Lemon Industry in California

long-term projection of market potential for lemon juice products based on variable determinants of summer demand

Sidney Hoos

The following article is the third of a series on the economic situation and marketing problems of the California lemon industry.

Analyses of short-term economic and price relationships between fresh lemons and lemon juice products were reported on in the second article of this series. For examination of the current situation and for projection over short periods into the future, such analyses are helpful, but for long-term projections, a different method is used. Future uncertainties—of varying magnitudes—exist in the long-run determinants of demand.

Making long-term projections in the economic sphere is a highly treacherous activity and definitely more dangerous for those who follow them than for those who make them. Yet, without long-term projections the investigation and report would be incomplete.

When considering the comparative trends in consumption disappearance of frozen concentrated lemonade some doubt exists as to what prepared cold-drink beverages are in fact competitive in demand. An even more difficult question concerns the varying degrees of competition. Lemonade is more of a specialty item than a staple or necessity. Further, its seasonality of consumption and its demand sensitivity of higher ranges of summer temperature may well be greater than for other cold drink products. For comparative purposes, the consumption-disappearance trend of frozen concentrated lemonade may be contrasted with carbonated beverages, fermented malt liquor, frozen concentrated orange juice, and frozen concentrated grape juice.

Each of these drink products has a different background and history and has in large part been influenced by differential impact of economic and demand development. Carbonated beverages, for example, have a statistical record back to 1849. Fermented malt liquor, generally referred to as beer and ale, has a longer record, but its long-term consumption development was interrupted by prohibition legislation. Frozen concentrated lemonade, orange juice, and grape juice, reflect postwar developments.

In its first five or six years, frozen concentrated lemonade surpassed the corresponding historical performance of the other beverages—excepting frozen concentrated orange juice—and since 1950-51, when it was introduced in any substantial amount for which household consumption data are available, frozen concentrated lemonade has grown at a faster rate than the other juice products listed. In substantial part, that growth reflects the behavior of a new product which has been favorably accepted by the public. Yet, frozen concentrated grape juice has been on the market about the same length of time as frozen lemonade but has not grown so rapidly. So far, the rate of market penetration and consumer acceptance of frozen concentrated lemonade has been near historic for that type of a specialty product.

For long-term projections in trends in production-disappearance of various beverage products, the basic determinants and the premises involved must be considered. Those determinants include the future trend in population and its structure, the course of gross national product and its related disposable personal income, and the changeable and changing pattern of consumer preferences.

The projection of the national population numbers can not be made with confidence. In the 1920's and 1930's, birth rates were falling as they had been for two centuries and it was widely thought that by 1975-1980 the national population would have reached its peak. But, shortly after 1940, a marked upward turn in births set in and has been sustained in recent years. Many observers have come to the view that a new and radically different population prospect is emerging.

Barring catastrophic events, certain developments in the national population can be anticipated between 1955 and, say, 1975. Most of the men and women who will become parents during the next 20 years have been born. In fact, until around 1965, most children will be born to parents whose birth occurred in the depression years. Because those were years of low birth rates, the limited child-bearing population between 1955 and 1965 will impose limits on the number of births, even if family size does rise and remain high. The number of women in the 20-39 age group will remain about constant until after 1965, when the many

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C A L I F O R N I A A G R I C U L T U R E
Progress Reports of Agricultural Research, published monthly by the University of California Division of Agricultural Sciences.

William F. Calkins .................. Manager Agricultural Publications
W. G. Wilde .................. Editor and Manager California Agriculture

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formed—emerged from cotyledon pro-
lications—tumors—as well as from
those of the hypocotyls. Shoot growth
was drastically retarded or completely
inhibited, and when leaves developed at
all they tended to be small, extremely
narrow and distorted.

None of the abnormal growth found
after treatment with the phenoxy com-
ounds appeared in seedlings from NAA-
treated trees. Although NAA inhibited
germination to a considerable degree and
reduced the percentage of viable plants,
its only unfavorable effect on seedling
growth was slowed development. Other-
wise the seedlings from NAA-sprayed
trees were like those from un sprayed
trees.

Seeds from sprayed trees were as nor-
mal in appearance as those from un-
sprayed ones, aside from a somewhat
greater tendency toward splitting of the
seed coats caused by slight stimulation
of cotyledon growth. Furthermore, in
microscopic studies of seed development
from the time of application of 2,4,5-T to
fruit maturity, not a single deviation
from the normal developmental pattern
was found. These observations lead to
the conclusion that the growth regulators
applied here with respect to concen-
tration and time of application do not
interfere with normal seed development
but do stimulate abnormalities during
germination.

To determine whether inhibited germi-
nation as well as the same types of seed-
ing abnormalities could be induced in
apricot seeds treated directly with 2,4,5-T
—as those occurring in offspring of
sprayed trees—unsprayed Royal seeds
were stratified in moist sand at 32° F for
three weeks beginning in February 1956.

Pits and integuments were then re-
moved and different lots of seeds were
soaked in 1, 2, 4, and 8 ppm solutions
of 2,4,5-T with three durations of treat-
ment for each concentration, 12, 24, and
36 hours. Seeds were also soaked in dis-
tilled water for the same periods of time.

After treatment the seeds were planted
in vermiculite in the greenhouse and
germination data were recorded during the
following seven weeks.

The smaller table in column 2 shows
that consistent decreases in the percent-
ages of germination and viable plants
accompanied either increasing concen-
tration of 2,4,5-T or increasing duration
of treatment. For the seeds soaked 24
and 36 hours, however, part of the re-
duced germination must be attributed to
exposure to liquid for those periods of
time, since germination of seeds soaked
in water also decreased with lengthened
time of treatment.

The seedlings from seeds soaked in
2,4,5-T solutions showed the same gen-
eral types of external abnormality as
those from sprayed parent trees. Primary
root growth was inhibited to greater or
lesser extent according to dosage. Swell-
lings appeared on the hypocotyls and
cotyledon bases and roots emerged from
them. Seedlings from seeds given the
higher dosages showed slight epinasty of
the first few leaves. Of the seedlings clas-
sified as viable, in all but those from the
lightest treatments, average shoot growth
was retarded, with the slowed growth ap-
proximately in proportion to the severity
of the treatment.

In view of the greatly reduced percent-
ages of seed germination and viable seed-
lings as a result of growth regulator
application to parent apricot trees, nurs-
erymen should avoid using seeds from
sprayed trees for propagation even
though they appear normal.

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The above progress report is based on Re-
search Project No. 1096.

LEMON INDUSTRY

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women born in 1945–55 will commence
to enter the 20–39 age category. There
will be the potential for a really explosive
population upward surge after 1965
should early marriage and large families
be popular at that time.

The projections of the national popu-
lation may be at different degrees of
high, depending on whether the project-
assumes the continuance of recent birth
rates or a gradual return to the prewar
level, or—even an even more extreme as-
sumption—that births might drop low enough
to fit the long-time prewar trend line.

National population projections to 1975
may be set at a high of 230 millions; a
medium of 220 millions; and a low of
210 millions.

Along with the growing numbers of
consumers, the capacity for gross con-
sumption has risen, and prospects are fa-
vorable to a continuation of this expan-
sion in the next 20 years.

The President’s Materials Policy Com-
mision has forecast a 100% rise in pro-
duction of all goods and services from
1950 to 1975. With the prospect of more
than 200 million persons in the United
States by 1975, this forecast implies a
gross national product of about $2,650
per capita, which is 52% higher than the
1950 figure.

During the past 30 years, per-capita
disposable income has averaged about
75% of per-capita gross national pro-
duct. However, this figure is affected by
the relatively lower tax rates of the
1930’s. During the last five years, the
per-capita disposable income has aver-
aged only 71% due to higher taxes. As-
suming no tax increases but only a
maintenance of the present structure in
1975, per-capita disposable income then
should be about 48% higher than it was
in 1950.

When people in low-income categories
obtain an increase in income, they may
spend as much as one half of their addi-
tional income on food. But in the higher
income categories, an increase in income
has much less effect on food demand—
perhaps no more than 10% of the in-
crease is spent for food. It is generally
TENDERIZERS

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These studies give some insight into the mechanism of papain tenderization of beef. Probably the most important tenderization mechanism is the hydrolysis of muscle-fiber protein, which accounts for three-fourths of the edible portion of beef. Papain hydrolyzes the sarcolemma and the muscle cell nuclei before there is any apparent digestion of the muscle fibers themselves. As measured by the transformation of soluble protein to amino acids, papain hydrolysis reaches a maximum at temperatures of 140°F to 176°F. It is probable that the heat-labile muscle proteins denature before the relatively heat-stable papain and papain hydrolyzes these denatured proteins with maximum effect.

Tenderization by papain cannot be ascribed to a specific reaction but rather to a general hydrolysis of all of the structural components of beef muscle.

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ALFALFA APHID

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aphid skin. The Triozys-produced mummy is smooth, rounded, and grayish-brown in appearance but the mummy produced by Aphelinus is oblong in shape and black in color.

Several days after the mummy is formed, the parasite pupa changes to the adult which chews a hole in the aphid skin and emerges through it to continue the attack on the aphid. The adults of all three parasites are very small wasps, those of the largest species, Prafon poliantas, being no longer than one-eighth inch. Except for their lethal attack on spotted alfalfa aphid, these wasps are completely harmless, probably gaining their food from nectars and honeydews.

At present it is impossible to speculate as to the role these wasps will play in the biological control of spotted alfalfa aphid. Even after becoming established they must demonstrate the ability to spread from the release plots into adjacent commercial alfalfa fields and there survive and multiply in the face of the disruptive conditions of the alfalfa growing cycle.

Some of the factors which may tend to inhibit maximum parasite activity are: widespread insecticide applications; the mowing and baling processes; winter pasturing or dormancy of alfalfa; and periodic scarcity of aphids resulting from ladybird beetle attack or adverse climatic conditions. However, if—despite these factors—the parasites can reach the status which they have attained in a number of areas in the Mediterranean region and Middle East, their collective role should be of considerable importance in the biological control of spotted alfalfa aphid in California.

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The above progress report is based on Research Project No. 1650.