed cane will dry out and fail to make a good stand the next year, if it is not properly secured.

Where winter legumes—Yellow-flowered Sweet Clover (Meliolotus indice), Austrian Winter Peas (Pisum arvense). Singletary Peas (Lathyrus pusillus), or Vetch (Vicia villosa) are used, they are often dropped on the fall planted row just ahead of the roller and are covered sufficiently by the action of the roller.

Planting winter legumes is not a universal practice but is used to some extent. With wet weather through the winter and spring, the seed cane is kept too wet by the legumes; and under very dry conditions, the seed cane is apt to dry out.

The quarter drains are then opened thoroughly and nothing further is done to the field of planted cane until the following spring.

Chapter 6

EARLY SPRING WORK

The grinding or harvest season is usually completed early in January and then early spring work on the next crop begins. During the harvest season all hands are usually occupied in getting the crop to the mill and aside from opening up drains which may have become so clogged as to interfere with proper drainage, no field work is done.

Mud and Trash

In most years, considerable rain falls during late December and early January. As a result, the ground is often too wet to permit the use of any machinery in the fields. If cane was hauled when the fields were muddy, deep ruts exist in many of the middles. These ruts usually close the eyes of the quarter drains enough to prevent the water from properly draining off of the fields. Hence the first job after the harvest season is to use hand shovels to open the quarter drains, which insures the removal of surface water.

Before harvesting machines were used all cane was cut and stripped by hand. The trash remained in the fields and was usually thoroughly dry by the early part of January. (Cane trash above ground absorbs very little moisture.) It was then burned off, to help the land to dry for the cultivating season. Burning off the trash has always been a universal practice. Some operators made a serious attempt to plow under the trash so that it would be worked into the soil and produce humus. This practice frequently interfered with proper later cultivation. It has never been adequately proven that the benefits derived from turning under the trash were greater than the trouble subsequently experienced.

Today when a great deal of cane is cut by the harvesting machines, the trash is burned from the cane before it is sent to the mill. After harvesting is completed, only the cane tops and a small amount of trash are left on the fields. This is usually burned off as thoroughly as possible.

A Stand of Sugarcane

All early spring work is directed toward obtaining an adequate stand of cane. Because of the relatively short growing season in Louisiana as compared with the growing season in the tropics, it is desirable to obtain the stand just as early in the spring as possible.

When mules were used entirely for cane cultivation the varieties available were not nearly as vigorous as those in use at the present time, and it was necessary to perform field practices which would benefit the germination of the eyes of the cane and make possible the proper development of the cane shoots. It was found that by using plows to remove dirt from each side of the six foot cane row, and hand hoes to take off dirt from the top, the row of cane warmed up faster and the shoots developed more rapidly. The plow operation was named off barring. The hoe work was called scraping in plant cane, and digging or grubbing in stubble.

As it was not possible to remove the dirt properly from each side of the row with one two-mule plow furrow, the operators used two furrows to take dirt from each side of the row. The first furrow was made rather close to the middle of the row and was known as boxing the middles. This operation could be done while the field was quite damp, without seriously affecting soil structure for later operations, and helped to drain off the excess water. The second furrow was taken off up on the shoulder of the row and was termed off barring, as the row of cane was left on a bar furrow about ten to fourteen inches wide and six to eight inches high.

The hand hoes were then used to remove the dirt from the top of the row. Hand hoeing to remove the first dirt had been used for many years before mule drawn scrapers for plant cane and shavers for stubble were developed. The scraping and hoeing operation tended to fill up the plow furrow which had been made on either side of the row and it was often necessary to re-off bar the cane rows with two mule plows before the fertilizer was applied.

Modern Shavers

Modern tractor implements permit removing the dirt from the top of the cane row before the row is off barred. The power driven shaver is especially good for plant cane as the blade revolves fast enough so that the young cane shoots are cleanly cut off. Photo #25 shows a Castagnos shaver removing dirt from plant cane where Yellow Flowered Sweet Clover (Melilotus Indica) had been planted on the row after the cane was planted. The dense cover of Melilotus keeps the ground damp and under such conditions the cane shoots are not capable of developing properly until the growth is removed.

The Castagnos shaver is built on a tractor drawn frame supported by two regular tractor wagon wheels and is powered from the tractor power take off. The shaving blade is a flat disc, thirty inches in diameter, and is usually tipped with Stellite or some similar material to lengthen the life of the blade and also to permit continuous operation through the day or days by eliminating the troublesome, time consuming operation of sharpening the blade.

There is no cultural practice in the sugarcane fields of Louisiana about which so many differences of opinion exist as that of shaving stubble. From early times until the present day, when the operator made a decision to shave, it was also necessary to decide what to shave, when to shave and how to shave.

If a careful examination of the stubble in the spring shows that it has come through the winter in poor shape, that the top or upper eyes are so weak they cannot be relied upon to produce sound, healthy shoots,

→

Photo No. 25. Castagnos Shaver in plant cane covered with Melilotus Indica.

Photo No. 26. Castagnos Shaver in Stubble Cane.

Photo No. 27. Allis Chalmers Tractor equipped with Thomson Shaver.

Photo No. 28. Off bar Plow in Stubble.

Photo No. 29. Off bar Plow with Longman Hoe.

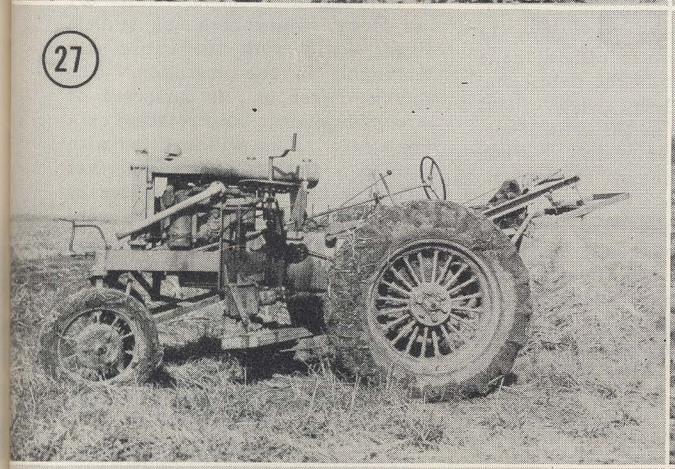
Photo No. 30. Disc harrow off barring with hoe.

Photo No. 31. Plow rigged to off bar, hoe and dig cane.

Photo No. 32. Hebert Rotary Hoe in plant cane.


25

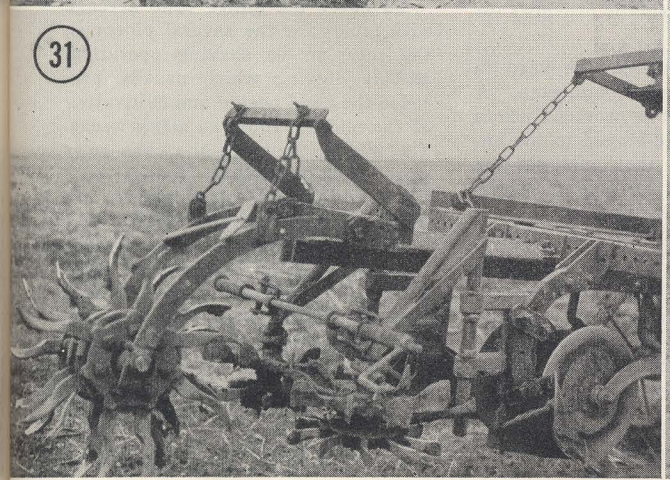

26


27


28


29


30


31


32

operators agree that the stubble should be shaved to get rid of the bad eyes so as to assist the stronger lower eyes to germinate and develop properly.

For successful shaving, there must be first of all a sufficient number of sound eyes in the stubble below the point where the cut is to be made. This means that the cane must have been planted to the proper depth and must have been adequately cultivated so there is a uniform ridge. Too light shaving will not produre a clean uniform job and heavy shaving will often destroy some needed eyes.

Stubble is shaved by making a horizontal cut of the stubble cane row, one or more inches below the surface of the ground. It should be done in the early spring when danger to the eyes from severe cold weather has passed.

In fields where improper cutting at harvest time has left many high stubbles, shaving will clear the row and therefore assist any necessary subsequent hoeing, especially where mechanical hoes are used. It will also remove grass roots and grass seed from the top of the row and reduce the need for later hoeing.

The cane rows are usually quite damp in the early spring. The removal of the old stubbles, cane shoots which had grown in fields cut early in the harvesting season and later on killed back by freezes (Photo #26) and trash with some of the top soil, will give the sun a better opportunity to warm up and dry out the row and furnish necessary light for the development of the young shoots. Shaving also helps soil aeration.

A field of cane which has been shaved will come up to a more uniform stand that seems to grow off better. Since the top of the row has been leveled and lowered, it is much easier to dirt the cane properly and control grass and weed growth with subsequent cultivations. At layby time, there are no stubbles in the way to prevent lapping the dirt from each side over the top of the row.

A great many cane borers (Diatrea saccharalis F.) are found in stubbles and in young cane shoots following a mild winter. Shaving will often remove these from the rows, and if the shaving operation is followed by wrapping up the middles with plow furrows an inexpensive measure of control for this pest is often effected.

The principal arguments against the practice of shaving in the past were that it split stubble, there were no implements available to do the job properly, and early enough. These arguments do not hold today. In addition to the Castagnos shaver, the Thomson shaver is available. (Photo #27). The Thomson shaver is an attachment which fastens under the tractor and is powered by a roller chain from the power take off of the tractor. This permits the use of an off bar plow drawn behind the tractor, so that shaving and off barring may be done at the same time.

Off Barring with Tractors

When both mouldboards are removed from a one row cane plow the implement is ready to off bar cane rows. In Photo #28 the field being off barred had been shaved about two weeks before as the cane shoots mark the row very plainly. When tractors are used for off barring, the ridge is usually left a little wider than it would be if mules were used. In plowing with mules the driver travels at a slower pace, has better control over the plow furrow and is able to steer around clumps of stubble which are a bit out of line in order to plow as much dirt away from the cane as is practical.

Hand work in the cane fields has always been expensive. A number of rotary hoes are now available which are fastened directly to the plow beams and work the sides of the row as it is being off barred. The Longman Rotary Cane Hoe (Photo #29) is designed to be readily attached to an off plow or a single chopper set to off bar cane rows. Two radial paddle wheels, one for either side of the row, are carried on axle shafts which are hinged directly to the plow beams or to a sub frame behind a disc chopper. Each paddle wheel functions independently and rotates by contact with the cane row as the tractor moves forward. The axle shafts are coupled together by means of a readily adjustable cross bar to take care of cane rows of different sizes. Spring tension is provided for each axle shaft.

This attachment may be used in stubble as well as in plant cane. A simple adjustment is provided where the axle shafts are hinged to the implement used, so that once set the machine will run at uniform depth in relation to the depth of the off bar implement.

In Photo #30, home made paddle wheels have been fastened behind a double chopper to off bar and dig stubble cane in one operation. It may be noted that the paddle wheels are carried at the end of straight bars which are bolted to the sub frame of the chopper. This rig is not flexible and is very apt to dig up stubble. There is a tendency toward using choppers for off barring instead of plows because choppers will readily roll over pieces of cane or cane trash left in the field which would clog the turn plow, even though rolling coulters are usually used just ahead of each turn plow.

A section from a mule drawn stubble digger is often fastened at the rear of the main plow frame (Photo # 31) and the complete unit—off bar plows, rotary hoes and stubble digger — will work the entire row thoroughly in one operation. The stubble digger unit is composed of three independent hubs rotating on a single axle. Each hub is fitted with seven picks and is so designed that each pick has a few degrees arc of free movement. If the picks were rigid they would act as a pry bar to loosen the stuble from the ground.

When mule drawn stubble diggers were used, three of these units were fastened to a frame with two wheels. Provision was made so that the driver could control the depth at which the stubble digger was operated.

The recently developed Hebert Rotary Hoe is shown in Photo #32. It is fastened to the frame of an off bar plow and has two rotary paddles similar to those of the Longman hoe. The two radial picks at the rear scrape across the entire row as the implement moves forward. Each pick is fastened to a coil spring which in turn is bolted to the radial angle irons. This machine performs a very creditable job in stubble and is quite good for plant cane.

Mule Power vs Tractor Power

The principal difference between modern tractor cultivation and mule cultivation covering the early spring work is that of time.

To cover the entire cane acreage with mules for the several plowings, the scraping or shaving operation, stubble digging which usually preceded the hand hoeing and cultivating of the middles required many weeks. The middles between the cane rows were often cultivated two or three times with mule drawn single disc choppers, drag harrows, rotary harrows, pick harrows or spring tooth harrows. The purpose was to make a deep, loose bed of dirt, which could then be readily plowed out to the cane rows after the fertilizer was applied. This thorough cultivation of the middles amounted to nearly the

equal of plowing the entire field just before the cane started to send out roots in the spring. The only part which was not plowed was the bar furrow containing the cane drill. The middle was always free of grass and in good tilth. Stubble cane was usually hoed twice and plant cane was hoed three or more times before fertilization.

Today the operation of shaving and off barring is a matter of days. It is only fair to point out however, that the mule plowing operation of boxing the middles may be done under soil moisture conditions which would be too wet for any tractor operation. To take the place of the hand hoeing which was necessary to keep down weed growth in the cane drill, flame cultivators, spraying machines and several types of rotary hoes are now available.

In recent years there has been a buildup of grasses (especially Johnson Grass) in the fields and along the ditch banks. At harvest time there is more vine growth to interfere with cane cutting. It is very possible that the speed which has been obtained in tractor operation for the early spring work is not as good for the cane crop as it is for reducing the expense of field operation.

Chapter 7

FERTILIZER

The area comprising the sugarcane district of Louisiana is known as one of the most fertile soil areas of the world. Numerous experiments have been carried on—many are still in progress—to determine what fertilizer may be added to the soil to supplement the natural fertility, for the production of maximum sugar per acre at such a unit cost as to yield the largest profit.

Early Fertilization

Prior to 1885 individual planters carried on field experiments of their own in an effort to determine what materials could be used to effectively increase their sugarcane yields. Cowpeas were introduced into the cane fields during the 1840's in an effort to renew the fertility of soils which were considered worn out. Some ten years later the use of natural fertilizers became a rather general practice. The materials used were cotton seed meal, bone meal, dried blood, meat and fish scraps. All of the materials used contained a low percentage of readily available plant food but did have a much greater carry over value than the materials in use today. These were applied by hand as it was a number of years later before machinery was introduced to apply these materials.

First Experiment Station

On June 30, 1897, Dr. William C. Stubbs, the author of "Cultivation of Sugarcane," started the preface to his book: "Twelve years ago the sugar planters of Louisiana established and endowed for a term of years, the Louisiana Sugar Experiment Station." The following quotations are taken from this book:

"Nitrogen Plat"

"These experiments have been conducted for eight years and will be continued indefinitely in the future." "The results up to date show conclusively, that this soil needs nitrogen to grow cane successfully, . . . "

"Phosphoric Acid Plat"

"Like the Nitrogen experiments, these have already extended over eight years, and will be continued indefinitely. The results so far indicate positively the value of phosphoric acid in manures for sugar cane on these soils, but the demand for this ingredient is small in comparison to that for Nitrogen, . . . "

"Potash Plat"

"These experiments have extended over eight years, and are being continued. So far, no results of any character, either in the increased sugar content or tonnage per acre have been visable from the use of any form of potash, upon the alluvial lands of the lower Mississippi."

The conclusions published by Dr. Stubbs have stood the test of time. Today a few small areas within the sugarcane growing district find it profitable to use a mixed fertilizer which contains phosphate as well as nitrogen. The rest of the cane acreage, which is by far the largest portion is treated with only a straight nitrogenous fertilizer.

Sources of Nitrogen

During the past fifty years a number of different sources of nitrogen have been used commercially. Early in the present century most of the materials used were waste products such as cotton seed meal, tankage and bone meal which contained an organic form of nitrogen.

These materials had a relatively small nitrogen content. As the cost of transportation and handling increased, it was necessary for the planters to use other forms of nitrogen which were cheaper in cost per unit of nitrogen applied. In addition other uses were found for some of these waste materials and the increased demand for them raised the price to a figure higher than the planter could afford to pay. During the period 1900-1915 some guano and Chilean nitrate of soda were used as well as cotton seed meal, tankage, bone meal and sulfate of ammonia.

As the years passed, a number of different synthetic products containing nitrogen, such as Cyanamid, Urea and ammonia nitrate, became available. The change from the use of one form of nitrogen fertilizer to another was never made abruptly. First a quantity of the newest material was tried on a small patch, and then the new material was thoroughly tested in field experiments together with the commercially proven fertilizers before being put to general use.

Louisiana planters have always considered several factors in choosing a fertilizer. Of first importance is the securing of a nitrogen fertilizer which will produce the best results in sugar per acre. Many trials have been made with different materials from time to time, and for all practical purposes it has been found that regardless of the source of the nitrogen, the sugar cane responds equally well. The second, and a very important consideration, is that of cost. The choice of nitrogen fertilizer through the years, and especially at the present time, is that form of nitrogen which is the cheapest, not only in initial cost, but when applied to an acre of cane.

Application

The materials which have been mentioned are all in a dry form, either pulverized or granular. They are applied just prior to the dirting of the cane. Split applications have been tried, such as the application of some fertilizer at planting time and the balance just prior to the dirting of the cane after it has been off barred in the spring; or two applications, half prior to dirting and the other half during the cultivating season. No special benefit has been derived from

split applications over a single application of the same amount.

The first fertilizer distributor was a box with a small hole in the bottom that would permit the fertilizer to drop out. This idea was soon developed into a light frame supporting the box large enough to hold 100 lbs. of fertilizer above the frame with a narrow diamond point shovel suspended on a shank below the frame to open a furrow to receive the fertilizer. A small pipe transported the fertilizer from the hole in the box to the ground behind the shovel. The small wheel placed under the frame behind the shovel was adjustable and permitted the fertilizier to be placed at different depths. In addition this wheel supported the weight of the machine. A single mule was attached to the front end of the frame and handles at the rear permitted the driver to hold the box upright and steer it along the side of the row. When it was found that the fertilizer would often cake in the box, an agitator was placed just above the hole and was turned by a chain fastened to the ground wheel.

In order to speed up the distribution of fertilizer to the cane row the Hall fertilizer distributor was developed. This machine had two large wheels and a box which would hold 300 pounds of fertilizer. The tread of the wheels could be adjusted from four to six feet. The bottom of the box was made of two large discs which insured a positive feed of the fertilizer material to the gates as they were geared to the main axle which in turn was driven by one of the wheels. Upright agitators were fastened to the discs. The machine was readily drawn by two fast mules and distributed fertilizer to each side of the row.

When tractors made their appearance in the cane fields, a fertilizer box was attached to each side of the tractor frame just ahead of the drive wheels. A scroll at the bottom of each box provided a measured, positive feed for the fertilizer. The scroll was driven by chains from sprockets on the drive wheels of the tractor. These boxes had two sprouts and fertilized the equivalent of two rows of cane.

Modern Fertilization

In 1947 standing orders to meet fertilizer requirements were cancelled by sales agents at almost the last minute, and some planters in Louisiana were faced with the problem of either using any nitrogen available, or doing without. Fortunately, an experiment carried out at Elm Hall Plantation some years before, showed that aqueous ammonia could be used as a satisfactory fertilizer for the cane crop.

The University of Tennessee had developed a squeege pump, which could be used to apply aqueous ammonia. The squeege pump is a positive displacement pump having a set of four rollers operating against a flexible rubber hose, or hoses. The hoses are pulled under tension in a semi-circle around the rollers. As the rollers revolve, a certain amount of liquid is squeeged through the rubber hoses. This pump is attached to the power takeoff of a tractor and may, or may not, be controlled by a clutch. An ordinary globe valve controls the flow of ammonia through the hoses from the tractor's storage tanks which are usually two 55 gallon drums. The amount of ammonia applied is regulated by the inside diameter size of the rubber hose (or hoses) used, as well as by the size sprockets used to couple the pump to the tractor power takeoff.

Some gear type pumps have since been developed which require a great deal less servicing and attention than is necessary with the squeege type pump. Flexible hose and pipe carry the ammonia liquor to the distributing shanks which are usually hung on the front end of the chopper, so that the chopper will cover the fertilizer immediately. As a rule both sides of a single row are fertilized as the tractor goes down the row. Two row applications have been tried but some difficulty was encountered in getting proper distribution to the rows.

Aqueous ammonia containing 31.1% ammonia (% NH_3 by weight is used). This material must be kept under six to ten pounds pressure to prevent evaporation, hence storage tanks must be available. Up to twenty pounds air pressure is used to unload the tank car into the storage tank, field tank, or directly into the drums on the tractor. Today, some large operators buy anhydrous ammonia and bubble it into water to produce ammonia liquor.

Anhydrous Ammonia

Anhydrous ammonia, as a source of nitrogen for sugar cane was tried out in a limited way in 1947, on a field scale in 1948, and throughout the cane area to a large extent in 1949. The reason for such rapid acceptance is low cost per unit. Anhydrous ammonia is a colorless alkaline gas at normal temperatures and pressures. It possesses a sharp penetrating odor and will irritate the skin and especially the mucous membrane of the human body. More than ordinary plantation care should be used in the handling of this material.

Storage tanks for anhydrous ammonia must meet certain specifications, particularly as to pressure. The recomendation is that the tank should have a working pressure of 250 pounds per sq. in. A Corkens vapor pump is being used with satisfaction to unload anhydrous ammonia from the tank car to storage tanks or to mobile field tanks. It is readily possible to fill the tractor tank from storage by releasing pressure on the small tank through the vapor check. When unloading or loading ammonia gas, gas masks should be worn by the operator, and an adequate supply of water should be kept handy, as ammonia is readily soluble in water, and the water may be used to counteract the effect of any gas which may come in contact with the worker.

Bulk storage tanks are often 30,000 gallon capacity, and should be covered to protect them from the direct rays of the sun. All tanks containing ammonia gas should never be filled to more than 85% of the rated capacity. Field tanks which carry the gas out to the cane fields are often 1,000 water gallon capacity, and are usually carried in trucks, or are equipped with wheels so that they may be readily moved from place to place. Tractor tanks of 110 gallon capacity are generally used.

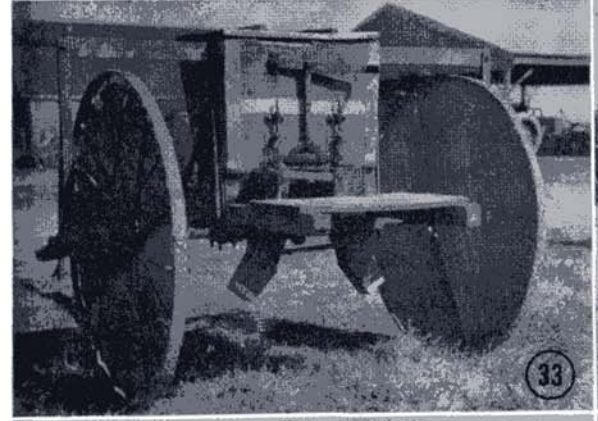
The operator's control of anhydrous ammonia is secured through a pressure gauge and a valve which can be closely adjusted. Charts have been prepared which enable the operator to set the valve at a certain mark for a given tank pressure and tractor speed. This setting will result in the distribution of a definite quantity of ammonia gas per acre covered. Only normal checking of the equipment is required during a day's use.

Ammonia is carried from the release valve to the soil shanks which are usually set just in front of a tractor chopper or in front of each side of a two row middle plow. Little trouble has been experienced in fertilizing two rows at once. However, it is necessary that the valves be equipped with the proper size orifices.

For handling either type of ammonia, it is mandatory to use iron fittings and rubber hose pipe which will withstand the action of ammonia and ammonia vapor. Gauges must be carefully constructed, as very small brass screws in pressure gauges have been

PHOTOGRAPHS NEXT PAGE ⇒

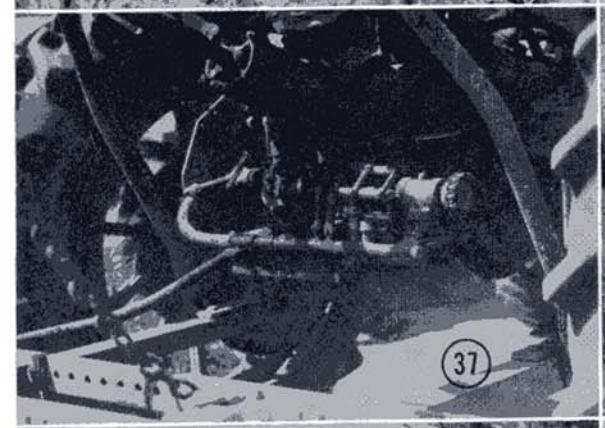
No. 33. Hall type Fertilizer Distributor—covered wheels for windbreak.
No. 34. Blue Fertilizer Distributors on International MV Tractor.
No. 35. Tractor being filled with aqueous ammonia from field tank—Portable air compressor unit at far left.
No. 36. Allis Chalmers tractor distributing aqueous ammonia in Plant Cane—Squeege Pump just ahead of rear drive wheel.
No. 37. Squeege Pump attached at rear of Farmall Tractor.
No. 38. Field Tank of Anhydrous Ammonia.
No. 39. International MV Tractor equipped to distribute Anhydrous Ammonia.
No. 40. Regulator with gauge to right of Tractor Driver—Shanks attached at front of chopper frame.


33


34


35


36


37

38


39


40

attacked by the ammonia, and the gauges rendered useless. Some propane rubber hose pipe has been used. This soon proved to be unsatisfactory, as the inner lining of the hose softened up and came loose from the body of the hose. Care should be taken to keep filling pipes and couplings as clean as possible Some difficulty has been experienced from dirt colleting on the diaphragm of the distributing unit and in the check valves.

It cannot be stressed too strongly that the application of either form of ammonia to the soil should be performed when soil is in a good state of tilth, to minimize loss from evaporation. Both aqueous and anhydrous ammonia should be covered to a depth of six or seven inches. Many operators feel that this requirement will make for better farming practices as the field will be well cultivated and will be in good rondition when the fertilizer is applied.

Rate of Application

In recent years there has been a tendency to apply increased quantities of nitrogen per acre. Ot present the recommendations are:

For Plant Cane in light soils, 36 lbs. nitrogen per acre.

For Plant Cane in heavy soils, 60 lbs. nitrogen per acre.

For Stubble Cane, 60 to 80 lbs. nitrogen per acre.

The best time for application is when the young canes are ready to use the fertilizer. This is just prior to suckering of the cane, when the plant sends out new roots which will develop to feed the suckers.

Chapter 8

CULTIVATION

The following appears in a History of Louisiana by Gayarre: "In this year (1751), two ships, which were transporting two hundred regulars to Louisiana, stopped at Hispaniola. The Jesuits of that island obtained permission to put on board of those ships, and to send to the Jesuits of Louisiana some sugar canes, and some negroes who were used to the cultivation of this plant."

It is regrettable that no written record is available of the work of these pioneers of the Louisiana sugarcane industry but it is fortunate that the industry was started by men who knew what they were doing.

Early Cultivation

The term cultivation is usually applied to the work that is done from the time the fertilizer is covered until the crop is laid by. It covers the building of the cane row and the maintenance of the best possible soil conditions for the proper development of the cane plants.

The early planters did not use fertilizer and had no field machinery other than crude plows to stir the ground before planting. Practically all of the cultivation, including the early work of opening up the row for drying out and aerating the land was performed with hand hoes.

The land used for early cane production was virgin soil which had been cleared of native growth or fields on which Indigo (Indigofera tinctoria) had been produced. In either case the land was fertile, loose or friable and easy to work once proper drainage had been established. The cultivation was necessarily quite shallow. Numerous grasses and weeds which always tend to come into a field after it has been in production to a single crop over a period of years were not present in quantity to compete with the cane plants for soil moisture and plant food.

A crew of men with hand hoes cross-hauling the dirt to the cane for the layby operation was the inspiration for James Mallon to design the first cultivator. This came about the same time as early work of the first experiment station under the able direction of Dr. Wm. C. Stubbs.

Principles of Cultivation

Nearly all of the complete and concise information concerning the preparation and cultivation of land for the production of sugarcane is contained in the writings of Dr. Stubbs. At this time, better turn plows were being manufactured which permitted deeper and more thorough preparation. The mule drawn machines, used for cultivation in place of the turn plows which had been in general use, originated just before the experiment station started and were developed at the time of the early work of the station. The observations and recordings of Dr. Stubbs concerning the land, the climate and the needs of the cane crop were most comprehensive and were undoubtedly complete for conditions which existed at the time.

In general Dr. Stubbs recommended well established principles of preparation and cultivation which would apply to all crops: (1) Drainage to control soil moisture. (2) Deep thorough preparation of the land to kill the grass and produce a seed bed of good tilth. (3) Frequent, shallow cultivation to preserve the tilth and avoid cutting roots. Tilth includes the preservation of soil conditions best suited to the liberation of plant food for the crop; and the maintenance of optimum soil moisture requirements for plant growth. These conclusions were undoubtedly drawn from the management of plots or small fields with good soil.

In the management of a large plantation today the preparation of the soil, no matter how thoroughly done, will not kill weed and grass growth nor insure a loose, deep bed for the entire time that cane occupies the land in the rotation. It is quite necessary that some plowing be done in the middles during the cultivating season. The cost of cultivation does not permit stirring the land at more frequent intervals than every 7 to 12 days. Because of this time lapse it is usually necessary to cultivate the soil deeper than was recommended some sixty years ago.

This chapter will deal with the implements generally used in cultivating the soil to build the cane row. A later chapter will cover specialized implements and practices which are used during the cultivating season on some plantations, including the all important practice of opening quarter drains which should be religeously performed after each cultural operation.

Dirting the Cane

When mule drawn implements were used for cultivation the cane middles had been thoroughly cultivated prior to fertilization. The elevation of the middles was invariably higher than the ridge which contained the row of cane and the mound of dirt was quite loose and friable some eight to twelve inches deep. Breaking out the middles after the fertilizer had been applied could be readily accomplished with a lister attached to a Magnolia frame, drawn by four mules. The dirt from the middle was split to cover the fertilizer which had been placed on either side of the row, filling the bar furrow but not covering the ridge on which the young cane shoots were growing. A good job of splitting the middles placed a small ridge of dirt along either side a little higher than the cane ridge.

A few days later, a Moline equipped with diamond points which straddled the row was used to tighten the dirt to the cane but not to cover the row of cane itself. Another Moline fitted with Louisiana shovels and a small middle breaker was run in the middles.

This operation was followed by one using high wheeled disc cultivators. At this time of the year the weather is usually dry with heavy dews early in the morning. The thorough pulverization of the cane row with properly set disc cultivators induced the absorption of moisture from the heavy dews by the finely divided soil particles which proved very beneficial to the crop.

The drill of cane was left open deliberately in order that the warmth of the sun would induce late germinating eyes to produce healthy sprouts and encourage adequate suckering around the sprouts which were growing. Dirt was seldom lapped across the cane ridge until the layby, but it was drawn closer and closer to the drill of cane with each cultivation, which was not only beneficial to cane growth but also killed or prevented weed growth.

The next cultivation was again with the disc cultivators which stirred the land and drew the dirt closer. This implement was followed by double mouldboard plows or Magnolias fitted with Rainbow plows and small mouldboards to open the middles. These implements, one following the other, were used as frequently as the weather would permit until the cane was too tall for the implements to pass over without breaking the tops of the stalks. The last cultivation was the layby operation.

Some years, excessive rain during the latter part of the cultivating season prevented the proper forming of the row in very sandy soil or washed down the row just after it had been laid by. Under such conditions a turn plow with spike team (one mule hitched ahead of another) was used to re-break out the middles with two furrows after the field had been laid by.

Transition to Modern Implements

The transition from mule drawn to tractor drawn cultivating implements came at the time when tractors were fitted with iron wheels. To obtain the necessary traction the drive wheels were fitted with angle irons, spikes or tent shaped iron lugs extending four to six inches above the wheel rim. Because of the iron wheels the speed of the tractor was a bit faster than mule gait but somewhat slower than speeds normally used today. Magnolia frames and Molines were simply attached to a bar which was fastened behind the tractor and extended across the row of cane straddled by the tractor.

The tractor driver operated the tractor and a man was placed with each unit drawn by the tractor to make necessary adjustments in the operation of the implement as it went down the row. Cultivation tools designed especially to be used on the tractor were then developed, as it was found that men could not walk behind implements for an entire day and keep up with the steady pace set by the tractor. It was necessary that the tools be hung from the tractor lift, so that turns could be negotiated on the existing headlands with the implements lifted to prevent damage to the cane on the ends of the rows.

The iron lugs on the early tractors were responsible for a major change in the crossings over the many field ditches. For many years wood bridges were used where the headlands crossed the two foot lateral ditches as well as for the larger cross ditches and canals. These were always a source of trouble during wet weather in grinding time, and many mules had been hurt as a result of bridge failure from rotted planks or sills. The iron tractor lugs soon tore up the wood bridges as they went back and forth over them. Where the roads or headlands crossed ditches which were six foot or larger, old boilers usually replaced the wood structure and these were covered with sufficient dirt so that grass would grow above the boiler. Cement culverts made on the plantation replaced the wood crossings at the lateral ditches and four foot ditches.

Tractor Cultivators

The reversible double disc chopper first appeared as a companion to the single row cane plow to pulverize the seed bed after the land had been plowed. This proved to be a splendid tool for land preparation. It is heavy enough and has sufficient speed to pulverize the land most thoroughly. A wide range of adjustments permit front and rear gangs to be set independently to build up the row or to tear it down. It is a far more useful tool behind the tractor than it was when pulled by mules. All points of contact with the soil have a cutting edge, and as they are rolled along the discs do not catch and foul up with any cane stalks, weed growth, etc. that may be in the field.

"A" frame drag harrows are sometimes hung on the rear of the chopper (Photo No. 42) to level off the top of the row for planting such seed as corn or beans. This hook up is used occasionally on plant cane to break the crust on the top of the row as the discs work the sides of the row. In order to rework a seed bed just before planting, a lister (Photo No. 43) may be attached to the front end of the chopper frame. This acts as a plow to open the row and the discs immediately behind re-form the row.

The amount of clearance from the row to the chopper frame is small so the double chopper is used only during the early part of the cultivation season when the cane is short enough that it will not be damaged. The double chopper can be set to thoroughly cultivate a full six foot row.

The two row cultivator (Photo No. 44) is usually used after the row has been formed with the double chopper, although it may be used to break out the middles just after the fertilizer has been applied. In this photo each unit consists of a depth wheel to regulate the depth at which the entire unit will operate and two three disc gangs which may be set to operate at different widths, each being adjustable for pitch and angle of operation. Immediately in rear of the disc gangs is a small lister to clean the middle. This particular machine is so designed that it requires a man in addition to the tractor driver to manipulate the control levers. The weight of the entire two row unit, including that of the man who operates the controls, is hung from the power lift and is raised from the ground at the ends of the rows for turning on the headland. Most two row cultivators are used with only a tractor driver. As a rule the rapid speed at which the machine operates in the cut of cane prevents lever adjustment which will be effective enough to justify the use of the extra man. The tractor driver usually makes necessary adjustments of the machine at the end of the row. He regulates some depth change by manipulating the power lift, and controls the pitch of the dirt to some extent by adjusting the speed of the tractor.

On a few plantations the Magnolia attachment (Photo No. 45) has been brought up to date with a depth wheel. The Rainbow plows have double shanks which permit a fine adjustment of plow depth and dirt pitch. The mouldboard at the rear has a rudder just below the frog to

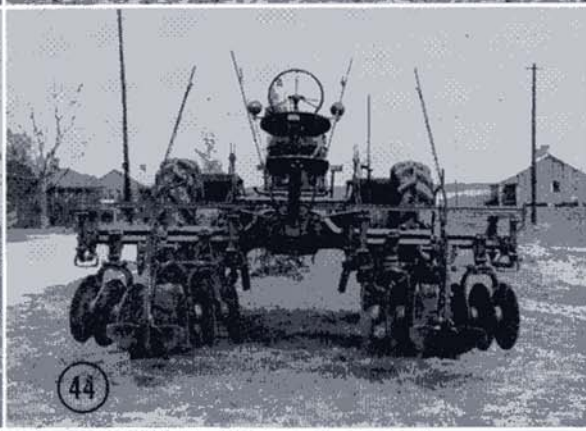
PHOTOGRAPHS NEXT PAGE ⟶

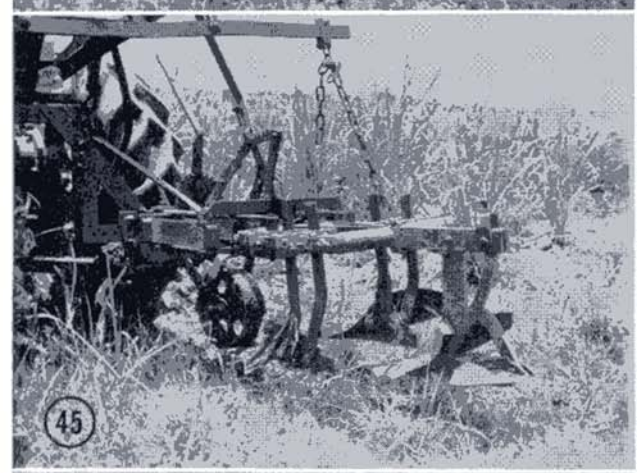
No. 41 Double reversible Disc Harrow
No. 42 Spike tooth "A" harrow attached to Single Disc Harrow
No. 43 Double Disc Harrow with lister attachment
No. 44 International MV Tractor with Two Row cultivator
No. 45 Magnolia frame used behind tractor
No. 46 Cultivating two middles with Magnolia attachments behind tractor
No. 47 Le Blanc Three Row Disc Cultivator in cane field
No. 48 Le Blanc Three Row Cultivator on headland


41


42


43


44


45


46


47


48

assist in the maintenance of a straight middle. Extending from the rear of the mouldboard, the flat depth gauge serves a double purpose. It not only regulates the depth at which the mouldboard operates but also sifts some loose dirt over the plow sole left by the mouldboard.

The frame supporting the two row cultivators is always fabricated to give ample clearance from the top of the cane row. This permits use of the machine in taller cane than could be worked with a double disc chopper. As a rule the tractor clearance is the limiting factor in the operation of these machines in tall cane.

The three row cane cultivator incorporates the principles which had been worked out in the building of the high wheel cane disc cultivator. (Photos No. 47 & 48) The main frame of the cultivator is fastened directly to the frame of the tractor. A high arch frame supports a three disc gang on each side of the cane row. Draw bars which extend forward to couple to the front of the main frame permit a ready adjustment to variations in row height. The disc gangs are provided with adjustments for pitch and angle of operation. Some three row cultivators use a man in addition to the tractor driver to set the disc gangs but many are operated entirely by the tractor driver.

Modern Cultivation

The essential difference between the work formerly performed with mule power and the operations of modern cultural machinery is that of speed. Timeliness was the most important factor governing operations when mule power was involved. The implements and machines were light and performed best when used under suitable conditions of soil moisture. In general cultural machinery used picks, plow points and shovels to supplement the job of soil aeration which had been performed when the land was plowed before planting. The walking plows and mouldboards built up a row with square shoulders. The high wheeled disc cultivators broke the crust of the land but they were primarily used to draw the dirt to the cane row, and set the dirt behind the plows so that the row would remain intact after rains.

To use the speed and power of the tractor to advantage, modern machinery is built quite heavy. The accent is placed on discs rather than plow points, as discs do not clog up as readily and they are relatively easy to set. In addition, the pitch of dirt in the cut can usually be controlled by the speed of travel of the tractor without the need of stopping when discs are used. Because of the weight and speed of modern machinery it is often possible to cultivate fields which are so dry they would present a most difficult problem to mule-drawn cultivating implements.

The disc harrow or chopper is really a segmented roller, each segment slightly curved. It does not cultivate very deeply, but does have a tendency to pack the soil. Heavy rains following a thorough discing of the field often pack the alluvial soil rather badly, and usually wash some of the finely pulverized soil into the lateral ditches. The growing cane plants tend to cover the row more and more as the cultivating season advances, which lessens the washing away of the finely pulverized soil.

Chapter 9

SPECIAL MACHINERY

The machinery and practices mentioned in this chapter are used in many places throughout the sugarcane producing area of Louisiana but they are not universally used on large and small plantations.

Drain Cleaner

The most practical method of draining a row of cane is to have the middles deeper than the row itself; the quarter drains deeper than the middles; the lateral ditches deeper than the quarter drains; and cross ditches, main canals and other water courses deeper than the laterals. Elemental? Yes. Important? Very.

Mention has been made of the quarter drains, usually numbering from one to four in each cut of cane, and of the need for opening them after each plowing or cultivation of the field. This task has always been performed with hand shovels, so as to provide adequate slope for the water to drain off properly. Now that many fields are being specially prepared to crown each cut so that it is higher in the center than at the sides, the task of opening the quarter drains may readily be performed by a machine which will maintain a constant depth.

The Barras drain cleaner (Photo #49) is drawn by a mule and is as wide as the normal single tree. The sides of the machine are streamlined and will not damage any more cane than is affected by a single plow. It is not necessary to run a single plow ahead of the machine as was formerly done when hand shovels were used. The machine cuts the desired depth and cleans out the eyes of the middles as it moves along. The dirt from the drain is well scattered to either side and will not interfere with subsequent movement of water through the middles into the drains.

The weight of the machine is supported at the center on a small, short coupled, four wheel rubber-tired truck. The wheels readily track in the drain cleaned out by the machine. The support point of the machine is a hinge joint which permits the truck to negotiate uneven places in the drain without affecting the level of the machine as it is operating. By the same token, the operator may adjust the depth of the cut of the machine by simply raising or lowering the handles.

The centrifugal impeller is powered through a reduction gear by an opposed two cylinder 10 H.P. air cooled engine. The reduction gear is enclosed in a dustproof housing and runs in oil. An oversized air filter is provided, and every effort has been made to keep dust out of the working parts of the machine. Three paddles radiate from the center of the impeller and throw the dirt out of the drain as the machine moves along. A replaceable cutting blade at the end of each paddle cuts the drain to a perfect semi-circle, eighteen and one half inches in diameter. Two chutes are provided above the impeller to direct the dirt to each side of the machine.

A riding platform at the rear folds up against the gas tank when not in use. This is lowered and is occupied by the operator of the machine when it is necessary to transport the machine from one field to another along the highway. The weight of the operator at the rear lifts the impeller at the front of the machine. An adjustment is provided to permit different depths of operation.

Ditch Bank Implements

Grass on the ditch banks of the lateral ditches grows faster than the cane crop and must be controlled to remove competition with the cane plants on the ditch bank rows. Years ago when cowpeas were planted with corn as a summer legume, the dense growth of peas completely covered the ditch banks and ditches as well as the rows in the cut. This shade tended to kill out or at least to keep under control the grasses along the ditch banks. During the time when sugarcane occupied the land the ditch banks were cut two or three times with side blades. A side blade has a straight blade about sixteen inches long at the end of a five foot straight handle. The blade itself has a hook at the end which carries the cut grass up to the bank. It is swung in a circle with two hands and a pair of strong supple arms.

A ditch bank plow (Photo #50) is now used at the time the land is prepared for planting and often during the early stages of cultivation. The plow itself consists of three to five cutaway discs, twenty-three inches in diameter. The tractor straddles the ditch bank row and the plow is extended along an outrigger boom at the rear of the tractor the desired distance to plow the entire bank. The chopper is fully adjustable and may be set to reach down over the edge into the ditch itself. The entire unit, including the weight of the man who operates the plow adjustments is hung from the power lift of the tractor.

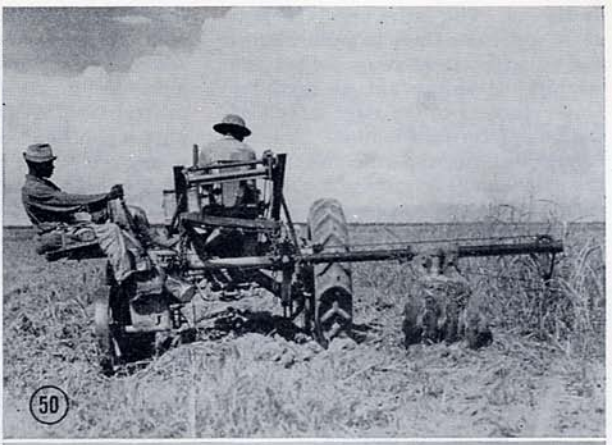
Burning the ditch banks is the solution used on many plantations for the problem of weed growth. A useful implement for this work is the Woolery Weed Burner. (Photo #51) It is an integral unit consisting of a motor with blower, fuel intake, and extension pipe with the burner head

---

Photographs →

No. 49—Barras Drain Cleaner
No. 50—Ditch Bank Plow
No. 51—Woolery Burner
No. 52—Aeroplane Dusting for Sugarcane Borers
No. 53—Aeroplane fitted for Spraying
No. 54—Plantation made Sprayer
No. 55—Three Row Flame Cultivator
No. 56—Dixie Rotary Hoe


49

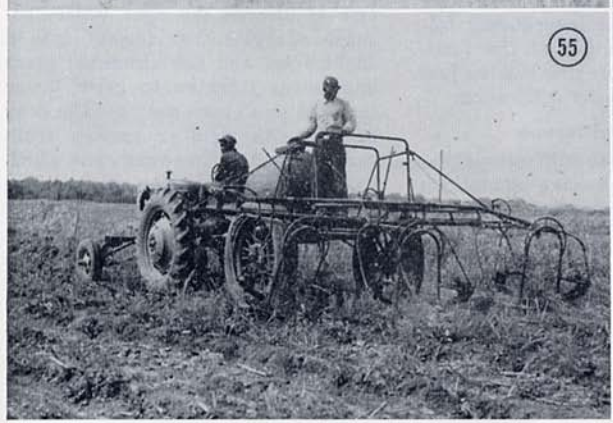

50

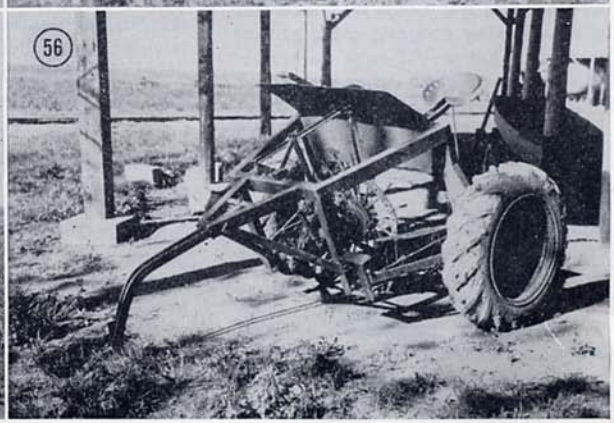

51


52


53


54


55


56

at the end. The entire unit is mounted on a circular track to permit burning either straight-away behind the machine or swung out as much as ninety degrees to the right or left of the line of forward motion. A lever is provided for the manipulation of the machine when swung in the possible 180 degree arc, and a locking device holds the unit in any desired position. The burner tip may be raised or lowered for the most efficient performance of the job being done. The entire unit is mounted on a two wheeled platform for field use or may be readily mounted on a flat car for burning railroad right of ways.

Aeroplane Dusting

Control measures for the sugarcane borer consist of dusting with Cryolite or Ryania. Dusting is started for first generation borers when the larvae emerge from the eggs laid by moths developed from over-wintering larvae.

Dusting with ground machines has been found to be equally as effective as dusting with an aeroplane for the first generation. At this time the cane is small and has not spread very much on the row. The nozzles from the ground machine may be readily directed to blow the dust into the leaf whorls. Dry weather early in the spring is usually favorable for the operation of ground machines.

A complete dusting for a single generation consists of four dustings each spaced a week apart. Ten pounds of material per acre are used for each application. Control measures are usually applied to the first or second generation larvae.

For best results the dust should be applied at the regular intervals of time when dew is on the cane leaves. From a plantation operating standpoint it has been found preferable to use aeroplanes for dusting as the tractors are usually quite busy in the spring of the year and cannot be used for dusting cane without upsetting the regular work program. Rainy weather and wet fields may interfere with a dusting program using ground machines, but would have no serious affect on a program using aeroplanes.

Where borer infestation is confined to rather small localized spots in a field, it is usually more economical to rogue out the infested stalks by hand, than to apply dust to the whole field. Hand rogueing was the method of control in use prior to the use of poison dust with machines.

Herbicide Sprayers

The use of herbicides for weed and grass control is increasing and becoming a permanent part of the plantation work program. Altho some dust has been used, spraying with an aeroplane is usually done where the cane has grown too tall for ground sprayers as in the case of control for Tie Vines (Ipomaea purpurea) during September. Light planes are used, which are able to land on the headlands in the cane fields (Photo #53) to load up with the spray material.

Aeroplane spraying is also used to control unwanted growth in ditches, canals and large scale field operations where there is little danger of damage to other crops growing in the area. This method of applying the spray material is especially valuable when the ground is wet and the use of tractor drawn implements might impare soil tilth.

A complete spraying program for the control of Johnson Grass is now being used on a number of plantations. Blanket sprays of suitable selective herbicides are used in conjunction with fallow plowing before the land is set up in rows for cane planting. The ditch banks are sprayed with sodium chlorate or a mixture of sodium chlorate and calcium chloride, or some similar material.

Shortly after the cane is planted a pre emergence spray is applied to the rows. Then in the spring a spray is applied to the tops of the rows immediately after the rows have been shaved. Some plantations have constructed their own spray units (Photo #54) to provide a larger capacity than is usually furnished on standard sprayers. The larger capacity reduces the time of travel to and fro from the fields to the water supply. Sufficient openings are provided along the pipe to permit blanket spraying. These may be plugged at suitable intervals for row spraying. It is possible to extend the pipe so that five rows may be carried instead of three rows. For general field use it has been found better to carry three rows.

A spraying is sometimes used after the first cultivation immediately following the application of the fertilizer. The final spraying is done just after the last or layby cultivation.

Flame Cultivators

A three row flame cultivator (Photo #55) is used on some plantations to control weeds and grass in the cane drill. This machine cannot be used on the corn crop but is used quite successfully on most unwanted plants in a field of cane. The growing tips of the cane shoots are well protected by the leaf sheaths and though a field of cane usually has a rather ragged appearance after a flaming, there is no adverse affect on the growth or final yield where flaming is practiced.

An early type of flame cultivator, the "Sizz Weeder", is a complete unit containing engine, air compressor, pressure tank, hose pipes and burner heads. Fuel used may be kerosene or tractor fuel. Other types of flame cultivators which use propane or butane gas for fuel require only a tank for the kind of gas used, hose pipes and burner heads. These machines replace hand hoeing and will take care of 150 to 350 acres of cane per season.

A machine of this type may often be used when the ground is too wet to permit hand hoeing. In small cane where a great deal of grass and weed growth has germinated and started to grow in the cane drill, a flame cultivation will often clean the row with less injury to the young cane plants than would be the case with hand hoes, as no cane shoots are cut off and no cane roots are disturbed.

Flaming has been found to increase the effectiveness of the use of herbicidal sprays in conjunction with cultivation of the crop or during the period of summer fallowing. Four burner heads may be suitably extended to the side of a tractor for burning off ditch banks and are used to some extent during harvest time to burn cane trash from the stalks of cane after they have been cut and placed in a windrow.

Rotary Hoes

A number of implements which may be termed mechanical hoes have been tried in the cane fields to take the place of hand hoeing for cleaning the cane drill. The need for such devices was particularly acute in the period after the Civil War when there was a great scarcity of field hands.

The spike toothed drag harrow was possibly one of the first to be used. It is sometimes used today for fields of plant cane where there is an excess of dirt on the cane which, because of rains, has formed into a slight crust and the unwanted grass and weeds threaten to grow faster than the small cane shoots. The drag harrow with rigid or springy teeth can only be run on young cane which will bend to the action of the drag and not break off where the shoot joins the mother stalk.

The straight toothed drag was followed by a rotating tooth harrow which rolled over the row as it went along. This developed into the stubble digger which has been described in Chapter 6 and was pictured in Photo #31. The stubble digger was

found to be a bit heavy for plant cane which requires mulching rather than digging, so stiff tined rotary picks, very similar to the stubble digger rotors were designed for use on plant cane. Usually about twice as many tines are used on plant cane picks as the number on the stubble digger rotor. The picks on the stubble digger are shaped but nearly straight. The tines on the plant cane rotor are bent to form an angle about an inch and a half from the tips.

When used at present tractor speeds, the stubble digger has a hoeing action on small grass and weeds due to the fact that it thoroughly disturbs the soil around the roots. The stubble digger was designed and perfected to be mule drawn and at that time was used primarily to loosen the packed dirt around the stubbles so as to lighten the burden of the hand hoes, and increase the amount of land that could be covered by the hoe gang in a day's time.

The Hebert and Longman hoes described in Chapter 6 were developed for tractor operation. These implements tend to work the sides of the row rather than the top. They are not only used attached to the plow in the off bar operation, but are occasionally used after the row has been formed following fertilization in small cane. Many and varied are the sizes and shapes of the paddles and tines of these machines as a result of the whims and fancies of individual operators.

A number of machines have been built at many different points in the sugarcane district similar in design to the "Dixie Hoe". (Photo #56) The rotor fitted with three to as many as twenty radial rods knocks the dirt off of the top of the cane row. The rotor is powered through gears, shafts, sprockets and chains by one of the ground wheels or from a power take off on the tractor. Depth wheels run on either side of the cane drill to gauge the depth of operation, and a hand lever is provided to permit depth adjustment.

All rotary type hoes damage the stand of cane to some extent. It is quite necessary that they be run under suitable conditions of soil moisture and be manned by careful, competent men.

Chapter 10

CUTTING SUGAR CANE

Harvesting in Louisiana is a race to get the sugarcane to the mills from the time there is sufficient sucrose in the cane to justify grinding until deterioration from the effects of low temperatures has advanced to such a stage that processing is no longer profitable. In period of time, this is from the early part of October to the early part of January. Field operations and mill capacity are balanced for the average year and very little cane, if any, is left in the fields when the mills stop grinding.

Cane Knives

For many years hand held cane knives were used exclusively for cutting the cane at harvest time. Today on plantations which are mechanized as fully as is practical, some cane is still cut by hand.

Prior to 1925 the varieties of cane used were of the large barrel, low fiber type and almost any kind of knife would hold an edge well enough to use for harvesting. When the P.O. J. varieties replaced Louisiana Purple and D 74, a knife problem arose. The stalks of these varieties were more difficult to cut and the average blade then in use either would not hold an edge or the well sharpened edge would soon bend and become useless as a cutting implement. The problem was solved by using knives made from a better grade of steel.

The short-handled cane knife is shown in Photo No. 57. It is the most popular style used. The blade is fastened to the wooden handle by means of five rivets. Given ordinary care this knife will last for three or four seasons.

The knife with the sharply curved blade is one of a number of patented knives which have been introduced into the cane fields from time to time. The thought behind their design was to reduce the amount of effort necessary to cut cane so that more cane could be cut in a day's time. Nearly half the width of the original blade has been filed away during the period of its use.

An eighteen inch rule photographed with the knives offers a gauge for the size of the knives. To the right of the rule is a long handled cane knife. This style knife was introduced especially for picking up cane which had been windrowed. It is also an excellent tool for cutting very tall cane. Many cane cutters today prefer a long handled cane knife.

The knife on the right was introduced into Louisiana cane fields a few years ago. It is a well balanced, splendidly designed knife, constructed from excellent materials. The blade of the knife is glued to the handle furnishing a firm bond for the life of the tool. Two rivets are used in the handle. These are really not necessary but do serve to relieve the mind of the wielder who has been accustomed to a knife having the handle riveted to the blade.

The hook at the rear of each blade is used to pick up stalks of cane from the ground or to draw the tops of the stalks of standing cane to the cutter when the tops are cut before severing the stalks at the ground. Experienced cutters usually sharpen the back of the blade for four to five inches just under the hook. This portion of the knife is then used for cutting off the tops of the stalks.

Piling Cane

When a field is cut by hand, the cane from four rows is usually piled together across the middle between the two center rows. This produces a completely cleared row on either side of the middle containing the cut cane and permits passage of the cane loader on one side and the wagons hauling the cane on the other.

The two center rows are known as heap rows or down rows, and the outside rows are called fly rows. Some years ago all of the cane stalks were properly topped, cut close to the ground and thoroughly stripped of adhering leaves before they were thrown on the heap row so as to form regular piles of cane. When cane was loaded by hand it was usually the custom to place three rows (two heap rows and a fly row) together in a heap. This left only one cleared row between heaps of cane for the wagon to pass over, and the cane could be loaded on the wagon from the heap on either side.

Windrowing

Windrowing cane is no longer practiced in the cane fields of Louisiana. It was used in an attempt to minimize the loss from cane deterioration following freezing temperatures.

Just before a freeze, or when the buds of the cane had been killed by a freeze, the stalks of cane from two adjoining rows were cut at the ground and placed together in the middle between the two rows. The butts of the cane stalks were placed at the lowest point of the middle, touching the ground about a step ahead of the cane cutters (it is necessary for two cutters to put down windrow together). The stalks with all adhering leaves and tops were then dropped parallel to the rows, in such a manner that the leaves and tops would completely cover the stalks which had been placed in the row: an effect similar to that of shingles on a roof. The butts of the stalks were laid uphill to assist drainage after heavy rains.

Windrowing is effective with some varieties, usually straight stalked ones capable of resisting deterioration. For best results the ground must be moist when the cane is put down. The principle involved in windrowing is that the stalks do not lose their moisture as rapidly as when they are standing in the row, they are protected from the warm rays of the sun and the drying effect of winds by the cane tops, and a more even temperature at a lower level is maintained through contact with the soil. The windrowed cane is

protected against subsequent freezing temperatures.

This practice was always performed from as early in the morning as possible, until noon. It was a cold, wet and thoroughly disagreeable job. In harvesting a field that had been windrowed, it was necessary for the cutters to stand in the wet middle and pick up the stalks one by one in order to top them and strip off the cane leaves.

Early Cane Cutters

Many attempts were made to develop a machine to harvest sugarcane. These date back to the time when wood was used to build farm machinery. Roller chains and special alloy steels were not available, but even if they had been the engines of that era did not develop sufficient horsepower per pound of weight to permit their being used in a portable vehicle necessary to travel through a cane field.

The Gonserand Cane Cutter was used to a limited extent. It was pulled by mules. A wood frame supported two circular cutters which could be raised or lowered. The stalks of cane were cut at the bottom and dropped at the rear along the row. This machine was one of the earliest and was followed by numerous others.

The Luce Cane Harvester was built about 1921. It was all metal in construction and designed to cut top and bottom and clean off the cane leaves and trash. At that time dependable multicylinder gas engines, which were capable of developing the necessary power for such a machine, were available.

Modern Cane Harvesters

The modern cane harvester dates from 1938 and is really the evolution of a machine originally designed to windrow sugarcane. For many years it had been necessary to bring in labor from points outside of the sugarcane area to help take off the cane crop. During the late thirties, it became increasingly difficult to obtain the necessary labor for the harvest season, and if windrowing had to be done, it was impossible to keep a full crew in the field. The major thought behind the development of the cane harvester was that it would permit the harvesting of the crop by using the labor present on the plantation. At that time a number of mules were still used, and the labor needed for cultivation would have been sufficient to do the harvesting with the present cane harvesters, equipped with modern piling attachments. Since then, tractors have supplanted mules for cultivation with a corresponding reduction in farm laborers needed for that work. The increase in the use of tractors came early in the World War II period, when laborers were leaving the cane fields for military service, for work in war plants and for other work connected with the war effort.

The 1938 Munson-Thomson Cane Harvester has gathering chains, equipped with finger like protrusions, which extend from the front of the machine and guide the cane stalks into the machine. The stalks are then carried through the machine by a central holding chain after the knives have cut the tops from the stalks and severed the stalks from the ground. The topping device consists of a revolving disc equipped with removable sections similar to those of a mowing machine blade. Chutes on each side of the arch convey the cut tops to the ground. The entire topping device may be raised or lowered on the drive shaft as shown on each side of the center column supporting the arch. The lower cutting bars are short mowing machine blades. Two extra blades may be seen hung from the left side of the arch. The forward speed of this machine is limited by the use of this type of cutter bar. The operator sits in the front, just ahead of the engine which is located within the center support. He operates the topping device as well as the steering and general machine controls. The two men at the rear adjust the height of the cutter bars which sever the cane stalks from the ground.

When Photo No. 58 was taken the machine was cutting cane for the mill. When the entire field was cut, it was necessary to cross the cut stalks from their position parallel to the row, to a position at right angles to the row, or, in other words, across the middle between two rows. Four rows of cane were usually crossed on one middle.

For windrowing, the central holding chains are longer and are carried to the rear along the angle made by the lower braces of the central support. The topping devices are not used. A revolving drum, shaped like a lamp shade is placed just above each row straddled by the machine. This truncated cone pushes the lower ends of the stalks to the center of the middle between the rows just ahead of the tops of the cane stalks which are still held by the central holding chains. As the stalks pass out of the grip of the central chains, the butt end hits the ground and the tops fall backward, the cane tops covering the stalk portions of the cane that had been previously dropped. The Munson-Thomson Windrower was preceded a few years by a windrowing machine designed by Mr. Del Thornton. Two rows were cut with the Thornton machine but the butts of the stalks were shoved rearward under the falling cane tops.

"Hurry-Cane" Harvester

The Thomson "Hurry-Cane" Harvesters (Photo No 59) are in the majority in the Louisiana sugarcane fields today. This machine cuts one row of cane. Gathering chains extend from the front of the machine which pick up and help to straighten any cane on the row which is not erect. When strong winds blow the cane over in the direction that the row runs and the cane does not straighten up again, it is sometimes necessary to do all cutting from one end of the row, and return idle. This seldom occurs, which is fortunate, as the expense of such cutting is doubled. A scroll which straightens up the upper half of the stalks before they are topped is located immediately behind the gathering chains.

The topping device is a circular blade driven by a hydraulic motor. Two chutes are provided to convey the cut tops to the ground, as the hydraulic motor on the cutting blade may be operated in either direction. These chutes make it possible to keep the cane tops from falling into the middle that will be used in piling the heap row of cane. The cutting height is controlled by the operator who sits on top of the machine.

The cane stalks are grasped by the main conveyor chain which carries the stalks in a vertical position through the machine to the piling device at the rear of the machine. When the stalks are grasped by the main chain, they are severed at the ground by a circular cutting blade. Both bottom and top blades are operated by a low grade fuel power unit situated just behind the front wheel. The height of the lower blade is regulated by the helper who sits at the rear of the machine. Both blades are fitted with easily renewable sections for the cutting edges and are tipped with a hard surfacing material for longer wear.

The piling device is held at a right angle to the machine when it is in operation. It is hinged, however, and may readily be folded along the right side of the machine when travelling from one field to another. This pil-

ing boom is constructed with a gate in the center for discharging cane. When this machine cuts the first row of a heap, the piler is not used but the cane is dropped lengthwise along the row from which it was cut. (This row is crossed by hand labor, after the harvester has cut the adjoining row of cane.) The second row of cane is cut, and a hook at the rear drops the cane across the middle just back of the right rear wheel. This is the start of a heap row. Then the two adjacent rows are cut and piled on the heap row by means of the gate in the center of the boom. The next two rows are cut and discharged from the end of the boom.

This cutting system will place six rows of cane on a single heap row. It is often used when the yield of cane is light. A disadvantage is that it mixes butts and tops in the heap. In heavier cane, or where it is desirable to have all of the butts on one side of the heap row, three rows are piled on one heap.

A low grade fuel power unit provides power for the movement of the machine and for the operation of the conveyor chains. It is located along side the left rear wheel. The steering wheel actuates the smaller front wheel, and is used for normal steering. A heavy duty clutch and brake is provided for each rear wheel and this feature is useful in turning the machine in a short radius or when the machine is being used under muddy field conditions. Selective gear ratios permit different operating speeds. The sheets and tubing which extend forward and carry the gathering chains are constructed of aluminum. The machine will cut from one acre to one and one quarter acres of cane per hour.

Thornton Harvester

The Thornton Harvester (Photo No. 60) is really a harvesting attachment that is mounted on a standard cane field tractor. This permits the owner of the machine to use the tractor for other work after the cane cutting season. The only adjustment made in the tractor when the harvester is used, is to change the place of one gear in the differential of the tractor. This permits the tractor to travel backward with normal forward speeds.

Arms extending from the front of the harvester are equipped with finger chains to bring the cane stalks to the topping device in an upright position. The topping device consists of two overlapping hard surfaced discs, which are driven by a hydraulic motor. The driver of the machine regulates the height of the topping device.

Just after the tops are cut off, the stalks are cut at the ground by a solid, circular disc cutter. This bottom cutter is also tipped with a hard surfacing material. The cutting height is regulated by the helper who sits between the wheels of the tractor.

The crossing device is hinged on the right side of the machine, and may be used to place the cane across the middle immediately behind the right wheels of the machine or extended so as to put four to eight rows of cane on one heap row. A hydraulic ram controls the extension of the crossing arm and is operated by the helper.

The tractor motor powers the forward or backward movement of the machine. All other power needs are met by the auxiliary motor which extends from the rear of the machine. This harvester will cut about an acre of cane per hour.

Burning and Piling

As the cane harvesters do not strip the trash and leaves from the stalks, it has become a standard practice to burn off the trash while the cane is lying in the heaprow. Early in the season when the trash is green it does not burn very well. After a freeze, it is usually possible to do a good clean job of burning in dry weather.

Most of the cane loaders in use today have no provision for piling the cane ahead of the grab. This job is performed with a mule rake as shown in Photo No. 62. A few motor propelled machines have been constructed to pile cane in the heaprow after it has been burned. These are still in the experimental stage.

Harvester-Loaders

During the past few years a number of machines have been constructed to cut, clean and load the cane directly into wagons. The Thornton Model SPDL (Photo No. 63) was demonstrated late in the 1948 season. Three sets of whipper drums clean the trash from the stalks as they are conveyed through the machine. As the machine moves forward the stalks are topped, cut and cleaned as they pass through. The cleaned stalks are then deposited in a hinged basket at the rear of the machine. A grab travelling along an inclined rail, conveys the cane from the basket to the wagon which moves along the row next to the harvesting machine.

The latest Thomson "Hurry-Cane" Harvester (Photo No. 64) is a four wheeled machine which is hinged in the center. Rubber fingers on disc rotors and chains detrash the stalks after they have been topped and cut. A series of sticker chains at different elevations, to permit the rubber fingers to clean the entire stalk, convey the stalks through the machine and up the inclined elevating device at the rear to a gathering basket. The cane is then dropped into the cane wagon which runs under the basket.

The use of these or similar machines to harvest a large percentage of the cane that is milled in Louisiana will no doubt depend upon whether the increased mill efficiency from grinding clean cane can overcome the increased cost of harvesting in the cane fields.

Photographs→

No. 57—Cane Knives.

No. 58—Munson-Thomson 2-row Windrower-Harvester.

No. 59—Thomson "Hurry-Cane" Harvester.

No. 60—Thornton Harvester.

No. 61—"Hurry-Cane" Harvester cutting cane.

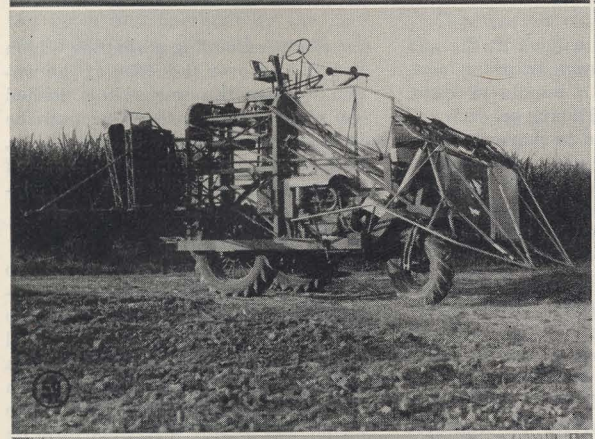
No. 62—Piling Cane in Heaprow.

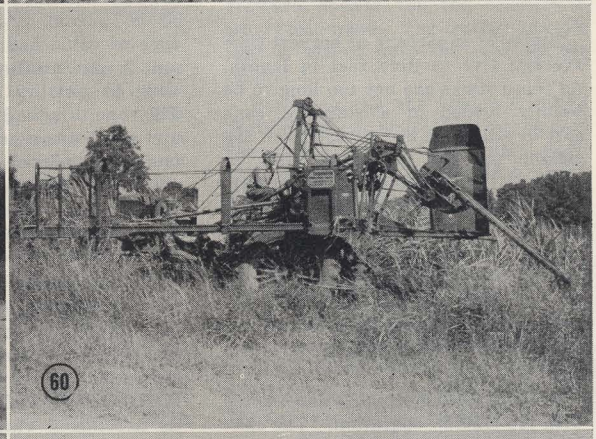
No. 63—Thornton Model SPDL.

No. 64—Latest Model "Hurry-Cane" Harvester.


57

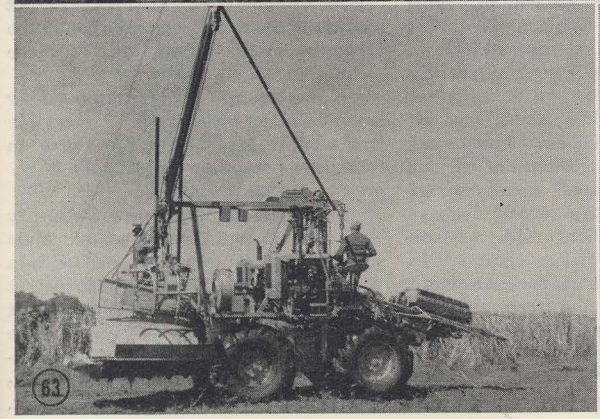

58


59


60


61


62


63


64

Chapter 11

LOADING CANE

Stalks of sugarcane at harvest time average five to nine feet in length. As these stalks are not too long to be readily loaded in a standard cane cart or wagon it has always been the custom to send the entire stalk to the mill. On occasion a particularly fertile field will produce stalks twelve to fourteen feet long. These fields are usually cut by hand and stalks longer than nine feet are cut in half so that they will not interfere with the loader or wagons used to haul the cane from the field as they lay across the heap row.

General field mechanization started with the loading operation. The cane loader was not developed to replace hand labor. It was developed because too few laborers of those able to perform the loading operation, were willing to do the hard labor the job demanded. On a few small farms where hand loading is still practiced, a low bed wagon is used and portable steps are hooked on each side of the wagon, to permit the men loading to mount the steps to build the load higher on the wagon.

Slings and Trip Bars

Many years ago the sugar mills were small and the cane which they ground came from the fields immediately surrounding the mill. Dump carts were used to haul the cane from the fields to the factory. The stalks were hand corded in the carts in the fields; when the carts reached the factory the load was dumped near the short carrier to the mill; then the stalks were again picked up and fed into the carrier by hand. It was not necessary to make provision for emptying the entire load from the field cart into some other vehicle for transportation to the mill. A small amount of cane was carried to the mill by barges. These were loaded and unloaded by hand.

In the early stages of mechanical loading development, the hoisting rope or cable had a hook at the end and it was necessary to use a rope sling to pick up a bundle of cane. The rope sling had a ring on each end and a rod was used to shove the sling under the pile of cane. Iron grabs were next designed to be used on the hoisting cable of the loaders and the rope slings for the piles of cane in the fields were no longer used.

The capacities of the sugar mills were being increased so it was necessary to transport cane for greater distances. Narrow gauge railroads began to appear in the cane fields and together with the barges acted as secondary carriers to transport the cane. Larger heavier rope slings were used in the field carts to lift the entire load of cane from the cart into the six ton narrow gauge cars. The cane was dropped loose into the railroad cars. It was not necessary to make provision to lift the entire load from the cars as they were equipped with full side doors hinged at the bottom and large steam rakes pulled the cane into the carrier when the doors were opened.

Where barges were used to transport the cane to the mills it became the custom to deposit the load with the sling on the barge so that the entire bundle could be lifted when it arrived at the mill. A pair of chains each having a sliding tripping block replaced the original rope slings and this chain sling is being used at the present time.

To facilitate dumping a load of cane into a railroad car or on to the stack at the mill, trip bars of various sorts were developed. One type of bar which had fairly general use was about four feet long with a chain fastened to each end at right angles to the bar. These chains each had a takeup block at the free end. A second set of chains were fastened to the trigger catches on each end of the bar. The bar was placed lengthwise in the bottom of the wagon, with the chains extending across the wagon bed and up over the sides of the wagon. After the wagon was loaded the chains were fastened around the cane by means of the takeup blocks. A lever placed at one end operated the triggers and permitted the tripping of the entire load in mid air.

Early Loaders

Gasoline engines light enough to be readily portable were not available to the designers of the first cane loaders. Mule power was used to pull the loader through the field and a mule was used to hoist the cane from the ground up to the wagon. The loader was usually a flat platform on three wheels. The front wheel and one of the rear wheels traveled in the middle containing tops and cane leaves to the left of the cane heap-row. The other wheel ran in the middle in which the heap row had been. A stub mast or "A" frame supported the swinging boom. A single hoisting cable was used as the grab was designed with a locking trigger that could be released when the grab load was in position over the wagon. Three men and one boy were used to operate the loader; one man on the ground to set the grab over the pile of cane; one to operate the brake and swing the boom; one to set the grab load of cane over the proper spot of the wagon and trip the trigger; the boy to ride the mule used to hoist the cane.

These early loaders were slow compared with the speed of operation of modern loaders but they were an improvement over hand loading.

Gasoline Loaders

The turn of the present century saw the change from hand and mule loading of cane to loading with a gasoline engine. Small, light in weight and dependable gasoline engines that could readily be used on a cane loader became available. Two loaders were developed and used extensively throughout the cane district.

The Castagnos loader was developed in the eastern part of the cane area near Donaldsonville. In principle the machine was the same as the mule loaders described above with a patented grab. The hoisting cable was fastened to a monkey which traveled along four central rods. The monkey had a trigger controlled hook at the lower end, which engaged the bar from which the grab prongs were suspended. When this hook was engaged the pull of the hoisting cable closed the grab on the pile of cane. When the trigger was tripped, either by the man on the cane cart or by means of a rope also suspended from the boom and operated by the man on the platform, the grab opened and dropped the cane.

The Howard cane loader was developed in the western part of the cane area, in St. Mary Parish. The original machine was designed to pick up the cane from two middles at one time. Pulled by four mules, it had an outrigger on either side supporting a mast by which the movable boom was raised and lowered. The boom had a fork device at the end that was pushed along the heap row until the fork was full of cane. Then an upper fork was snapped into place to cover the cane on the lower fork. As the boom raised the cane by means of a mule traveling back from the machine in the middle from which the cane had been lifted, the fork swung down on a swivel joint ready to be released when the boom had been lifted high enough to be swung over the wagon. The jaws holding the cane were tripped from the wagon. The movable boom was soon replaced by a double line grab, and only one row of cane was picked up instead of two.

The outrigger boom on the Howard loader rolled in the middle on which the heap row was piled. This permitted the machine itself to run in middles which had some cane tops and trash in them, which was quite an advantage when the fields were muddy. The grab was operated by two cables. The hoisting cable was attached to the top cross bar of the grab and the tripping cable was fastened to the lowest crossbar, just above the pile of cane. The sheve block at the bottom of the outrigger mast was constructed with a drum attached to it. The tripping cable was fastened to the drum and wound up the slack in the tripping cable as the hoisting cable passed over the sheve. To trip the grab, the operator applied the brake fastened to the tripping cable drum and released the hoisting cable, through a hand clutch on the machine. The outrigger boom was so adjusted that the loaded grab would swing over the wagon as it was hoisted up. The grab was returned to the heap row by means of a rope fastened to the front end of the grab, and manipulated by the front grab man.

Both machines required a crew of six to ten men to operate at capacity and clean up the scrap cane as the machine moved along the heaprow. They were used for a period of about forty years before giving way to the loaders that are used at the present time.

P & H DCL

Shortage of labor during World War II gave impetus to the development of machines for loading cane which would use a minimum of laborers for the loading operation. The original one man loader was the Barras loader, the principles of which are incorporated in the P. & H DCL. It is not necessary to pile the cane in the heap row for this machine, as a chute equipped with extending piling prongs is located just ahead of the left front wheel. As the machine moves forward the cane is piled ahead of the chute. The rear prongs of the grab fit down into the chute and when sufficient cane has been piled up, the grab is ready to close on its load. One internal combustion engine provides all of the power necessary for the operation of the machine. The boom is power controlled. Guide rods attached to the grab maintain the grab in a vertical position under the boom, guide the grab to its position over the chute and hold the loaded grab in the proper place over the wagon.

Two cables control the operation of the grab. The mechanism is so designed that the operation of the grab is under the complete control of the operator at all times. The entire load may be lowered into the wagon before opening the grab, and the grab may be raised or lowered in an open or closed position.

This machine is designed especially for the cane fields of Louisiana. A leveling device, actuated by a hydraulic cylinder, levels the machine on uneven ground. When rows of more or less than 72 inches in width are encountered, the leveling mechanism may be used to tilt the machine either to the right or left, so that the grab load of cane may be readily placed in its proper position on the wagon. It is used during the harvest season for loading cane and at other times may readily be converted for ditching operations, or for other dragline work.

Modern Castagnos Loader

The complete loader mechanism is built on a platform that may be mounted on wheels to be drawn by mules or oxen, or placed on any of the large, standard cane field tractors. When used on a tractor the power for operation is taken from the tractor engine. For other uses a small gasoline motor furnishes the power for operation.

For tractor mounting the only change made in the tractor itself is to move the ring gear from one side to the other. This gives the tractor with loader attachment the normal forward speeds for the tractor to travel backward. The tractor driver's seat is placed over the rear of the engine.

Power to run the loader is taken from the front end of the crankshaft by means of a triple "V" belt, through a clutch, to the jack shaft, which drives the reduction gear. The hydraulic pump is also driven from the jackshaft. The reduction gear drives the double drum fitted with individual clutch and brake.

Two men are needed to operate the loader, one to drive the tractor and the other, seated over the large tractor wheel, to manipulate the controls of the loader mechanism. Two cables are used to operate the grab, one to lift, and the other to control the opening and closing of the grab. This permits the grab to be opened or closed in any position. Rods attached to either side of the grab run through sleeves fastened on top of the mast. These maintain the position of the grab under the boom, as the boom is swung from cane heaprow to wagon. The swing of the boom is controlled by a hydraulic ram. The upper end of the boom may be raised or lowered to adjust the arc of the swing for cane rows of different widths. A hand winch fastened to the mast is provided for this purpose.

This machine has a drawbar attachment that is extended from the side of the tractor to permit the loader to be used as a dragline for cleaning out small field ditches. The dragline bucket is shaped to fit into a normal lateral ditch.

Thomson "Hurry-Cane" Loaders

The original one man three-wheel model "Hurry-Cane" loader is normally steered by the smaller wheel at the front of the machine. Each rear wheel is powered through an individual clutch and brake which provides positive steering in muddy fields or for turning in a short radius. The grab is hinged to the boom and

No. 65. Mule Powered Loader Which Replaced Hand Loading

No. 66. Howard Cane Loader

No. 67. P & H DCL

No. 68. Modern Castagnos Loader on Minneapolis-Moline Tractor

No. 69. Munson-Thomson One Man "Hurry-Cane" Loader

No. 70. Thomson "Hurry-Cane" Semi Hydraulic Loader

No. 71. Latest Thomson Full Hydraulic "Hurry-Cane" Loader

No. 72. Link Belt Speeder

opens automatically when it reaches the ground just back of the cane heap row. A forward movement of the machine bunches up the cane for a full grab load. The single pulling cable attached to the grab is actuated by a hydraulic ram and lifts the grab load of cane over the wagon. A bell crank attached to the boom directs the swing of the grab in an arc from the ground up and over the wagon, with no manipulation by the operator other than starting the hydraulic ram. At the end of the swing, the grab load of cane is over the cane wagon. At this point, the operator engages a hook which holds the boom. He then releases the hoisting cable, the grab swings downward from its hinged position on the boom, opens as it drops and discharges the load of cane. The hoisting cable is again engaged so that the hook on the boom can be released and the grab arcs back to the ground when the pull on the cable is relieved.

The hydraulic grab "Hurry-Cane" loader uses the same frame, stub mast and hoisting cable as on the original model. One hand lever on the left side of the steering wheel controls the opening and closing of the grab. When the grab is fully opened, it is held in that position by a rod on either side of the grab. This permits the cane in the heaprow to be bunched together as the tractor moves forward. A second hand lever on the left side of the steering wheel controls the lift and descent of the grab. The grab may be raised or lowered independently of the opening or closing of the grab itself. The third hand lever on the right side of the steering wheel controls the swing of the boom. This control is also independent of the other two mentioned. The upper end of the boom is forked so as to cradle the grab. This permits the grab to swing into place on the heaprow to pick up the grab load and then to be in a vertical position when the boom is swung up and over the wagon, ready to drop the load. Power for each of the three operations is furnished by individual hydraulic pumps.

The latest model Thomson "Hurry-Cane" loader has complete hydraulic control. It has neither stub nor boom as have other makes of loaders. The entire arm hinged on the left side of the tractor lowers to pick up the cane on the ground and raises to place it in the wagon. The grab may be held in an open position on the heap row with the rear jaws down, so that as the machine is moved forward, the cane is piled by the grab itself. Individual hydraulic rams permit fingertip control by one operator who drives tractor and loader. Power to operate the hydraulic pumps is taken from the tractor.

Link Belt Loader

The Link Belt Speeder is a cane loading attachment that can be placed on a standard cane field tractor for the harvest season. The rear prongs of the two line controlled grab reach the ground in front of the right front tractor wheel, with the front prongs remaining in the air. A bar is provided in the front of the machine so that the forward motion of the tractor causes the rear prongs of the grab to pile up a full grab of cane, and it is not necessary to pile the cane on the heaprow ahead of the loader. When the grab is full of cane the operator releases the front prongs and they close the grab.

Guide rods fastened to the grab slide through sleeves attached to the boom and direct the grab to the proper position in front of the tractor to pick up a load. These rods also serve to hold the loaded grab in its position over the wagon until the load is dumped.

Naquin Loader

The Naquin is similar in design and operation to the modern Castagnos loader. One man operates tractor and loader. It is simple in construction and low in initial cost, hence is especialy suited to the small farmer. Two cables are used to control the operation of the grab. The mast and boom are so adjusted that when the grab load of cane is hoisted, the pull of the hoisting cable automatically swings the grab over to the wagon. When the grab load has been released into the wagon the resistance of the holding cable and the weight of the empty grab bring it back to the starting point on the heaprow. Double drums with brakes operate the cables with power from the tractor engine.

Babin Loader and Ditcher

The Babin loader and ditcher is a specially constructed unit. The grab is controlled by two cables and the boom is swung by a double action hydraulic ram. The controls and operation are similar to that of other two line machines. A drawbar is extended to the side of the machine when it is used as a dragline. One man operates the machine for either loading or ditching.

Chapter 12

TRANSPORTATION

Problems associated in past years with the transportation of the cane from the field to the mills have been mentioned in previous chapters. There is little need for further elaboration, but to preserve continuity these problems are recounted here in substance preceding a discussion of modern methods of transportation.

Time has always been the crux of any system of cane transportation to the mills after the cane has been cut. In the old days no expense was spared to obtain the finest mules for hauling cane. During the time of cane harvest it was usually possible to hire up mules which had been busy at other jobs during the warm months of the year, such as road construction, logging operations, etc. Having extra mules in the lot made it possible to rest up the cane hauling mules every few days. Cane hauling with mules meant a steady, heavy pull from the field to the factory and then a full trot back to the field. Should there be any question in the mind of the reader as to the skill required on the part of the driver to turn four mules traveling at full trot with one lead line from a twenty-four foot plantation road into a twenty foot headland, he is invited to try it. First, of course, the aspirant should take four bridles into a catch lot of some sixty mules and catch up his team before harnessing and hooking the mules to the wagon, all of this before daybreak aided by the light of two or three oil lanterns.

Later on, mule hauling was supplemented by barges and narrow gauge railroads carrying the cane from the fields to the mills. These conveyances were commonly loaded during daylight hours and they were moved to the mills at night. Standard gauge railroad cars were used in some places for long hauls and this mode of transportation is still in use today. Gondola type cars are used along with old freight cars which have their roofs removed.

The rubber tire age which came to the sugar cane plantations shortly after the modern tractors were introduced is responsible for our present transportation system.

Altho the term "wagon" is customarily used, the conveyances are really carts as they have only two wheels. When speaking of this vehicle, cane people use "carts" or "wagons" interchangeably. They have of necessity a high clearance, to be able to roll over the cane rows.

The carts used to haul cane with tractors are almost universally the type shown in many of the photos. Two large rubber tired wheels are mounted on roller bearings. The solid axle directly supports the wagon bed, which is as wide as the tread of six feet will permit. Plank walkways extend from the top of the bed on each side to hold the workmen catching the grab or trying the chains when the cart is loaded, and extensions are built up on each side to hold the cane. Two carts per tractor are used under normal hauling conditions. When the fields are muddy, only one cart is used because of the heavy pull. On small farm units, where cane is still cut and loaded by hand, rubber tired automobile wheels have replaced the wooden wheels, and these wagons are drawn by mules.

When the modern cane tractors were first introduced to the cane fields they were equipped with iron wheels. These were not satisfactory for hauling cane as mud from the fields would build up on the iron wheels to such an extent as to stop the operation. When mud builds up on pneumatic tired wheels as the tractor and carts go down the cane row, it is slung off by centrifugal force as the tractor picks up speed on the headlands or roads.

A pair of cane slings is placed in the cart bed before loading the cane and the entire load of cane is lifted from the cart by means of these slings.

A Load of Cane

The transportation of sugarcane from the field to the factory centers around a bundle of cane stalks held by a pair of cane slings. If the tractor goes from the field directly to the mill, hoists propelled by steam, internal combustion engines or electric motors lift the entire load by means of the slings. The sling load of cane may either be deposited as is on the ground or on a suitable cane pile for storage pending its lift into the carrier where the slings are removed from the bundle, or the load may be deposited in a bulk storage bin to be picked up later by a large hoist grab.

A sling load of cane will weigh 1½ to 3 tons (2,000 lbs. per ton) depending on cane variety, length of stalks, manner of loading and weight of individual stalk due to seasonal influence.

Some mill hoists are now equipped to lift sling loads of cane simultaneously from both wagons behind the tractor. Usually empty sling chains are placed in the carts as the loaded slings are lifted out and the tractor is on its way to the field before the hoist has had time to deposit the cane loads.

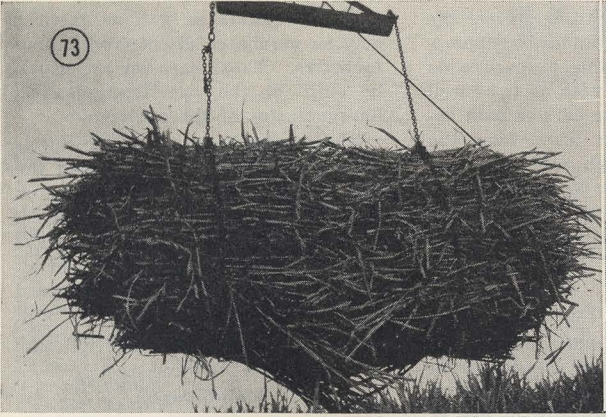
Hauling Distances

Tractor loads of cane are now hauled directly from the fields to the mills when the haul does not exceed five miles. Beyond this distance secondary carriers, usually truck transportation are used.

Very little cane is being moved at the present time by barge. Since a great deal of labor is necessary for loading, transporting and unloading barges of cane, this operation has become too expensive for general use.

The use of narrow gauge railroads for transporting cane to the mills is also on the way out. Increased costs of material and maintenance combined with increased taxes on rolling stock and equipment have dictated the abandonment of this once most useful system.

Barges and railroad cars provided storage bins which permitted a ready choice as to the order in which the



3. A Sling Load of Cane

4. Link Belt Speeder Unloading Barge of Cane

75. Fabricated Steel Derrick Loading Narrow Gauge Cars

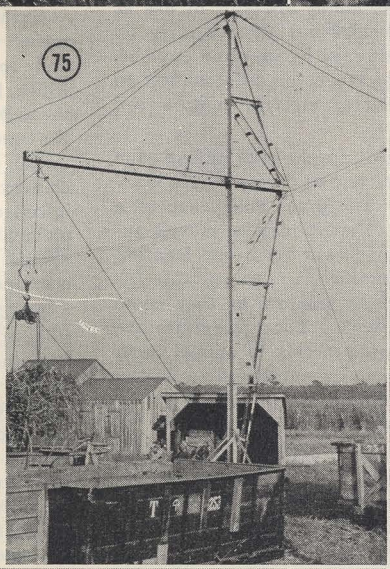
76. P & H Dragline Unloading Cane Wagon

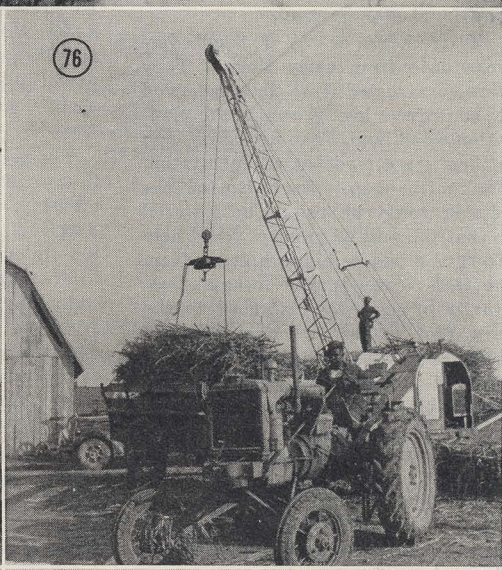
. 77. Loading Narrow Gauge Cars

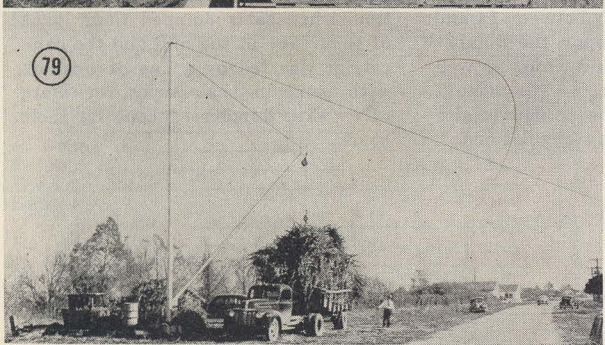
8. Wood "A Frame" Derrick Powered by Ford Model "A" Motor

. 79. Pipe Full Swing Boom Derrick gside Paved Highway. Powered by Old Truck Motor

. Sugar Mill—Unloading Cane Trucks and Tractors







cane should be ground. Cane was seldom hauled by mules for greater distances then half a mile. Because of the storage capacity of barges and railroad cars, a few mills did not go to the expense of providing suitable storage facilities for bulk cane with its attendant double handling costs, and no cane was received by carts.

Derricks and Field Hoists

The first hoist was very possibly the strong limb of a nearby tree. Trees near barns are still used when it is necessary to detach a bulky, heavy tractor attachment from the tractor in order that another piece of equipment may be used.

"Stiff Leg" or "A Frame" derricks date from early times. They were constructed from timbers hewed by hand from logs grown in the plantation wood land. The necessary iron fittings were made at the plantation blacksmith shop. Each leg of the derrick could be raised or lowered so that the pull of gravity would help direct the bundle being hoisted from the cart to the truck. A hand line, usually of rope was attached to the crow foot so that when empty, the crow foot could be pulled back over the next cart load. A bar extending across the lower triangle formed by mast and boom was used by the operator to assist the helper who pulled the rope. Present day derricks are now constructed of pipe or channel iron, but the principles of operation are the same as when they were made of wood.

The angle of effective operation for an "A Frame" derrick is approximately 260 degrees. This permits tractors to be unloaded on one side and bundles of cane to be piled on the other. Scrap cane is piled near one of the legs on a pair of slings and then loaded on a truck when the bundle is large enough.

At stations where it is necessary to furnish more space for storing cane or to permit greater flexibility of position for the carts to be unloaded, a full swing boom derrick is used. The central mast of the full swing derrick is tall enough for the boom to rotate a full 360 degrees under the guy wires which hold the mast upright.

Simple beam hoists are usually used where the cane is loaded into narrow gauge railroad cars from the field carts. The standards supporting the beam straddle a space wide enough for tractor with carts as well as the narrow gauge cars to pass between. The load is lifted from the carts, and when high enough is permitted to roll across in position over the narrow gauge car for dropping the cane out of the slings. This operation is much faster than using a derrick.

Hoisting Power

For many years mule power was used to hoist the cane bundles from the carts to secondary conveyances. At present mules are still in use at a few derricks but the majority by far are powered by gasoline engines, usually old trucks or automobiles. In a few places, electric motors are used.

The use of draglines to unload cane in the field and at the factories is increasing. The great advantage of a dragline is that it may be moved under its own power from one location to another which is more suitable for unloading the tractors as they come from the fields. These draglines are not purchased merely to unload cane, they are usually purchased to do the heavy ditching during the time of land preparation and cultivation.

Cane derricks are invariably placed close to paved or hard surfaced, all weather roads. This provides solid footing for the truck trailers which transport the cane to the mill.

Truck Trailers

Modern truck trailers provide a far more flexible and less expensive means of secondary transportation of cane to the mills than any that has been used to date. Some trucks are usually owned by the plantation on which the cane is grown but many are hired to haul the cane from the field derricks to the mill.

The trailers are built as wide as highway regulations will permit and long enough so that four bundles of cane will fit in the bed. Eight to ten bundles of cane are usually hauled at one time. The net weight of a trailer load of cane will vary between 14 and 26 tons depending upon the number of wheels on truck and trailer as well as the size of the tires. The amount of cane that may be hauled is also governed by highway regulations.

Truck trailers as well as derricks may be purchased direct from manufacturers. These however are usually built to the specifications and idiosyncrasies of the owners.

There are many derricks as well as draglines at the mills to unload the cane which arrives via the tractors direct from the field or by truck trailers. It is not an uncommon sight however to find loaded vehicles of all descriptions gathered at the mill yard in the morning soon after the mill starts since they arrive faster than they can be unloaded.

Maintenance

Nothing has been mentioned in this series concerning the maintenance and repair of the many machines which have become a familiar sight throughout the cane growing area. No comparison has been made of the initial costs of the complicated machinery of the tractor era with the initial costs of the machines and implements used when mules alone furnished the motive power. Modern machinery is expensive.

Another important factor to consider is that skilled men are presently necessary to perform the repairs and to do the conditioning for proper operation. There was a time when the blacksmith and the carpenter performed all of the skilled work necessary to build the machines and to keep them in proper running order. Today these men have been replaced by mechanics, welders and grease monkeys who only maintain and service the machines.

The men who drive the tractors and the men who manipulate the controls of the various machines must also be skillful. It should not be assumed, however, that the men who operate and maintain the machines in use today are more capable or more skilled than were those who worked with mulse.

* * * * *

And so we reach the end of A Story of Sugarcane Machinery. The Louisiana Sugar Industry has come a long way in mechanization from the time when carts dumped their loads of sugarcane at the mill and the cane carrier was fed by a line of workers with cane in their arms, or more often with bundles of cane on their heads.

INDEX

	Page
Ammonia	
anhydrous	27
aqueous	27
Bayous	
primary	3
secondary	3
Bridges	4, 31
Bulldozer	14
Burner	
cane trash	40
ditch banks	34
Canals	4, 5
Carts	7, 8, 46
Clearing land	14
Corn	7, 16
cultivation	17
fertilization	17
hybrid	17
preparation	16
Covering	
seed cane	20
planted cane	21
Cowpeas	15, 16
planting rate	17
Cultivation cane	30-33
cane, contrast	24, 25, 33
dirting cane	30
early	30
modern	31
principles	30
Cultivators	
Butterfly	10
disc	9
double choppers	10, 16, 31
flame	13
Magnolias	9, 10, 31
Mallon rotary	9
Moline	9, 10
mule	9
2 row	31
3 row	33
Cut crowning	14
Cutting	
seed cane	20
mill cane	38-41
Derricks	48
Ditch	
bank plow	34
cleaner	4
cross	4, 5
hand cut	4
laterals	4, 5
size	4, 5
Dragline	
buckets	4
ditching	4
hoisting	48
Drainage	4
canals and ditches	4
drain cleaner	34
gravity	4
pumping plant	4
quarter drains	6, 9
Dusting	
cane borers	36
machines	13
Experiment station	26
Feed, mules	16
Fertilizer	26-29
distributors	9, 27
early used	26
forms	26
modern	27
rate	29
time to	29
Frost	6
Grades	14
Harrows	
double disc	10, 16, 31
drag	8, 9
Mallon rotary	9
rotary	9
rotary pick	9
side	9
spring tooth	9

	Page
Harvesters	
development	39
early	39
Hurry-Cane	39
modern	39
Thornton	40
& Loaders	40
Harvesting	
cane knives	38
cutting	38-41
piling cane	38
loading	42-45
transportation	46-48
windrowing	38
Hauling	
cane	7-46
distances	46
Headland	4, 5
crossings	31
Hoes	
Dixie	37
hand	8
Hebert	24
Longman	24
Mallon	9
rotary	36
Hoisting power	48
Hoists	48
Implements	
introduction	7-10
maintenance	48
Irrigation	4
Knives, cane	38
Land	
cane growing	3-6
contour	4
elevation	5
layout	4
occupancy	3
trading	3
Legumes	
summer	16
winter	21
Loaders	
Babin	45
Castagnos	43
Howard	43
Hurry-Cane	43
Link Belt	45
Naquin	45
P & H DCL	43
Thomson	43
Loading	42-45
early	42
gasoline	42
load of cane	46
seed cane	20
slings	42
Magnolias	9, 10, 31
Maintenance	48
Mules	11
implements	9
Offbarring	24
Organic matter	15, 21
Overflow, river	3
Piling cane	40
Planting	
corn	16
corn with sugarcane	7
cowpeas	16
soybeans	16
soybean planter	17
sugarcane	7, 18-21
Plows	
cane, single row	12, 16
ditch bank	34
double mouldboard	9
four mule	9, 11
gang	11, 14
left hand	9
Parsons Whirlwind	15
root	14
sulky	11
turn	7, 9

INDEX (Continued)

Page

Preparation 14-17
- fallow plowing 15
- land for corn and legumes 16
- land for sugarcane 7, 20

Quarter drains 6, 9, 34
Rainbow plows 31
Rubber
- cart tires 46
- tractor tires 13, 46

Seed
- corn 17
- cowpeas 6, 15
- soybeans 17
- sugarcane 7, 18-26

Shavers 13
- disc blade 9
- modern 22
  - Castagnos 24
  - Thomson 24
- when to use 22, 24

Skilled labor 48
Slings & tripbars 42
Soil
- air space 4
- formation 3
- moisture 4
- particle deposition 3
- particle size 3
- slope 3

Soybeans 16
- cultivation 17
- planting date 18
- planting depth 17
- planting rate 17

Sprayers 4, 36
Stubble diggers 24, 36
Sugarcane
- carts 7
- Fall Plant 18
- Fields 4, 5

Page

- hauling 7, 8, 46
- knives 38
- requirements 6
- rows 4, 5, 6, 7, 10
- seed hook 10
- Spring Plant 20
- Summer Plant 18
- Varieties 7

Tile 4
Tires 13, 46
- spade grip 13

Tools
- hand 7, 8

Tractors 11, 13
- all purpose 13
- crawler 12
- early 11, 12
- modern 13
- Moline Universal 12
- requirements 13

Transportation 46-48
- barges 42, 46
- carts 7, 8, 46
- narrow gauge cars 42, 46
- standard gauge cars 42, 46
- truck trailer 48

Trash
- burning 22

Tripbar 42
Wagons 8, 46
- Water lilies 4
- boat 4
- control 4

Weeds 15
- spray program 36

Windrowing 38
Wood
- bridges 4, 31
- implements 7, 8