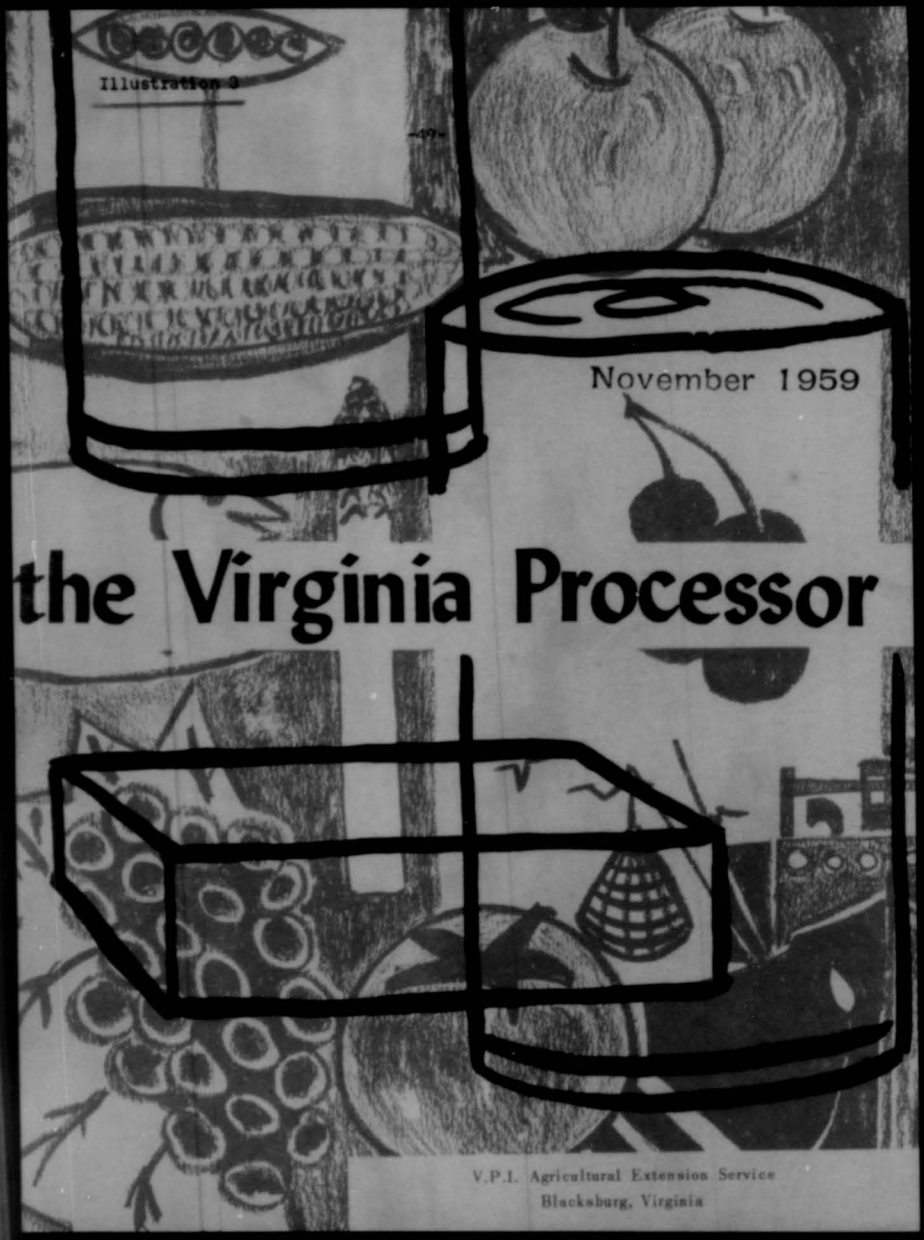
Illustration 3



November 1959

the Virginia Processor

V.P.I. Agricultural Extension Service
Blacksburg, Virginia

THE VIRGINIA PROCESSOR

prepared by the

Departments of Horticulture and Agricultural Economics
Virginia Agricultural Extension Service
Blacksburg, Virginia

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Agricultural Extension Service, V.P.I., Blacksburg, Virginia
An Educational Service of The Virginia Polytechnic Institute in cooperation with the U.S. Department of Agriculture and County Governments

CONTINUOUS GRADES FOR PROCESSING APPLES - IS THIS THE ANSWER?

Three percent, five percent, six percent, ten percent, twelve percent, twenty-five percent - these are all proposals we have heard suggested for grade limits of processing apples. Almost everyone in the industry agrees that some changes in the present grades are needed. The big question of what limits and grades to set up still has not been established by the apple industry. Some have suggested only minor alterations to the present USDA grades. Others suggest major revisions in the grades and in the system of grading.

Dr. Joe Johnson, Dr. Anthony Lopez and Mr. Charles Wood of the V.P.I. Agricultural Experiment Station have conducted extensive research on the problem of processing apple grades over the past five years. They have been attempting to develop a system of grades that will allow the processor to pay the grower a price for his fruit that will more nearly reflect the actual value to the processor. In other words, if the fruit from Grower A is worth twice as much to the processor as the fruit from Grower B, then the system of grades should be such that Grower A receives twice as much for his fruit. Under the existing USDA grades with the wide tolerances, this often is not the case. Instead, all growers tend to receive a "blend" price.

How Continuous Grades Work

What can be done to overcome the problems associated with a "blend" price? Based on their five years of research in this field, the V.P.I. researchers have made a proposal they feel will alleviate this problem. I will briefly outline the main ideas of their suggested system of continuous grades.

The research team first suggests that the fixed grades and tolerances for defect waste, such as U.S. No. 1 with 5% waste, be eliminated. In place of this, they suggest that the inspector take a sample of the load and determine the actual defect trim waste of the sample. This sample trim waste figure itself would be used in determining grade.

The second suggestion of the researchers is that the size classes as now used be eliminated. In place of size, they suggest that the count of apples in the weighed sample be used. To obtain a standard value for size, this value would be expressed in number of apples per 100 pounds.

How would the mechanics of this system be carried out? It would be necessary for the processing plant to provide a peeling and trimming unit for use in inspection. This unit would be manned by personnel hired by the Federal-State Inspection Service. The Federal-State inspector would be charged with the responsibility of supervising the operation of this unit and determining the grade.

The inspector would obtain a sample from the grower's load of fruit when it was delivered to the plant. This sample, instead of being graded by eye under present methods, would be peeled, cored and trimmed by the machinery and personnel in the Federal-State inspection line. The inspector would obtain the following information for the sample.

(1) Percent defect trim - the defect trim removed by the Federal-State workers would be weighed and expressed as a percent of the total weight.

(2) Count - the machine count would be converted to the number of apples per 100 pounds, thus measuring size accurately.

Processors would have several problems to work out before the continuous grades system could be effected. However, once the system was established, it is felt by the researchers that both the processors and growers would be far better satisfied than with the present USDA grades. An equitable system of grades would be of immeasurable value to the entire industry.

How Price is Determined

Based on a table of predetermined relationships between percent defect trim and count, and the cost of producing a case of the canned product, the price for any load of apples would be determined. Higher prices could be paid for apples of larger sizes and low percent defect trim while fruit of small size and high percent defect trim would be discounted. Under the continuous grade system, each grower could be paid directly according to the value of the fruit to the processor.

Based on the research carried out at V.P.I. a sample price scale has been calculated which gives an idea of how this system of arriving at price works. These data are based on assumed plant cost relationships and may only roughly approximate the actual relationships in a particular plant. In the example shown on the following page, a base price of $2.25 for

apples of 5 percent defect and size count of 300 (2 3/4 inches) was used. All other prices were projected from this base. The relationships between price, count and percent defect trim can most easily be seen in Figure 1. The two curves represent two sizes of fruit (300 and 400 apples per cwt.). By reading up from the percent defect trim scale and over, the price for apples of these sizes can be determined. For example, apples with a count of 300 per cwt. and 4 percent defect trim would have a value of $2.50 per cwt.

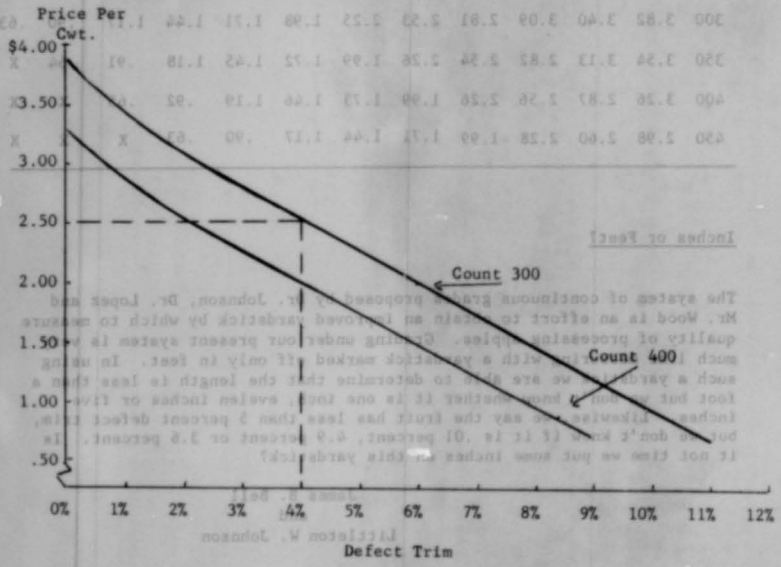

Figure 1: Value of apples to processors as determined by size (count) and percent of defect trim

Although only two curves representing count per cwt. are shown in this example, other size curves are available. In fact, it is possible through

the use of a three dimensional curve to calculate the exact price of any possible combination of size and percent defect trim.

Table 1: Value of apples to processors as determined by size and percent of defect trim

Size	Defect Trim 0%	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%
250	$4.10	$3.67	$3.36	$3.07	$2.80	$2.53	$2.26	$1.99	$1.72	$1.45	$1.18	$.91
300	3.82	3.40	3.09	2.81	2.53	2.25	1.98	1.71	1.44	1.17	.90	.63
350	3.54	3.13	2.82	2.54	2.26	1.99	1.72	1.45	1.18	.91	.64	X
400	3.26	2.87	2.56	2.26	1.99	1.73	1.46	1.19	.92	.65	X	X
450	2.98	2.60	2.28	1.99	1.71	1.44	1.17	.90	.63	X	X	X

Inches or Feet?

The system of continuous grades proposed by Dr. Johnson, Dr. Lopez and Mr. Wood is an effort to obtain an improved yardstick by which to measure quality of processing apples. Grading under our present system is very much like measuring with a yardstick marked off only in feet. In using such a yardstick we are able to determine that the length is less than a foot but we don't know whether it is one inch, evelen inches or five inches. Likewise, we say the fruit has less than 5 percent defect trim, but we don't know if it is .01 percent, 4.9 percent or 3.6 percent. Is it not time we put some inches on this yardstick?

James B. Bell
and
Littleton W. Johnson

SWEET POTATO VARIETY TRIALS

Where Variety Trials Conducted

During 1959 the Virginia Agricultural Experiment Station in cooperation with the Virginia Truck Experiment Station started sweet potato variety tests to aid growers in selecting suitable varieties. These tests, which were at the Virginia Truck Experiment Station Eastern Shore substation, are in addition to the Southern co-oparative variety trials and other sweet potato research already being conducted by the Truck Station.

Why Variety Trials

Sweet potato buyers and canners are very exacting in their requirements. Growers must produce high yields of top-quality sweet potatoes to meet these requirements and to make a fair profit. One important factor in top-quality production is the selection of the variety that meets the market demands as well as being well adapted to the area in which it is grown.

As every grower knows, sweet potato varieties do not always maintain their good qualities. We hope, by having presently popular varieties and new selections in the tests, a profitable comparison will be available to growers and processors. If, in a few years, a popular variety declines in quality, possibly we may have determined a higher quality variety to take its place. At least, that is our aim.

This new sweet potato variety trail is a test of yields, resistance to cracking and serious disease, shape, skin and flesh color, storage and processing qualities and carotene content.

Yield Data for 1959

We are now analyzing the data obtained this year and continuing our study of processing qualities. We will make the information available to all interested persons, when the work is completed.

In the meantime, growers and canners may be interested in some yield data. These data are based on U. S. standard grades so they will be understandable anywhere in the United States, although other standards, especially as they relate to size, may be more acceptable in certain areas. The figures given below are records for only one year and have little or no significance except for that year. The performance of sweet potato varieties frequently differs considerably from season to season and so it will take three or more years to obtain dependable information. When reading the figures given below, keep firmly in mind that no decision should be based on only one year's results.

The following table notes yield per acre in hundredweights of marketable roots. The first three columns are weights as graded from the total harvest. The fourth column is a record of weights of canning sweet potatoes that could have been graded from the total harvest, if U. S. 1's and U. S. 2's had not been removed.

Yield per acre in hundredweights of marketable roots

Variety	U. S. 1's or better cwt.	U. S. 2's cwt.	Canning cwt.	Total Canning cwt.
Goldrush	158	65	23	49
Allgold	124	84	21	39
Carogold	119	30	61	105
Early Port	98	59	19	38
Oklamar	91	56	19	27
Puerto Rico 109	88	54	15	29
Puerto Rico Unit 1	84	37	20	30
Nemagold	83	28	30	35
Sunnyside	56	36	23	32
Vates Golden	46	47	17	24
Jersey Orange	43	34	25	55

In addition to the varieties in the regular replicated trials that are listed on the previous page, one observational row of L3-77 was planted. Based on very limited information obtainable from only one row, L3-77 yield of U. S. 1's and 2's was about the same as Early Port and the total canning yield was similar to Nemagold.

Other Characteristics of the Varieties

There were only eight jumbos in the entire replicated field, which were not enough to warrant any conclusions.

Cracked sweet potatoes were fairly high in four varieties. Jersey Orange has the highest weight of cracked roots. Also higher than other varieties were Puerto Rico Unit 1, Vates Golden and Nemagold.

Most of the other culls resulted from small size, roughness, misshapen, veining and pox. Another cause of culls in some varieties, especially Nemagold, were sunken areas that appear to be overgrown cracks.

Average weight per marketable root varied considerably. Carogold was the lowest in weight with Jersey Orange and Sunnyside next. Nemagold was next in weight and the other varieties were higher. Of course, these weights would be different if sizes other than those of U. S. standards were used.

While no count was made, it was obvious in our production of plants for the trials that the number of sprouts was very low for Sunnyside and fairly low for Carogold.

Other characteristics of the varieties of sweet potatoes in the trials are well known to most growers, with the possible exception of Carogold. This variety produced a rather high yield of exceptionally smooth, well-shaped roots with reddish-gold skin. The main cause of culls was small size. The variety trials were harvested September 22nd. Carogold may be a little later than Puerto Rico and it is possible that at a later harvest the Carogold culls would have been reduced and the marketable yield increased. Other qualities of Carogold have not yet been evaluated.

Processing Data to Follow

Analyses of processing and other qualities of varieties in the trials have not been completed. As soon as the information is obtained, it will be made available.

These sweet potato variety trials will be continued in 1960. We will probably delete from the trials, Sunnyside, Vates Golden and Jersey Orange and add two other varieties.

F. H. Scott

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NEW DEVELOPMENTS IN PLASTIC GREENHOUSE RESEARCH

Interest in plastic greenhouses has increased considerably during the past two years. Many commercial vegetable growers have realized the value of these greenhouses and are using them in their operations to grow their own plants and/or to produce plants for sale. Some farm operators have discontinued the use of hotbeds for plant production and are now using plastic greenhouses.

Recent research at V. P. I. has been concentrated on developing a superior structure; an economical heating system, automatically controlled; an inexpensive automatic ventilation system; and the testing of new types of plastic film. The latest developments in each of these areas of research will be discussed under the headings below:

Greenhouse Structural Research

The search for a better type of structure to support the plastic film has resulted in the development of two new types of framework: (1) planted post foundation-type construction with scissors-type trussed rafters (Figure 1) and (2) masonry-block foundation type of construction (Fig. 2).

The planted post foundation house is twenty-one feet wide and has side-walls three feet high. Most commercial growers like greenhouses wider than eighteen feet. The low sidewalls reduce the air volume in the house which reduces the heating load. The scissors-type trussed rafters are easily constructed in a simple jig and can be installed at a fast clip. The 10/12 slope of these rafters allows snow to slide off. Water accumulation on any relatively flat surface of the inner lining of plastic greenhouses has been a serious problem. An inner layer of plastic film attached to the underside of the scissors framing will allow any condensed moisture to drain to the outer walls of the greenhouse.

The masonry-block foundation type of plastic greenhouse is a little more expensive than planted post foundation, but makes a more permanent structure. The masonry-block sidewalls are laid on a concrete footing and are usually no more than two feet high. This new greenhouse, built at V. P. I. last year, has interested many small growers who have seen the structure. It is build low to the ground and is easy to heat.

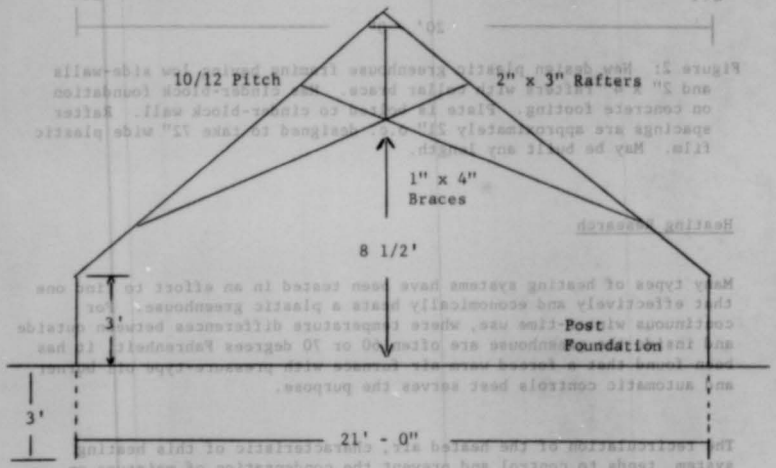

Figure 1: New design plastic greenhouse framing having low side-walls and scissors-type trussed rafters with glued and nailed joints. Has planted post (4" x 4") foundation. Rafters and framing spaces are 32" o.c. designed to take 72" wide plastic film. May be build any length in increments of 8-feet.

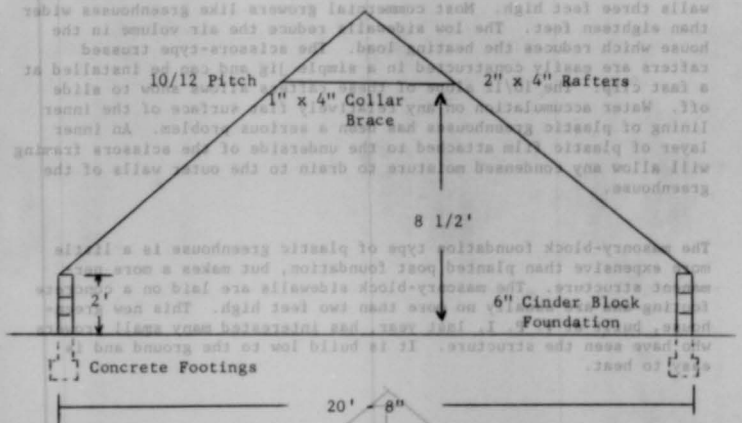

Figure 2: New design plastic greenhouse framing having low side-walls and 2" x 4" rafters with collar brace. Has cinder-block foundation on concrete footing. Plate is bolted to cinder-block wall. Rafter spacings are approximately 21" o.c. designed to take 72" wide plastic film. May be built any length.

Heating Research

Many types of heating systems have been tested in an effort to find one that effectively and economically heats a plastic greenhouse. For continuous winter-time use, where temperature differences between outside and inside the greenhouse are often 60 or 70 degrees Fahrenheit, it has been found that a forced warm-air furnace with pressure-type oil burner and automatic controls best serves the purpose.

The recirculation of the heated air, characteristic of this heating system, tends to control and prevent the condensation of moisture on the inside layer of the plastic film.

One 80 to 90 thousand B.t.u. forced warm-air furnace is sufficient for heating a plastic greenhouse approximately 20' x 40' x 4' under the above mentioned conditions. Average fuel costs are about one dollar per day for the heating season.

Where plastic greenhouses are operated only in the very early spring months for early plant production, one or more oil burning space heaters, provided they are equipped with circulating fans, have been found quite satisfactory. They are inexpensive and economical to operate.

Plastic Film Research

V. P. I. is continuing to test all new plastic covering materials as soon as they become available for experimental work. Some films have been in use for three years before disintegrating under severe weather conditions. One new film that appears promising from the standpoint of weather-ability is made from polyvinyl flouride. Some other films being tested are made from polyvinyl chloride and have weathered in good condition for two years. Therefore, it would seem that long lasting plastic films that will remain on greenhouses in good condition for three to five years will soon be commercially available.

Ventilation Research

Most individuals with greenhouses are interested in installing a low-cost automatic ventilating system. The latest trend in greenhouse ventilation agrees with research at V. P. I. in concluding that normally operated ventilator openings should be eliminated. The best solution to the problem of automatic ventilation seems to be the use of large exhaust fans, controlled by an air-switch-type thermostat plus automatically operated intakes of proper size. Large plastic greenhouses (twenty-one by eighty feet) will require two thirty-inch fans with two motorized intake louvers of comparable size. Such an automatic ventilation system has been found to be very satisfactory at V. P. I.

Additional Information

If you are interested in obtaining more information on plastic greenhouses, write the V.P.I. Ext. Service for Circular 760, PLASTIC GREENHOUSES; Agri-News Bulletin No. 6, HEATING SYSTEMS FOR PLASTIC GREENHOUSES: and Circular 764, STARTING EARLY PLANTS.

P H. Massey, Jr., and McNeil Marshall

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NEWS AND VIEWS

Washington State Adopts New Standards Based on V. P. I. Research for Grades of Processing Apples

Research findings by the Virginia Agricultural Experiment Station of V. P. I. form the core of new apple processing grades adopted on September 5, 1959 by Washington State. Researchers of the Food Technology Section of the Department of Horticulture and the Department of Agricultural Economics have conducted studies during the past five years to determine modifications necessary to create more equitable conditions for pricing apples, based upon their value for processing.

The research work was done under commercial conditions in co-operation with Bowman Apple Products Company, Inc., Mount Jackson, Virginia; National Fruit Product Company, Inc.; Shenandoah Valley Apple Cider and Vinegar Corp.; The Zeropack Company, all of Winchester, Virginia; Knouse Foods Coop., Inc., Peach Glen, Pennsylvania; and the C. H. Musselman Company, Biglerville, Pennsylvania.

The results obtained during the course of five years have been published in six articles which give basic information on apple grades and also trimming times and yield data for applesauce and apple slices for several varieties of processing apples. References to these publications are given below.

Grades and Values of Apples for Applesauce, V.P.I. Agr. Ext. Service, Circular 751, 1957.*

Determination of Relative Value of Apples for Applesauce and Evaluation of Experimental Processing Apple Grades, Food Technology, Vol. 12, No. 10, p. 554, 1958.*

Trimming Time and Yield Factors in Processing of Applesauce, Food Technology, Vol. 12, No. 1, p. 57, 1958.*

Trimming Time and Yield Factors in Processing of Apple Slices, Food Technology, Vol. 13, No. 3, 1959.*

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* Reprints of several of these articles may be obtained from Dr. Anthony Lopez, Department of Horticulture, V.P.I.; Dr. Joseph M. Johnson, Department of Agricultural Economics, V.P.I.; or Professor Charles B. Wood, Department of Horticulture, V.P.I.

Relationships of Apple Grade and Size to Apple Value in Processing of Apple Slices, Food Technology, Vol. 13, No. 7, p. 385, 1959.*

Grades of Apples for Processing, Canner/Packer, June 1959.*

The Washington State Standards for Grades of Processing Apples (non-mandatory) as adopted by order 791, effective September 15, 1959, read as follows:

"Section 1. Washington Processing Peeling Grade A, B, or C, shall consist of apples of one variety that are (a) mature, free from (b) decay, (c) internal breakdown, (d) internal browning, (e) soft scald, (f) dirt and/or other foreign matter, (g) serious insect damage or infestation, (h) are larger than 2 1/2 inches in diameter, or other minimum size specified by buyer, and (i) meet the requirements of trim waste specified in A, B, or C listed below. Apples shall comply with Washington State regulation for food products. The inspector shall certify the approximate number of apples per 100 pounds.

1. "Grade A shall consist of apples that meet the requirements of Washington Processing Peeling Grade and that require less than 3.125 percent (1/32) trim waste in addition to normal peeling and coring waste, including the grading tolerance listed in Regulation 5.

2. "Grade B shall consist of apples that meet the requirements of Washington Processing Peeling Grade and that require less than 6.25 percent (1/16) trim waste in addition to normal peeling and coring waste, including the grading tolerance listed in Regulation 5.

3. "Grade C shall consist of apples that meet the requirements of Washing Processing Peeling Grade and that require less than 12.5 percent (1/8) trim waste in addition to normal peeling and coring waste, including the grading tolerance listed in Regulation 5."

In 1958 the State Horticultural Societies of Virginia, West Virginia and Pennsylvania endorsed resolutions stressing the need for revising the present U. S. standards for apples for processing in the direction shown

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* Same as footnote on previous page.

by the work of V. P. I. researchers. At present the U. S. Department of Agriculture is considering a revision of U. S. Standards for Apples for Processing.

For further information on the most recent proposal by the Virginia Agricultural Experiment Station in respect to apple grades, refer to article one on Continuous Grades in this issue of The Virginia Processor.

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NEW PUBLICATIONS OF INTEREST

Food - The Yearbook of Agriculture 1959, the U. S. Dept. of Agriculture.

Making and Preserving Apple Cider, U.S.D.A. Farmer's Bulletin No. 2125 (this bulletin supercedes FB 1264, Farm Manufacture of Unfermented Apple Juice).

An Information Bulletin on Retort Operation, Bulletin 32-L, National Canners Association, June 1959.

For the Retort Operator, a picture story, National Canners Association.

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