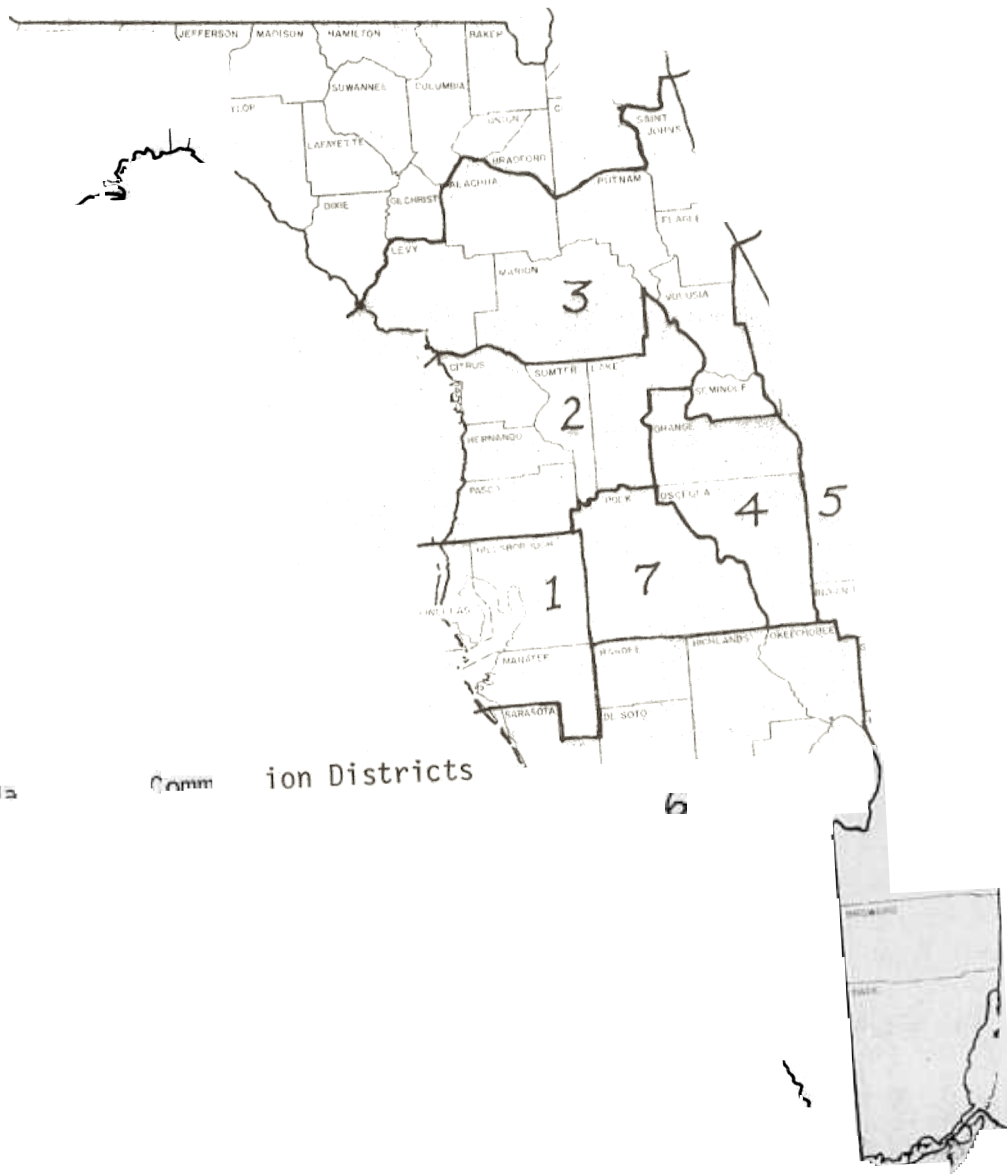


Citrus Maturity and Packinghouse ProceduresLegal Factors (cont.)

- (ii) Recoverable oil (bromide-bromate titration):
Pipette 25 ml juice into 500 ml distillation flask, add 25 ml isopropanol and beads or boiling stones; distil into a 150 ml beaker until solvent ceases to reflux; add 10 ml dilute HCl (1 conc HCl to 2H₂O by volume) and 1 drop 0.1% methyl orange indicator, titrate with 0.0247 N bromide-bromate reagent to clear endpoint; titrate 3 separate mixtures of 25 ml isopropanol plus 10 ml dilute HCl plus indicator without refilling the burette, divide total ml titrated by 3 to obtain average blank; $(\text{ml titrated} - \text{ml average blank}) \times 0.004 = \% \text{ recoverable oil by volume}$. Grade A must have 0.010 to 0.035% and Grade B not more than 0.040%.

Flavor: Very good (like fresh orange juice) is scored from 3 to 40, Grade A; good (no abnormal or off flavors of any kind), from 3 to 35, Grade B. Anything less is Substandard. A score sheet is shown in Table 38.

(d) Total score: There are 40 points for color, 20 for defects and 40 for flavor possible; thus a juice sample must obtain a score of 90% or above in all 3 categories to be rated as Grade A and 80 to 90% for Grade B. All tests particularly those for color and flavor must be run on carefully prepared samples. (It should be noted that a can of a lot of FCOJ labeled Grade A when tested may have very poor flavor when prepared in the consumer's home as a result of mishandling there or in the supermarket.)



Florida Commission Districts

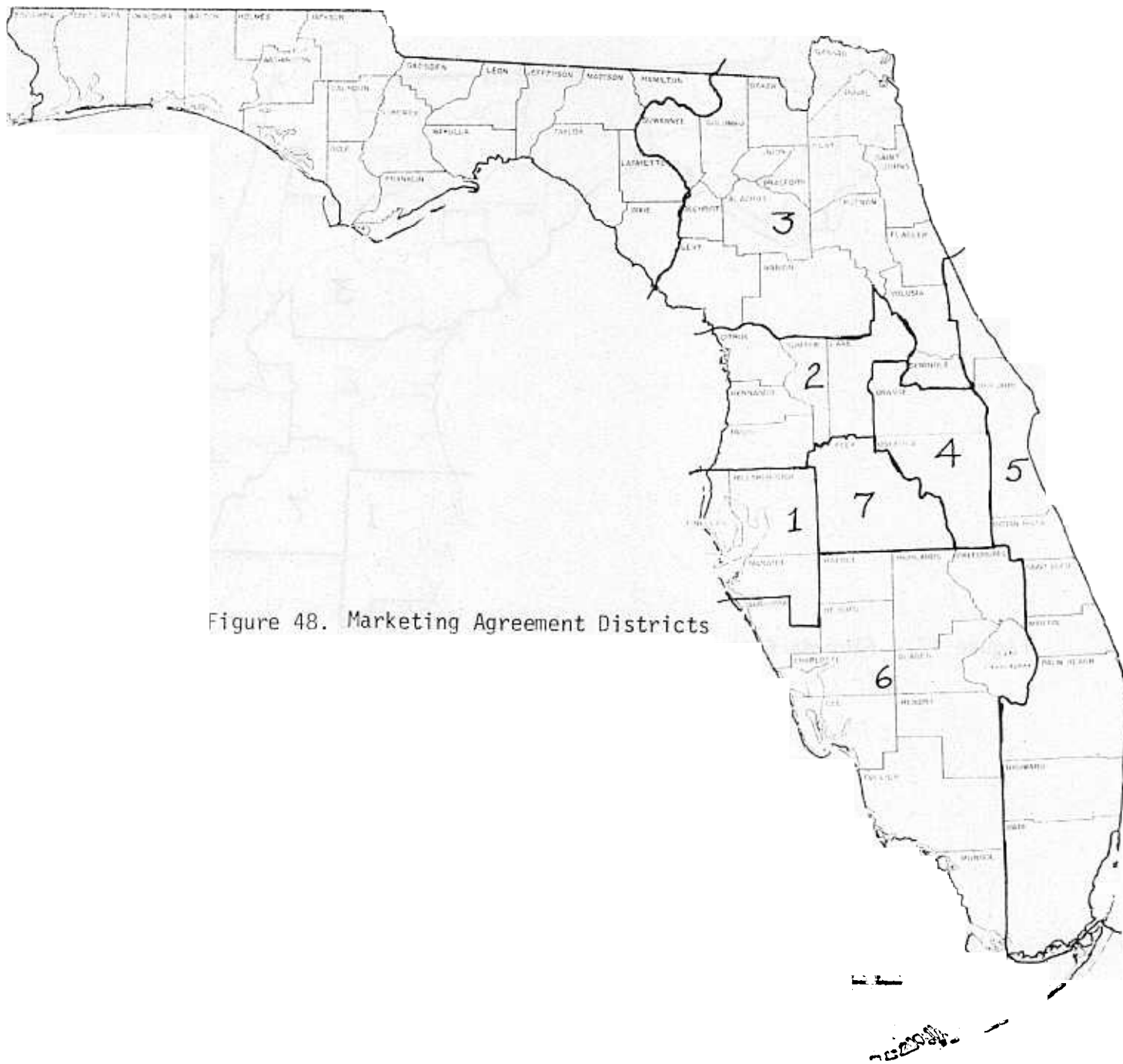


Figure 48. Marketing Agreement Districts

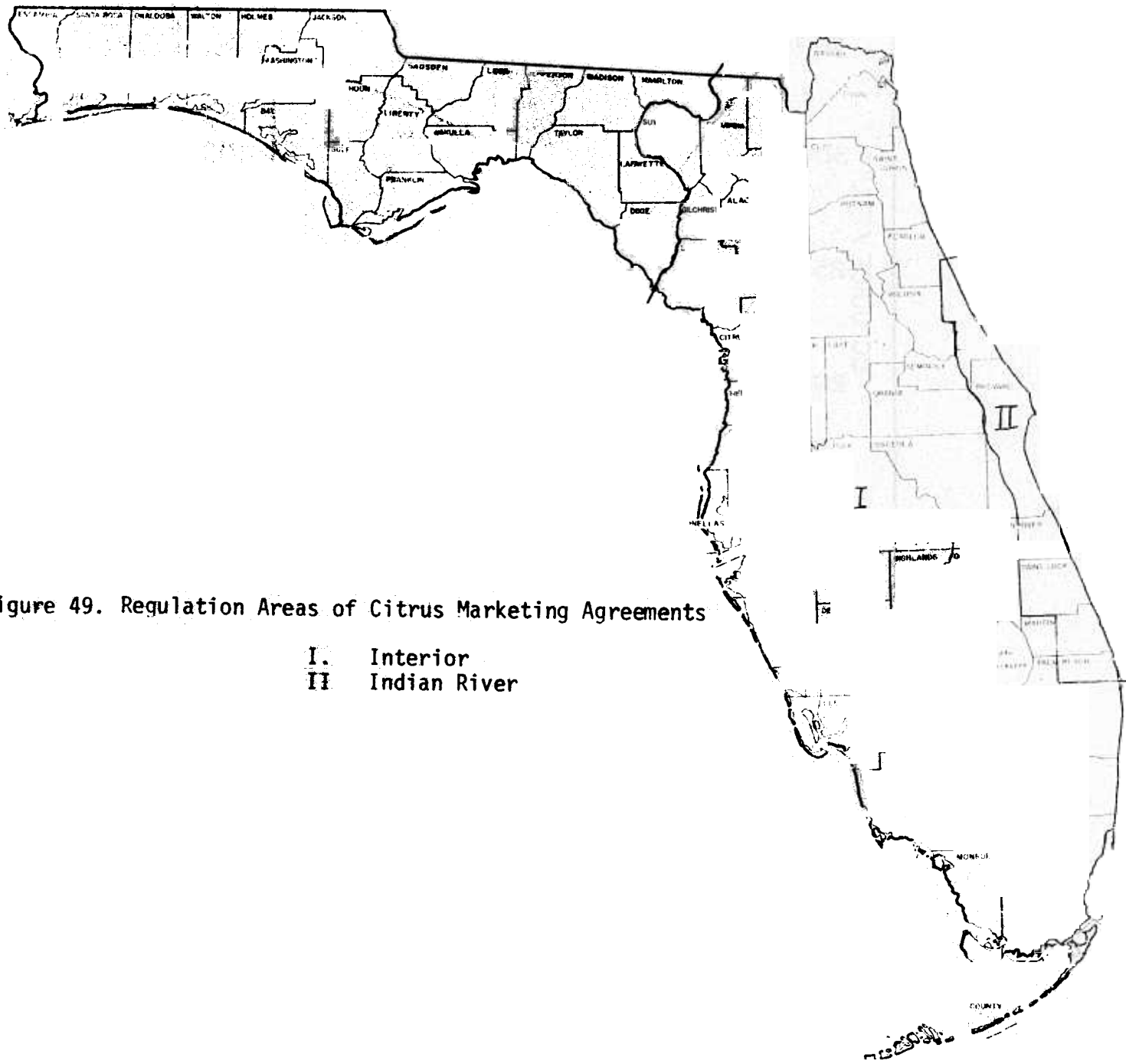


Figure 49. Regulation Areas of Citrus Marketing Agreements

- I. Interior
- II. Indian River

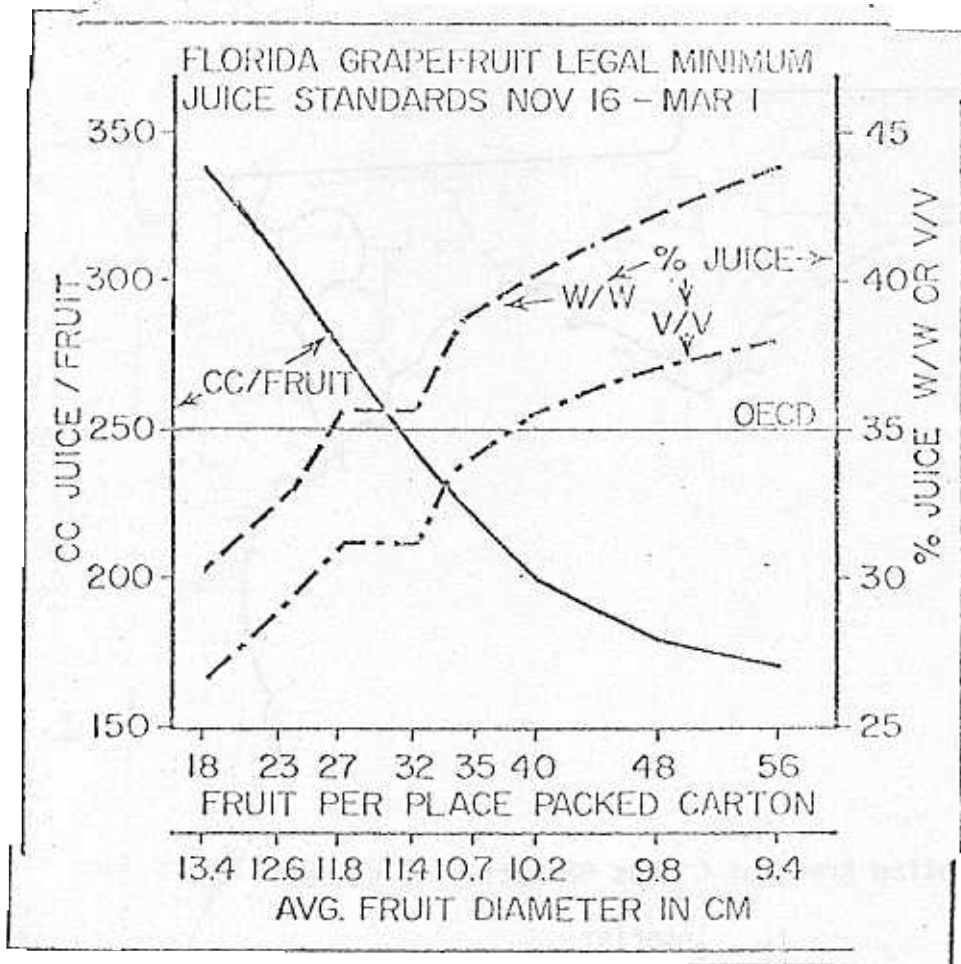


Figure 50. Florida grapefruit: Minimum juice requirement for November 16 through March 1 (6,29). The legal juice requirement, as cc per individual fruit size, is also expressed as % juice volume, both v/v and w/w. Note that the smaller sizes (common in the export trade) would greatly exceed the OECD (European) minimum (26) although the 2 largest sizes of exactly comparable maturity would be below OECD required % w/w juice content. (From Grierson and Ting, 1978.)

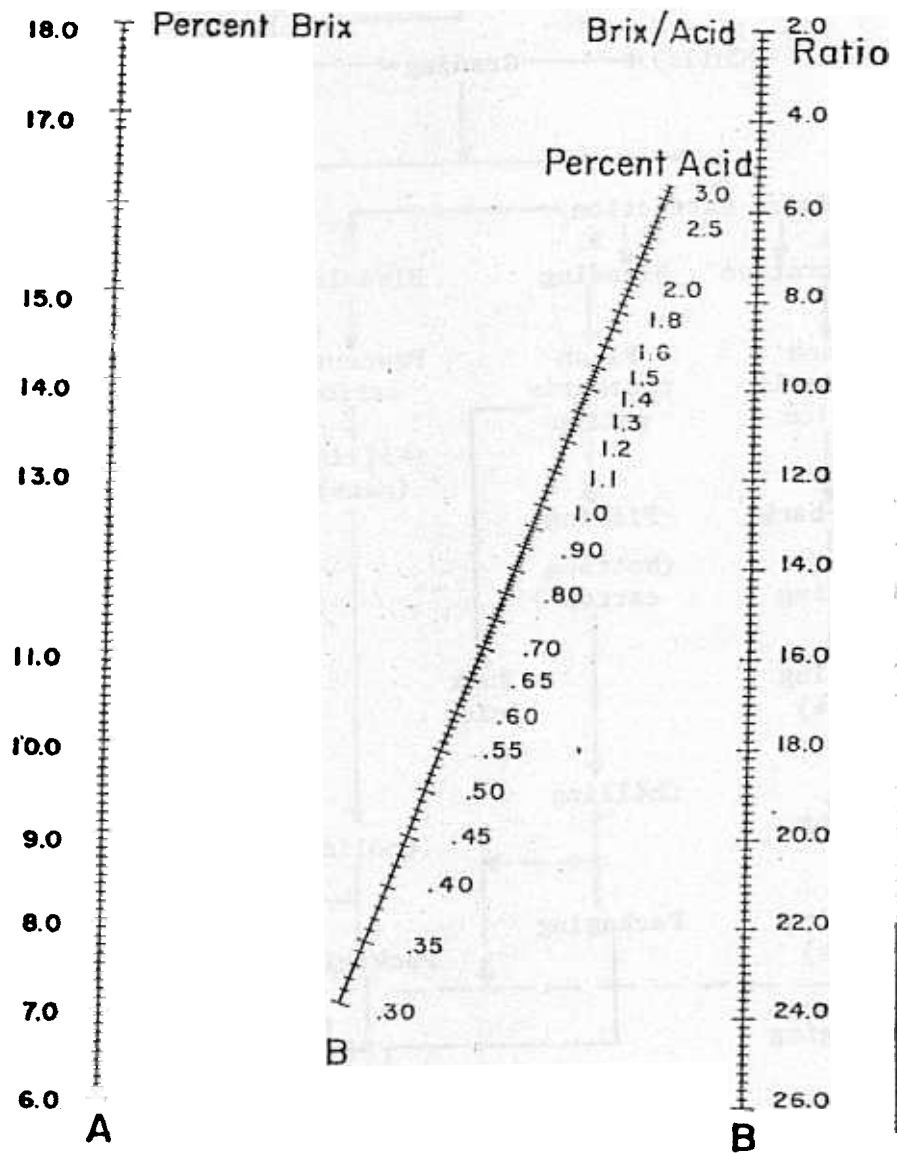


Figure 51. Nomograph for soluble solids:acid ratio (Soule Grierson and Blair, 1967).

Fruit from grove
Eliminations

Dumping

Inspection
for
quality

270

Storage
bins

(Culls)

Grading

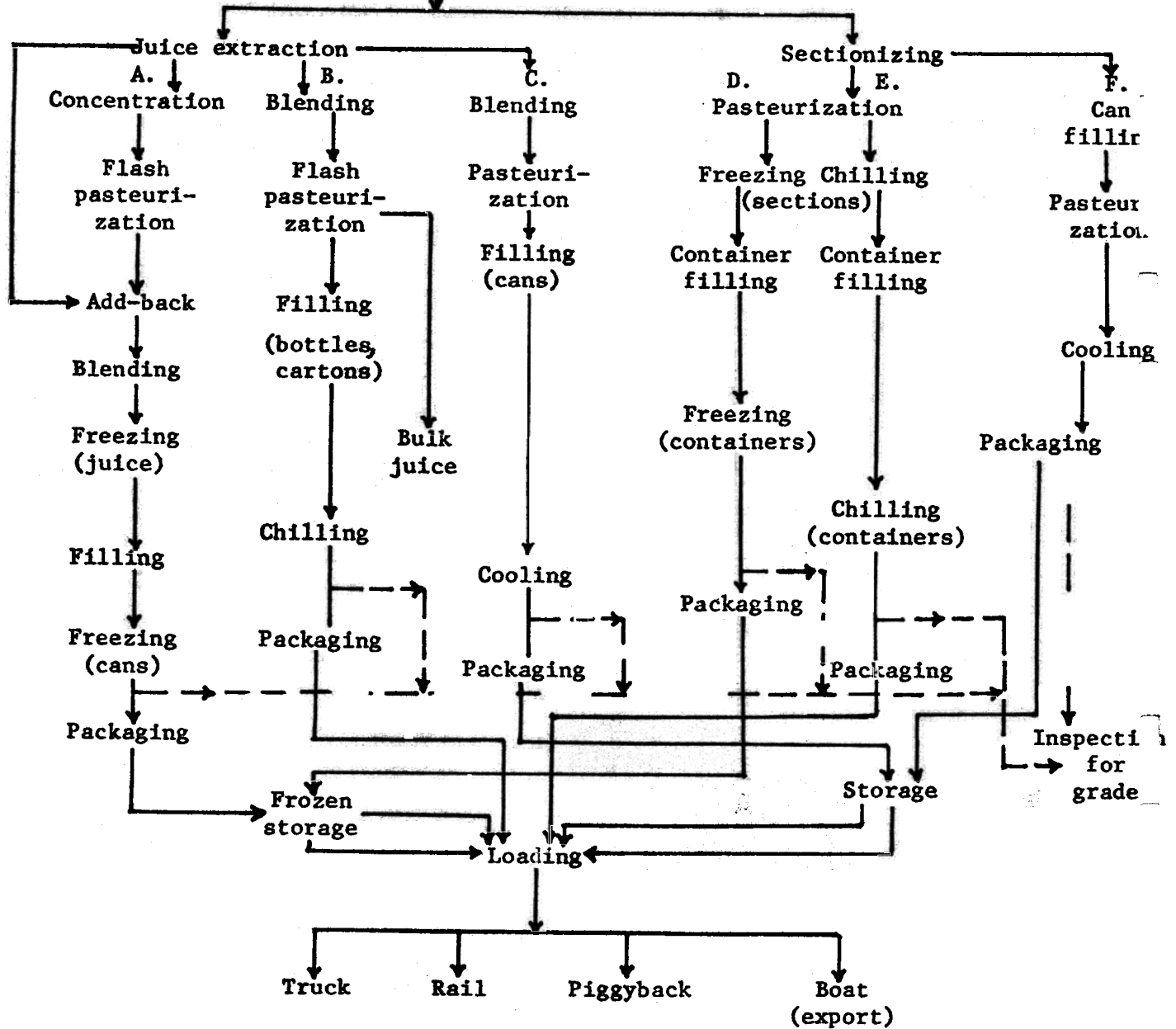


Fig. 52. Cannery flow sheet (A. Frozen concentrated juice, B. Chilled juice, C. Single-strength juice, D. Frozen sections, E. Chilled sections, F. Canned sections.)

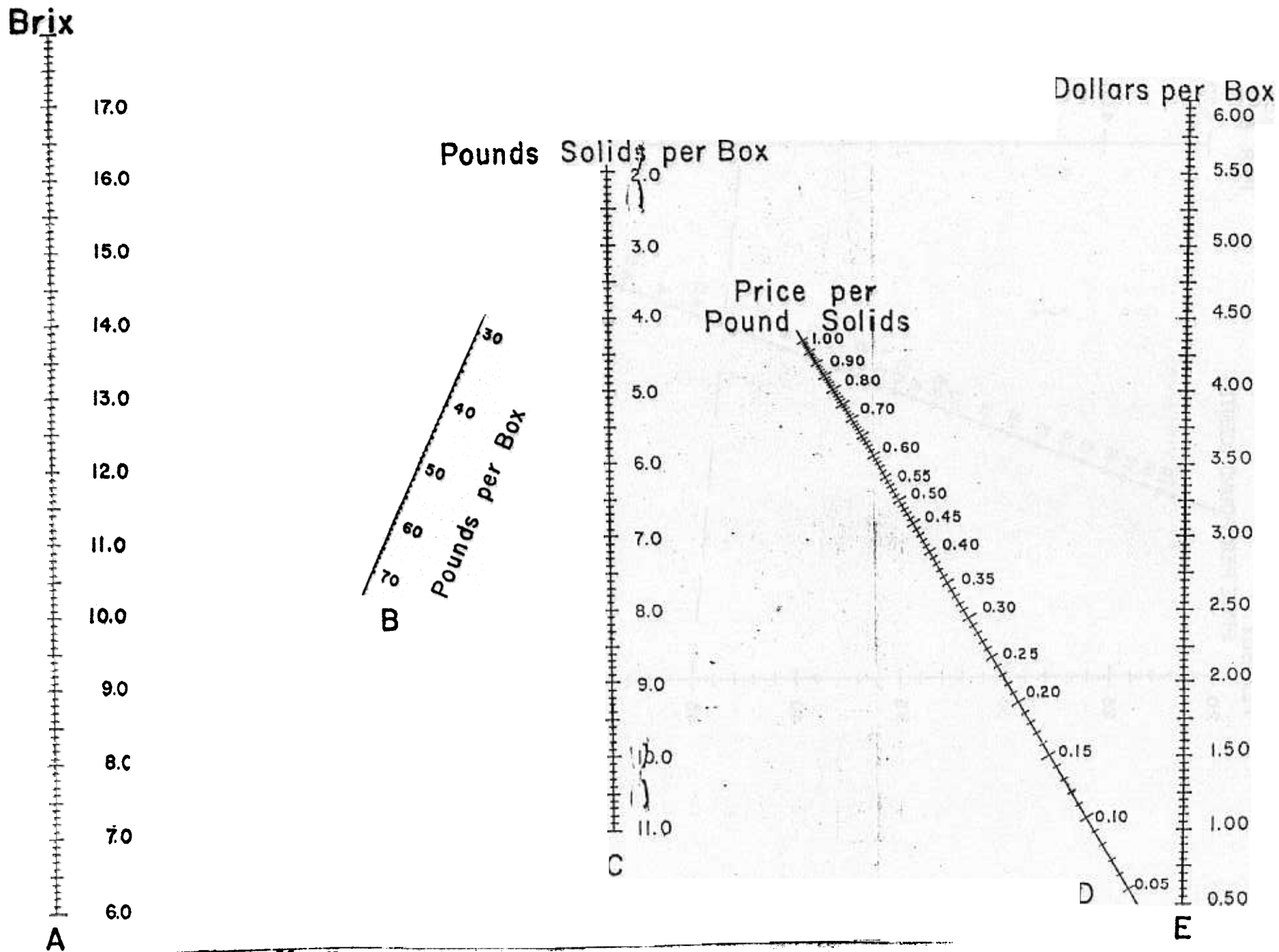


Figure 53. Nomograph for calculating pounds solids per box and price (Soule, Grierson, and Blair, 1967).

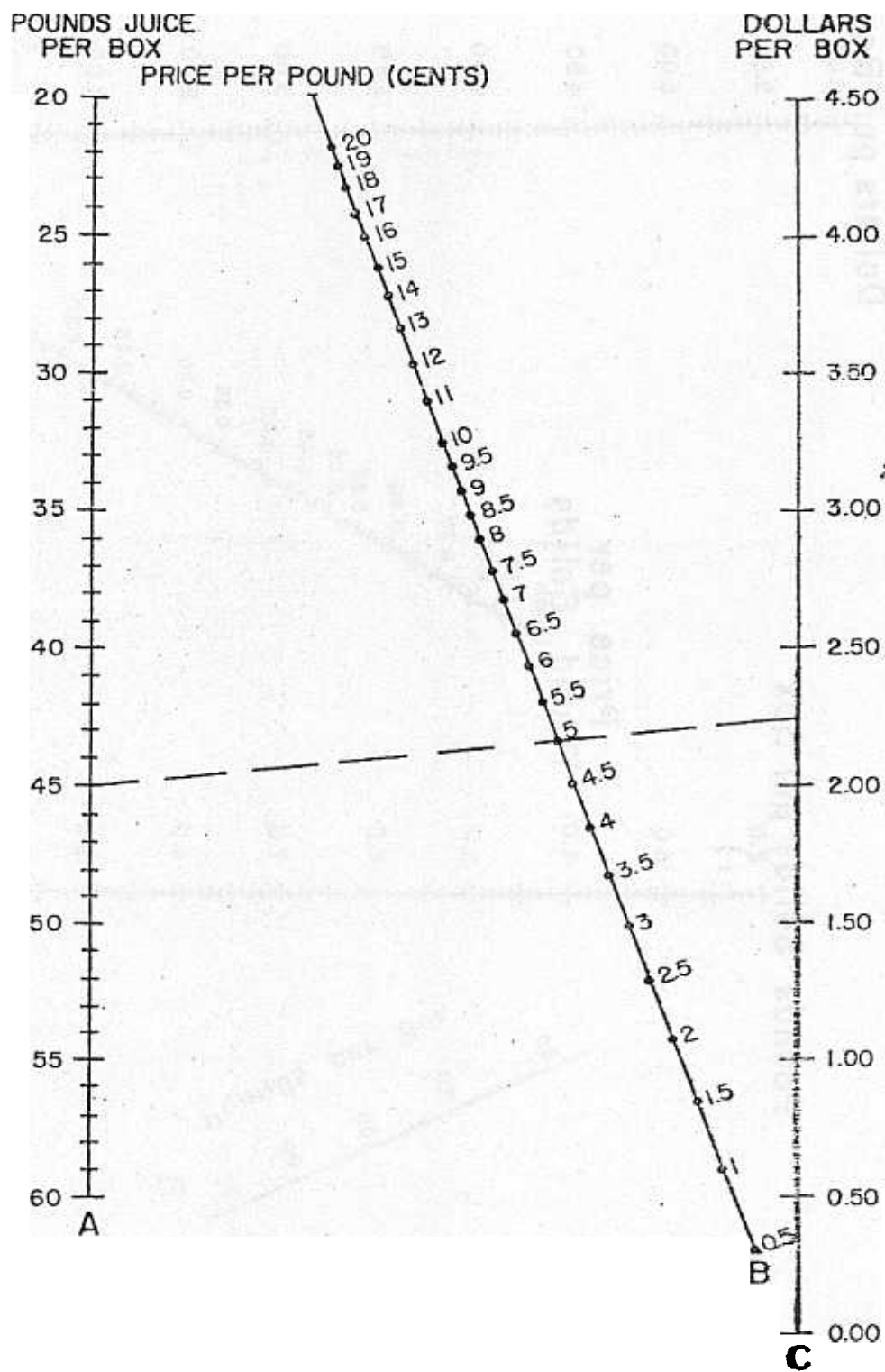


Figure 54. Nomograph for calculating price of pounds juice per box (Soule, Grierson and Blair, 1967).

Table 24. Laws, agencies and boards affecting the Florida citrus industry.

Laws, Rules and Regulations

A. State

1. Florida Citrus Laws (Chap. 601. Florida Citrus Code of 1949, as amended): Compendium of citrus laws except Indian River Citrus Area and registration of field boxes (handled by Secretary of State)--passed by Legislature, with changes made once a year.
2. Florida Department of Citrus Official Rules (Chapter 20): Spell out provisions of Chapter 601 Florida Statutes; changed frequently after public hearings.
3. Florida Food, Drug and Cosmetic Law, as Amended: State counterpart of federal act.
4. Florida environmental Protection Law: State counterpart of federal act.
5. Florida Department of Environmental Regulation Official Rules: Pollution control. (Now perhaps the biggest single factor in packinghouse operation in the near future. Every one of the 19 Indian River County packinghouses are currently under a "shut down or clean up order" as of April 1978.)
6. Business laws: Apply to all businesses, including fruit buyers, packinghouses and canneries.

B. Federal

1. U.S. Standards for Grades: Orders issued by U.S. Department of Agriculture (under authority of Agricultural Marketing Act of 1946); amended after public hearings and review; apply to fruit and processed products in interstate commerce.
2. Federal-State Marketing Agreements (established under authority of the Agricultural Marketing Agreement Act, as Amended):
 - a. Handling Oranges, Grapefruit, Tangerines and Tangelos grown in Florida: Regulates sizes, grades and containers permitted shipment and shipping holidays.
 - b. Grapefruit grown in the Indian River District in Florida: Regulates prorate shipments.
 - c. Grapefruit grown in the Interior District in Florida: Regulates prorate shipments.

Table 24. (cont.)

3. U.S. Department of Agriculture Marketing Agreement Regulations: Grower-shipper committees make recommendations for marketing policy at the beginning of a season and for changes in regulations periodically during the season.
4. Other federal laws and regulations (long list):
 - a. Food, Drug and Cosmetic Act, as Amended (postharvest handling)
 - b. Food and Drug Administration: Regulations on residues in or on fruit, misbranding, etc.
 - c. Insecticide, Fungicide and Rodenticide Act, as Amended (pre-harvest and postharvest pesticides).
 - d. Environmental Protection Act (pollution control)
 - e. Environmental Protection Agency: Regulations on pollutants of all kinds.
 - f. Occupational Safety and Hazards Act (industrial and farm safety).
 - g. Perishable Agricultural Commodities Act (dealings with buyers).
 - h. Fair Labor Standards Act (wage and hour law)
 - i. Clayton Act; Robinson-Patman Act (antitrust laws, operation of cooperatives).
 - j. Regulations of U.S. Departments of Agriculture (P.A.C.A.), F.L.S.H., Labor (OSHA), Health, Education and Welfare, etc.

ETC.

C. Foreign

Pure Food Laws of Canada, United Kingdom, West Germany, Japan, France, Italy, etc.

Agencies and Boards

A. State

1. Florida Citrus Commission: 12 men from 7 districts (7 growers, 5 handlers including 2 for fresh fruit, 3 for canneries-1 or latter from Polk County); appointed by Governor for 3-year terms
Districts are shown in Fig. 47.

Table 24. (cont.)

2. Florida Department of Citrus: Administers citrus laws and issues Official Rules.
3. Florida Department of Agriculture and Consumer Services, Division of Fruit and Vegetable Inspection: Enforces citrus laws and Florida Dept. of Citrus Official Rules, including inspection of fruit for compliance with Florida maturity and grade standards. Inspectors are also licensed by the U.S. Dept. of Agriculture to enforce U.S. standards for grades, and Marketing Agreement regulations on fresh fruit.
4. Florida Department of Environmental Regulation: Enforces Official Rules on pollution (see comment made above).

B. Federal

U.S. Department of Agriculture: Administers Marketing Agreements and regulations issued under them; federal (U.S. Dept. Agr.) inspectors enforce U.S. standards for grades of processed products.

2. Growers and Shippers Administrative Committee: Members and alternates representing growers, fresh fruit shippers and processors are elected annually from 7 districts (Fig. 48). They make recommendations, which are used as the basis for regulations issued by the U.S. Secretary of Agriculture, on changes in the current Citrus Marketing Agreement regulations after public hearings. Regulation areas of the Citrus and Grapefruit Marketing Agreements are shown in Fig. 49. (Regulation Area II is the Indian River Citrus Area as defined in the Florida Statutes of 1941.)
3. Indian River Grapefruit Committee: Six growers and 6 shippers elected annually; makes recommendations on changes in regulations covering prorate shipments of grapefruit from the Indian River district.

C. Private (long list).

1. Florida Citrus Mutual
 2. Sealdsweet (formerly Florida Citrus Exchange)
 3. Florida Citrus Packers Association
 4. Florida Gift Fruit Shippers Association
 5. Indian River Citrus League
 6. Florida Fruit and Vegetable Association
 7. Growers and Shippers League
 8. Florida Citrus Cannery Association
- ETC.

Table 25. Florida Department of Citrus Official Rules applicable to packinghouses and canneries.

Rule	Subject
<u>A. Rules of General Application</u>	
20-1	Dealers license application, bond, etc.
20-2	Identification and records on fruit
20-3	Monthly reports by citrus and fruit dealers
20-8	Payment of inspection fees
20-9	Payment of excise taxes
20-10	Issuance and use of permits
20-11	Point of inspection
20-12	Testing for freeze damage
20-13	Classification and maturity for hybrids ['Temple', 'Murcott' tangelos, etc.]
<u>B. Rules Applying to Fresh Fruit</u>	
20-30	Registration of packinghouses
20-31	Coloring room practices [Degreening rooms]
20-32	Artificial coloring of fresh fruit [Color add]
20-33	Fungicide treatment
20-34	Fresh fruit maturity
20-35	Grade and quality standards--fresh fruit
20-36	Tree run grade
20-37	Determining grade of fresh fruit
20-38	Export tolerance for fresh fruit
20-39	Containers, packs, stamping, and labeling
20-40	Loading manifests
20-41	Certificate of inspection
20-42	Registration of brands for grade
20-43	Bonded shipper or bonded dealer
20-44	Roadside and gift fruit--inspection, grades and labeling
20-45	Brand advertising rebates--fresh fruit
<u>C. Rules Applying to Processed Products</u>	
20-60	Registration of processing plant
20-61	Maturity tests--processed citrus
20-62	Processing unwholesome fruit
20-63	Reporting processing yields
20-64	Grade standards--processed citrus products
20-65	Color grading--processed orange products
20-66	Labeling--processed products
20-67	Institutional packs 4 + 1 FCOJ
20-68	Brix tables for concentrated citrus juices
20-69	Processing imported fruit and products

Table 25. (cont.)

Rule	Subject
20-70	Designation of grade on container, registration of labels for grade and notice of intent to label
20-71	Manifests for processed products
20-72	Certificate of grade inspection
20-73	Processed grapefruit brand advertising rebate
<u>D. Rules Applying to General Subjects</u>	
20-90	Florida OJ for school marketing program
20-91	Special campaign orders—adoption of
20-92	"OJ" certification mark
20-93	Florida Citrus certification mark
20-94	Florida Sunshine Tree certification mark
20-95	Sunshine Tree certification mark

Table 26. Factors in maturity tests of fresh citrus (Soule, Grierson and Blair, 1967).

Fruit	Color Break	Juice Content	Brix	Acid	Brix/Acid Ratio	
					Required ¹	Minimum
Oranges ^a	Yes	Yes ^a	Yes	Yes	Yes	Yes
Grapefruit	Yes	Yes ^a	Yes ^a	No	Yes	Yes
Tangerines	Yes	No	Yes	No	Yes	Yes
'Temples' ^b	Yes	No	Yes	No	Yes	Yes
Tangelos	Yes	No	Yes	Yes	Yes	Yes
'Murcotts' ^c	No	No	No	Yes	No	Yes
Lemons ^d	No	Yes ^a	No	No	No	No
Limes ^e	No	Yes ^a	No	No	No	No

- Notes: 1. For appropriate Brix.
 2. Separate standards for natural color and color added fruit.
 3. Gallons per 1-3/5 bushel box.
 4. Cubic centimeters per fruit.
 5. Separate standards for seeded, white seedless, and pink and red seedless varieties.
 6. No specific Florida standards; California standards
 7. Volume basis.
 8. Restrictions on size of fruit.

Table 27. Factors used in maturity (quality) tests of cannery fruit (Soule, Grierson and Blair, 1967).

Fruit	Color Break	Juice Content	Brix	Acid	Brix/Acid Ratio	
					Required ¹	Minimum
Oranges [*]		No			Yes	Yes
Grapefruit [*]		No			No	Yes
Tangerines [*]		No			Yes	Yes
'Temples' [*]		No			Yes	Yes
Tangelos [*]		No			No	Yes
'Murcotts' [*]		No			Yes	Yes
Lemons		Yes ^a			No	No
Limes		Yes ^a			No	No

^{*}From August 1 through November 30, fruit must meet fresh fruit standards (Table 4).

- Notes: 1. December 1, through July 31, unless noted otherwise.
 2. Required ratio applies until January 1.
 3. No color break after November 15.
 4. Standards for oranges apply.
 5. Volume basis.

Table 28a. Florida grapefruit juice standards. (Nov. 16 to March 1^z)
expressed in metric and as % juice (From Grierson and Ting,
1978).

Size ^y	Diameter (cm)			Juice/fruit (cc)	Approx. % Juice	
	Min	Max.	Ave.		v/v ^x	w/w ^w
18	12.7	14.1	13.4	335	26.5	30.9
23	11.9	13.3	12.6	305	28.8	33.6
27	11.1	12.5	11.8	270	31.1	36.3
32	10.6	12.1	11.4	240	31.1	36.3
35	10.0	11.4	10.7	220	34.0	39.7
40	9.5	11.0	10.2	200	35.4	41.3
48	9.1	10.5	9.8	180	37.1	43.3
56	8.7	10.2	9.4	170	38.4	44.8

^zi.e., for most of the harvesting season. See also Table 2.

^yAs number of fruit per 4/5 bushel (28.2 liter) carton.

^xPresumes fruit approximately spherical.

^wPresumes specific gravity of fruit = 0.9 and of juice 1.05.

Table 28b. Florida juice requirements for grapefruit expressed as regression formulas. (From Grierson and Ting.)

Period	Formula ^z	
	x = diam. in 1/32"	x = diam. in mm.
1 - Nov. 15	$y = 3.5x - 240$	$y = 4.41x - 240$
16 - Mar. 1	$y = 3.4x - 238$	$y = 4.28x - 238$
2 - July 31	$y = 3.3x - 236$	$y = 4.16x - 236$

^zy = required juice volume in cc's. Tables or graphs of juice required for any diameter of fruit can be constructed from these formulas.

Table 29. Equipment for maturity tests of fresh fruit (Soule, Grierson and Blair, 1967).

^aExtractor--Automatic Machinery Corp. Model 2700 or equivalent.
 Hand reamer, with orange and grapefruit burrs.
 Cheese cloth, #60 or #80 mesh; collander; or strainer.
 Pans (2)--0.5 gal., metal or plastic, round
 Graduate--500cc., with smooth lip
 Graduate--500cc., with pouring lip
 Hydrometer--scaled from 5 to 15 degrees Brix in 0.1 degree divisions
 (Calibrated at 20°C)
 Thermometer--centigrade--scaled from 0 to 50 degrees in 0.1 degree divisions
 Erlenmeyer flask (2)--125 cc.
 Burette, direct reading--calibrated to read percent anhydrous citric acid,
 scaled in 0.01 percent divisions, capacity 2.85 percent
 Juicer--25 cc.
 Burette stand
 Funnel, small
 Official fruit sizer
 Medicine dropper and dropping bottle
 Maturity chart
 Juice chart for oranges
 Standard sodium hydroxide solution (0.3125N)
 Phenolphthalein indicator solution

^aRequired for packinghouses shipping over 200,000 4/5 bu. boxes

Table 30. Additional equipment for maturity tests of cannery fruit (Soule, Grierson and Blair, 1967).

A. Items furnished by processor

Mechanical sampler
 Extractor--FMC Model 091 B with automatic feed
 Scale--60 lb capacity, with 1 oz or 0.05 lb graduations

B. Items furnished by Fruit and Vegetable Inspection Division

Sample baskets, wire gauge--60 lb capacity
 Juice buckets--aluminum, with bail and pouring spout, 5 gal. capacity
 Juice aspirator flask--8 in. diameter, round bottom, long neck (2 in. diameter)
 Water aspirator or Vacuum pump--to produce 25 in. vacuum in 30 seconds
