

POTATO PROCESSING

FOURTH EDITION

POTATO PROCESSING

Fourth Edition

Edited by
William F. Talburt
Santa Rosa, California

Ora Smith
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Potato Processing

Fourth Edition

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History of Potato Processing

W. F. Talburt

EARLY HISTORY

Potato processing is very old. Historians and archeologists are able to trace the potato, *Solanum tuberosum*, to at least 200 A.D. when it was being cultivated in the mountainous areas of Peru. Even then potatoes were dehydrated by allowing them to freeze at night and thaw during day. Juice was expressed from the thawed potatoes by treading on them. This cycle was repeated several times until the moisture content was reduced sufficiently to preserve the potatoes. Almost two thousand years later this process was rediscovered and used in the so-called freeze and squeeze process for the preparation of dehydrated potatoes in England.

For many centuries the potato served as the primary food source of the Indians of Peru. Apparently, sufficient potatoes were dehydrated to provide for periods when potatoes were not available between crops or when shortages developed. When the Spanish explorers arrived in the New World, the potato was quite widely distributed throughout South and Central America, Mexico, and into the southern parts of the United States. However, there is no record that potatoes were cultivated outside of the Andean areas. The wild plants were recognized as sources of food and to some extent the tubers were used, but no evidence of how domestication was achieved has been found.

Today the potato is cultivated in Peru as intensively as in pre-Columbian time. In the Lima market some most extraordinary and unusual types of potatoes are seen. Through centuries of cultivation in Peru, cultivars that are scarcely recognizable as potatoes have developed. Some are golden-yellow, others are purple, pink, pale lilac and blue, spotted and striped, round and oblong, crenated and cylindrical, and may be smooth-skinned or warty.

INTRODUCTION INTO THE OLD WORLD

Europeans recognized the great value of the potato early and obtained them from the Indians for use in provisioning ships. It was not long before potatoes were introduced into Europe. Records have been found indicating that a hospital in Seville, Spain, bought potatoes as early as 1573. Since all purchases were made in the fourth quarter of the calendar year, they were probably grown in Spain and freshly harvested (Hamilton 1934). Potatoes were probably regarded as a luxury up to 1584. From Spain the tubers were carried to Italy and to other parts of Europe. In 1588 it is recorded that potatoes were being used in Italy as cattle feed.

The exact date and the method of introduction of the potato into England is a subject of considerable controversy but must have occurred at the end of the sixteenth century. For a number of years it was grown only in gardens and was used as a food on only a limited scale. Even though the potato was reputed to cause a number of diseases including leprosy, cultivation of potatoes in Ireland and, to a lesser extent, in England became quite extensive during the seventeenth century.

Potatoes were first introduced into the United States in 1621 when a shipment was sent to Virginia from Bermuda where they had been sent from England. In 1719 Irish settlers brought potatoes to New Hampshire. Being so familiar with the potato, they did much to promote its cultivation and acceptance in New England.

In the eighteenth and nineteenth centuries when the potato became the major source of food in a large part of Europe, its two principal disadvantages—bulk and comparatively short storage life as compared with grain—became apparent. In Europe, experiments with various types of dried potato were made in the latter half of the eighteenth century partly to increase the usefulness of the tubers as ships' provisions. A sample of potato flour or meal was prepared in 1786 that "keeps sound for any length of time" (Fraser 1794).

Little was accomplished along this line either in Europe or the United States until World War I when a number of dehydrated potato products were manufactured for military use. This war industry practically disappeared soon after hostilities ceased although considerable quantities of potato flour, both for stock feeding and human consumption continued to be produced in Europe, and to a lesser extent in the United States and England.

Potato starch, which uses substantial quantities of potatoes, has been produced both in Europe and in the United States for over 100

years. The first starch plant was established in this country in 1831, and within a few years over 100 plants were producing potato starch.

FOREIGN AND DOMESTIC POTATO PRODUCTION

The potato, with a total annual production in excess of 10 billion bushels, is one of the major food crops in the world. Because they yield heavily, are relatively inexpensive, and can be grown in a wide variety of soils and climates, potatoes are the mainstay in the diet of people in many parts of the world. The production of potatoes by countries is given in Table 1.1.

Werner (1930) stated that in Germany over 38% of the potato crop was used for stock feeding compared with only 38% for human food. In general, on the continent of Europe, some 20–50% of potato production was normally fed to stock (Yates 1940), while in Ireland, almost 60% was used for stock feeding (Kennedy 1941) in the 1930s and 1940s. It is difficult to generalize about the production and utilization of potatoes in Europe during the past 30 years. In the more highly industrialized countries, uses of potatoes as food and in feeding livestock has probably declined. In countries more dependent on agriculture, production

Table 1.1. Annual Production of White Potatoes in Various Countries

Country	Production (10 ⁶ cwt) in			
	1955–59 (average)	1977	1978	1979
Austria (212) ^a	73.9	30.3	31.4	30.6
Canada (199)	40.6	55.7	55.5	56.2
Denmark (255)	38.2	21.4	22.6	20.2
Finland (162)	28.5	16.5	16.7	17.2
France (230)	323.9	177.0	167.1	158.5
Germany, West (286)	534.8	254.7	235.4	195.9
Ireland (237)	51.5	31.4	24.3	23.7
Italy (146)	77.6	70.5	62.7	60.5
Japan (238)	69.1	78.8	74.3	73.6
Netherlands (336)	81.7	128.8	139.7	137.8
Poland (185)	752.7	921.7	1044.9	1121.8
Spain (131)	93.8	124.4	119.1	117.5
Sweden (269)	33.5	28.6	30.0	27.1
Switzerland (383)	32.2	17.9	22.2	21.7
United Kingdom (292)	143.3	148.3	164.2	147.6
United States (276)	245.7	360.3	371.1	353.9
Yugoslavia (76)	58.0	69.1	56.0	58.2
Germany, East (189)	—	231.0	226.2	246.4
U.S.S.R. (110)	1890.1	1873.8	1928.6	1906.2

Source: U.S. Department of Agriculture.

^a Numbers in parentheses are yields (cwt/acre) for 1979.

of potatoes has remained high. Processing of potatoes for food has been increasing in Europe but to a lesser extent than in the United States largely because of the earlier entry of the latter country into this field.

The average annual production of potatoes in the United States was about 245 million hundredweights (cwt) in 1956, or about 135 lb per person. Approximately 110 lb of this were actually consumed as food. By contrast, production of potatoes in Poland that same year was 838 million cwt, or about 3350 lb per person. Although food use of potatoes throughout central Europe is very high, large quantities of potatoes are obviously employed in livestock feeding, in starch production, and in the manufacture of alcohol.

RECENT TRENDS IN POTATO PROCESSING IN THE UNITED STATES

In the United States, per capita consumption of potatoes reached a maximum of about 180 lb in 1950 after a rather gradual increase from 120 lb in 1850. This increase is undoubtedly attributable in large part to the heavy influx of North European immigrants into this country during this period. During the first half of the twentieth century, the adjustment in eating habits by these immigrants and their descendants was superimposed on a developing economic situation that was exerting a downward pressure on potato consumption. These two factors resulted in a decrease in per capita consumption, which offset the effect of population increases on total consumption of potatoes from 1910 through 1950. There is reason to believe that the effects of these factors may now be diminishing to a point where per capita consumption of potatoes has been fairly well stabilized, and that with the rapid increases in processing and the greater availability of a larger variety of processed products, per capita consumption of potatoes may again increase in the future.

Another very significant trend in the production of potatoes in this country has been the steadily rising yield, which increased from 67 cwt/harvested acre in 1920 to about 270 cwt/acre in 1979. The harvested acreage of potatoes fell quite dramatically for several years following World War II until about 1955 and has remained surprisingly stable at about 1.3 million acres since that time (Fig. 1.1). Despite this decrease in acreage, the yield increases have resulted in substantially higher total production during most of the years following World War II. Prices during this period have fluctuated widely between \$0.625 and \$4.90 per cwt. Since 1975 the average price received by growers has been around \$3.50 per cwt.

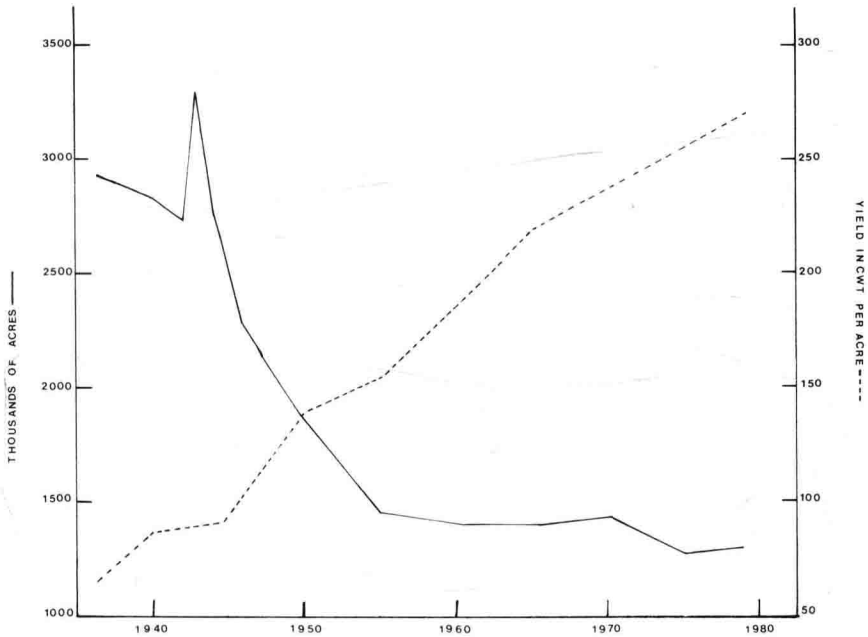


Fig. 1.1. Trends in white potato acreage planted in the United States and in yields per acre, 1938–1979.

The amount of potatoes processed in the United States has increased at a phenomenal rate since 1940. Figures on the production and disposition of the U.S. potato supply during the 1960s, 1970, and 1980s are shown in Tables 1.2 and 1.3. Per capita consumption of processed potatoes increased from 1.9 lb in 1940, to 23.4 lb in 1956, to 80 lb in 1978, when processing used about 61% of the crop going into food uses, or about 48% of the total crop (Fig. 1.2). Frozen potato products have been the fastest growing category of processed potatoes, utilizing more than one-half of all potatoes that are processed. Potato chips, which used more than 42% of all potatoes processed in 1964, dropped to about 22% in 1978 (Fig. 1.2). However, this still represented a substantial increase in tonnage of potatoes used for chipping—from 29 million cwt in 1964 to 39 million cwt in 1978.

Potato chips, which were first made in this country about the middle of the nineteenth century, were originally called Saratoga chips. For a number of years they were prepared only by the housewife in her own kitchen. Small-scale commercial production was later carried on for a number of years but did not really develop to any great extent until improved peeling and frying techniques were developed. In 1939 the