UNIVERSITY SYSTEM OF GEORGIA

Georgia Coastal Plain Experiment Station

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Irish Potato Culture

in the

Coastal Plain of Georgia

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JANUARY 1933 BULLETIN 20

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IRISH POTATO CULTURE IN THE COASTAL PLAIN OF GEORGIA

INTRODUCTION

The work with Irish potatoes at the Georgia Coastal Plain Experiment Station covers a period of eleven years (1922 to 1932 inclusive). During that time it has been observed that the general yield at this Station is considerably lower than that in the commercial producing centers along the coast. This difference is probably not due to more productive soil or to increased rainfall along the coast, but to the fact that the flat lands of that section are more retentive of moisture, thereby providing a more suitable growing condition.

IMPORTANCE OF THE CROP

The Irish potato is perhaps third in importance as a commercial truck crop in the coastal plain area of Georgia. Between 1500 and 2000 acres are normally planted to potatoes in the coastal plain section of this State, principally along the coast, with an annual value to the producer of slightly less than $500,000. The Irish potato is also probably of greatest importance as a home garden crop.

ADAPTATION

Because of the moisture and climatic requirements of this crop it is largely confined to well defined production centers. At the present time the early commercial plantings are found almost exclusively in the counties along the Atlantic coast, but as a product for home consumption it is found in practically every garden throughout the coastal plain of Georgia.

SOIL TYPES

Sandy loam soils, which are well drained but retentive of moisture and slightly acid in reaction, are well adapted for the production of early potatoes. Such soils become warm early in the spring and are easily prepared.

TABLE I—RAINFALL AT TIFTON

Number of Inches of Rainfall for Each Month During the Years 1922 to 1932 Inclusive

MONTH	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	Ave. Mo. Rainfall
January	2.72*	7.04	5.77	8.76	11.02	.38	1.36	5.11	5.41	2.54	6.06	**5.11**
February	4.64*	1.97	4.43	2.37	4.66	2.93	7.39	4.45	2.56	2.75	2.24	**3.67**
March	4.12*	5.24	4.82	.69	8.30	2.93	5.55	6.19	5.70	2.84	3.50	**4.53**
April	.30	1.38	5.41	1.28	3.55	2.58	11.57	3.69	5.95	2.92	1.82	**3.68**
May	7.08	4.67	1.52	2.88	3.35	.66	3.41	2.34	1.20	3.24	3.68	**3.09**
June	2.90	8.87	6.50	6.00	2.88	8.40	4.27	7.04	7.22	2.48	3.63	**5.47**
July	5.71	4.51	5.43	3.34	7.56	6.70	7.93	4.87	5.62	7.11	4.79	**5.78**
August	2.21	4.14	3.21	1.94	4.20	9.66	18.36	3.29	3.82	4.77	7.51	**5.74**
September	1.49	1.05	12.01	2.91	2.86	.74	6.72	6.41	3.78	1.56	5.47	**4.09**
October	3.79	.58	1.01	6.63	1.13	.55	.40	3.31	.23	1.47	5.00	**2.19**
November	.75	2.01	.26	2.93	4.02	.92	1.11	4.16	2.84	.....	2.81	**1.98**
December	4.68	2.17	6.63	4.65	2.39	7.70	2.48	4.36	3.72	2.73	1.83	**3.94**
Total for Year	**40.39**	**43.63**	**57.00**	**44.38**	**55.92**	**44.15**	**70.55**	**55.22**	**48.05**	**34.41**	**48.34**	**49.27†**

* Taken from Thomasville Weather Station.

† Average annual rainfall for the eleven-year period

CROP ROTATION

In the early commercial Irish potato section of this State no definite crop rotation system is practiced. However, it is generally recognized by potato growers that soils rich in humus are more productive; therefore, a system of rotation should be followed which would maintain a high humus content in soils on which this crop is to be grown. Inasmuch as nitrogen is an important element in the production of high yields, it would be good practice to turn under a leguminous cover crop, such as crotalaria, velvet beans, or cowpeas, immediately preceding Irish potatoes.

PREPARATION OF THE LAND

The preparation of the soil has a very direct influence on Irish potato yields, deep plowing being especially beneficial. Ordinary loamy soils should be turned to a depth of seven or eight inches. Land having a heavy cover of vegetative matter should be turned, preferably in the fall, in order that the litter may have time to decay. Where winter plowing is practiced, the land should be thoroughly disced in early spring, preparatory to laying off the rows for planting.

VARIETIES

A study of Irish potato varieties was conducted over a period of six years; the results of this test are shown in Table II. It will be observed from this table that the highest yield has resulted from second crop Virginia grown seed, while from the Maine grown seed there is no appreciable difference in the yields of Irish Cobbler, Red Bliss and Green Mountain. However, it should be noted that Green Mountain is a late maturing variety.

TABLE II—IRISH POTATO VARIETY TEST

Average Yields for Years 1922 to 1927 Inclusive

Fertilizer: 500 pounds per acre analyzing 8% Phosphoric Acid, 4% Ammonia and 4% Potash

Average Date Planted: March 9

VARIETY	Yield in Bushels per Acre			Days Required to Mature
	Marketable	Culls	**Total**	
1. Red Bliss (Second Crop)‡	64.10	3.79	**67.89**	101
2. Irish Cobbler	48.89	5.32	**54.21**	93
3. Red Bliss	48.41	6.40	**54.81**	88
4. Green Mountain	45.25	7.71	**52.96**	110
5. Spalding Rose No. 4*	30.67	7.44	**38.11**	93
6. Rural New Yorker No. 2†	29.88	12.38	**42.26**	108
7. McCormick†	25.59	7.15	**32.74**	116
8. Lookout Mountain‡	24.11	7.14	**31.25**	128
9. Improved Peach Blow†	17.10	7.06	**24.16**	116

*Five-year average.
†Four-year average.
‡Three-year average.

CERTIFIED SEED AND SOURCES OF SEED POTATOES

In a comparative test with certified and non-certified seed, the data obtained indicate that there is little benefit to be derived from certified seed from the standpoint of yield, although there was a marked difference in the appearance of the resulting crop. The non-certified potatoes showed considerable scab which would prove quite a detriment in marketing.

During the period over which this test was conducted it was found also that Nebraska grown seed were more productive, as will be noted in Table III.

TABLE III—SOURCES OF SEED

Average Yields of Red Bliss for Years 1929 to 1932 Inclusive

Fertilizer: 800 pounds per acre analyzing 8% Phosphoric Acid, 4% Ammonia and 4% Potash

Average Date Planted: March 6 **Average Date Harvested: June 8**

SOURCE OF SEED	Yield in Bushels per Acre				Days Required to Mature
	Marketable	Culls	Rot	**Total**	
Red Bliss (Certified Neb.)*.....	68.59	10.21	6.07	**84.87**	95
Red Bliss (Non-Certified Neb.)*..	66.60	12.53	3.79	**82.92**	95
Red Bliss (Certified Maine)†.....	54.91	6.24	3.82	**64.97**	95
Red Bliss (Non-Certified Maine)..	52.04	8.41	2.18	**62.63**	95

*Three-year average.
†Two-year average.

QUANTITY OF SEED REQUIRED PER ACRE

The quantity of seed required to plant an acre of potatoes is determined largely by the size of the seed piece and the distance at which the potatoes are planted. Where rows are spaced 3 to 3½ feet apart and the seed pieces are planted 8 to 12 inches in the drill, 12 to 15 bushels are required for each acre. The requirement also varies with the size of the potato; large tubers do not cut to such good advantage as do those of medium size.

SEED POTATO TREATMENT

The object of seed treatment is to destroy surface borne diseases, the most destructive of which are scab and black-scurf. Corrosive sublimate is the most effective disinfectant. It is prepared by dissolving 4 ounces of this material in 30 gallons of water. Fifty-gallon wooden barrels are excellent containers in which to treat potatoes. (Metal containers should not be used.) The potatoes should be placed in perforated hampers for immersion and should be cut and planted immediately after being treated, or should be spread out to dry.

PERIOD OF TREATMENT

The length of treatment of seed potatoes should vary with the condition of the seed. Seed stock that is apparently free from disease need not be immersed for more than one hour, and stock that is badly sprouted should undergo a similar period of treatment. On the other hand, potatoes that are dormant or that show sign of disease should be soaked at least half an hour longer.

The corrosive sublimate solution becomes weaker with each lot of potatoes treated; it is good practice, therefore, to use the same solution only four times as indicated below:

Soak first lot of potatoes 1 hour.
Soak second lot of potatoes 1¼ hours.
Soak third lot of potatoes 1½ hours.
Soak fourth lot of potatoes 2 hours.

After the fourth lot has been treated the solution should be replaced with a fresh batch.

CARE OF SEED PIECE AFTER CUTTING

Poor stands of potatoes are often the result of improper handling of freshly cut seed pieces. If stored in bulk during warm weather, heating, which quickly injures the vitality of the stock, is likely to occur. Undue exposure to wind and sun also dries out the seed pieces, resulting in devitalized seed. When the seed pieces are cut, it is advisable to dust them with either lime or sulphur. Sulphur is preferable because it not only stops bleeding and thus prevents wilting, but it also has a tendency to act as a check on scab.

EFFECT OF SIZE OF SEED PIECE ON YIELD

In order to determine the size of the seed piece that would produce the most profitable returns, a test was conducted in which whole, half, and quarter potatoes were used. The potatoes selected for this purpose were of medium size, averaging 4 ounces in weight. The data obtained in this study are shown in Table IV. Although the yield is in direct proportion to the size of the seed piece it will be observed that the increase in seed require-

ments for the larger seed pieces is greater than the increases in the resulting crop. Under the conditions of this test it is evident that the greatest returns may be expected from the 1 ounce seed pieces.

TABLE IV—INFLUENCE OF SIZE OF SEED PIECE ON YIELD

Average Yields of Red Bliss for Years 1922 to 1927 Inclusive

Fertilizer: 500 pounds per acre analyzing 8% Phosphoric Acid, 4% Ammonia and 4% Potash

Average Date Planted: March 8 **Average Date Harvested: June 7**

SEED PIECE	Size of Seed Piece	Bushels Seed to Plant one Acre	Yield in Bushels per Acre			Days required to Mature
			Marketable	Culls	**Total**	
Whole Potato	4 oz.	60	74.76	7.28	**82.04**	92
Half Potato	2 oz.	30	62.30	5.58	**67.88**	92
Quarter Potato	1 oz.	15	53.30	6.29	**59.59**	92
Tip End	2 oz.	30	56.97	7.12	**64.09**	92
Stem End	2 oz.	30	56.75	7.54	**64.29**	92

FERTILIZER REQUIREMENTS

The work pertaining to plant food requirements of Irish potatoes has been in progress at this Station over an eleven-year period. This work embraces a rather wide range of ratio studies with phosphoric acid, ammonia and potash; high analysis fertilizers; rates of applying fertilizer; sources of ammonia; sources of potash, and miscellaneous plant nutrients. The data and observations resulting from this study will be set forth in the following tables and discussions. Unless otherwise stated, all fertilizer is applied previous to planting.

TRIANGLE FERTILIZER TEST

In the spring of 1922 a study was begun with a series of fertilizer formulas known as the Triangle System. The purpose of this study was to determine the ratio of phosphoric acid,

ammonia and potash that constitutes the nearest approach to a balanced fertilizer for this crop. The test was conducted over a six-year period (1922 to 1927, inclusive) and was begun on land that had been in cultivation for only one year. The formula which produced the highest yield and thus seemed more nearly to approximate the plant food requirements of the potato crop, carried 8 per cent phosphoric acid, 4 per cent ammonia, and 4 per cent potash. However, in view of the fact that each formula in the triangle system carried two variables, it was discontinued in 1927 and the 8-4-4 formula was used as a basis around which to construct a new series of formulas carrying only one variable. The data resulting from the Triangle Fertilizer Test are shown in Table V.

TABLE V—TRIANGLE FERTILIZER TEST

Average Yield of Red Bliss for Years 1922 to 1927 Inclusive

Fertilizer: 500 pounds per acre

Average Date Planted: March 8 **Average Date Harvested: June 6**

FORMULA*	Yield in Bushels per Acre			Days required to Mature
	Marketable	Culls	**Total**	
8-4-4	54.24	6.91	**61.15**	91
8-2-6	50.17	7.64	**57.81**	91
8-6-2	49.91	8.02	**57.93**	91
10-4-2	49.39	7.03	**56.42**	91
10-2-4	48.64	5.89	**54.53**	91
12-2-2	47.37	7.48	**54.85**	91
12-0-4	46.19	5.06	**51.25**	91
10-0-6	44.45	5.40	**49.85**	91
12-4-0	43.21	6.24	**49.45**	91
8-0-8	42.45	7.13	**49.58**	91
14-2-0	42.47	5.51	**47.98**	91
10-6-0	42.14	7.31	**49.45**	91
8-8-0	41.61	8.48	**50.09**	91
14-0-2	41.22	7.37	**48.59**	91
16-0-0	40.42	5.03	**45.45**	91
Check	27.45	5.01	**32.46**	91
0-8-8	24.55	5.61	**30.16**	91

*Phosphoric acid, ammonia and potash in the order named.

FERTILIZER FORMULA TEST

The revised fertilizer formula study was begun in 1928 and consisted of eighteen combinations which are divided into four groups, designated as phosphoric acid, ammonia and potash series and incomplete formulas, together with two checks or areas receiving no fertilizer.

This experiment was conducted on land that had been planted to field crops for fifteen years and was in a fair state of cultivation, although only light fertilization had been practiced; therefore residual effects of fertilizers should not have been carried in the soil to any appreciable extent.

The results of this test indicate that potatoes require less phosphoric acid but more ammonia and potash than were carried in the highest yielding formula of the triangle test. Reference to Table VI will show the highest yield in the phosphoric acid series resulting from the formula carrying 6 per cent phosphoric acid, while in the ammonia series the highest production came from 8 per cent ammonia, and from 10 per cent of potash in the potash series.

If the highest yielding variable in each series is selected, a formula is constructed which carries 6 per cent phosphoric acid, 8 per cent ammonia and 10 per cent potash.

The phosphoric acid and ammonia in this formula correspond to recommendations and rather general practice in early potato producing sections, although the per cent of potash is considerably higher. This is perhaps due to the fact that there is a potash deficiency in the soils of this section, as is also indicated by results from fertilizer formula tests with other crops at this Station.

TABLE VI—FERTILIZER FORMULA TEST

Average Yield of Red Bliss for Years 1928 to 1932 Inclusive

Fertilizer: 800 pounds per acre

Average Date Planted: March 4 **Average Date Harvested: June 10**

FERTILIZER FORMULA*	Yield in Bushels per Acre				Days Required to Mature
	Marketable	Culls	Rot	**Total**	
Phosphoric Acid Series:					
2-4-4	27.55	13.33	1.34	**42.22**	99
4-4-4	29.28	10.71	1.85	**41.84**	99
6-4-4	35.00	11.32	1.71	**48.03**	99
8-4-4	34.14	11.49	1.24	**46.87**	99
10-4-4	29.65	11.26	1.34	**42.25**	99
12-4-4	26.92	10.74	1.29	**38.95**	99
Check (No fertilizer)	10.18	7.60	.68	**18.46**	99
Ammonia Series:					
8-2-4	24.11	9.29	1.06	**34.46**	99
8-4-4	28.85	9.85	1.78	**40.48**	99
8-6-4	32.91	10.30	1.33	**44.54**	99
8-8-4	38.94	9.41	1.90	**50.25**	99
Potash Series:					
8-4-2	31.62	8.96	1.32	**41.90**	99
8-4-4	30.37	9.52	1.52	**41.41**	99
8-4-6	39.96	8.73	1.50	**50.19**	99
8-4-8	42.95	8.99	1.63	**53.57**	99
8-4-10	47.42	8.73	1.73	**57.88**	99
Incomplete Formulas:					
0-4-4	26.53	6.77	1.32	**34.62**	99
8-0-4	22.50	12.63	.90	**36.03**	99
8-4-0	30.37	7.77	1.06	**39.20**	99
Check (No fertilizer)	15.53	6.22	.39	**22.14**	99

*Phosphoric acid, ammonia and potash in the order named.

HIGH ANALYSIS FERTILIZERS

In the fertilizer study with Irish potatoes, formulas of varying concentration have been compared with a standard mixture. The data at hand show no marked difference in yields resulting from concentrated fertilizers as compared with the standard mixtures, although commercial growers should realize a slight saving in transportation and handling costs if the less bulky materials

are used. It has been observed, however, that unless concentrated fertilizers are well mixed with the soil, poor stands are likely to occur because of injury to germinating seed.

TABLE VII—HIGH ANALYSIS FERTILIZER TEST

Average Yields of Red Bliss for Years 1928 to 1932 Inclusive

Fertilizer: 800 pounds per acre analyzing 8% Phosphoric Acid, 4% Ammonia and 4% Potash—Basic Rate of Application

Average Date Planted: March 4 Average Date Harvested: June 13

FERTILIZER FORMULA	Yield in Bushels per Acre				Days Required to Mature
	Marketable	Culls	Rot	**Total**	
30-15-15 (200 pounds)*....	43.96	13.01	2.16	**59.13**	102
8-4-4 (800 pounds).....	43.62	7.66	1.25	**52.53**	102
16-8-8 (400 pounds).....	36.58	11.14	1.32	**49.04**	102

*200 Lbs. of 30-15-15 formula during 1928 to 1930, inclusive.
266 Lbs. of 24-12-12 formula during 1931 and 1932.

RATES OF APPLYING FERTILIZER

In 1922 a test was begun with rates of applying fertilizer to determine the quantity that could be most profitably used under this crop. The applications were made in 200-pound variations and ranged from 200 to 1200 pounds per acre. The entire amount of fertilizer on each area was applied previous to planting. In following this study it was soon observed that fertilizer applied in excess of 800 pounds per acre in the drill previous to planting injured germinating seed and young seedlings, thus resulting in poor stands. To overcome this detrimental effect, applications in excess of 800 pounds were applied broadcast. It was again observed that the yield from 1000 pounds of fertilizer when applied broadcast was less effective than from 800 pounds applied in the drill. This led to the conclusion that fertilizer applied broadcast was less effective than when applied in the drill because of the fact that if distributed uniformly throughout the surface area of the soil it was only partially accessible to the concentrated feeding area of the roots at the time it was most essential to the

plant's development. To overcome this difficulty a third method of applying large quantities of fertilizer, and one which gave better results, was adopted; this method consisted of placing one-third of the fertilizer in the row and the remaining two-thirds in the two adjacent furrows. This proved more effective, although it was concluded that where heavy fertilization was practiced, the amount should be divided, a part being applied previous to planting and the remaining part used as a side dressing. Thus to study this method of applying fertilizer, a test was begun in 1928 in which all fertilizer in excess of 800 pounds per acre was applied as side dressings at the first and second cultivations.

It will be noted from Table VIII that 800 pounds seem to give the most profitable yield where all of the fertilizer is applied

TABLE VIII—VARYING AMOUNTS OF FERTILIZER
(Applied Before Planting)

Average Yields of Red Bliss for Years 1922 to 1927 Inclusive

Fertilizer: 8% Phosphoric Acid, 4% Ammonia and 4% Potash
Average Date Planted: March 8 Average Date Harvested: June 7

Amount of Fertilizer per Acre	Yield in Bushels per Acre			Days Required to Mature
	Marketable	Culls	**Total**	
Check (No fertilizer)	26.09	4.69	**30.78**	92
200 Pounds*	36.07	5.88	**41.95**	92
400 Pounds	37.25	6.26	**43.51**	92
600 Pounds	41.88	6.69	**48.57**	92
800 Pounds	45.86	6.70	**52.56**	92
1000 Pounds	46.35	5.95	**52.30**	92
1200 Pounds	49.38	6.13	**55.51**	92

*Five-year average.

before planting. However, where the application is divided, part being applied before planting and part as side dressings, as shown in Table IX, increases in yield are obtained from applications ranging as high as 1600 pounds per acre. It seems, however, that, under the conditions of this test, the most profitable returns may be expected from 1200 pounds.

A most important factor influencing the use of commercial fertilizer is the condition of the soil and the kind of farming practiced. Soils which are rich in humus and which receive proper cultural methods will more profitably utilize higher applications of fertilizer than impoverished soils which are poorly handled.

In commercial producing centers where moisture conditions are favorable it is a rather common practice for growers to use as much as 2000 to 3000 pounds of a high grade fertilizer per acre.

TABLE IX—VARYING AMOUNTS OF FERTILIZER*

Average Yields of Red Bliss for Years 1928 to 1932 Inclusive

Fertilizer: 8% Phosphoric Acid, 4% Ammonia and 4% Potash

Average Date Planted: March 7 Average Date Harvested: June 7

Amount of Fertilizer per Acre*	Yield in Bushels per Acre				Days Required to Mature
	Marketable	Culls	Rot	**Total**	
Check (No fertilizer)	11.91	8.09	.30	**20.30**	93
400 Pounds	22.70	9.90	.49	**33.09**	93
800 Pounds	32.61	11.30	.68	**44.59**	93
1200 Pounds	46.96	10.22	.35	**57.53**	93
1600 Pounds	48.85	10.15	.81	**59.81**	93
2000 Pounds (4-year avg.)	42.64	10.34	1.01	**53.99**	93

*The 400 and 800 pound rates were applied before planting. In the 1,200 pound rate, 800 pounds were applied at planting and 400 pounds at the first cultivation. In the 1,600 pound rate, 800 pounds were applied before planting and 800 pounds at the first cultivation. In the 2,000 pound rate, 800 pounds were applied before planting, 800 pounds at the first cultivation, and 400 pounds at the second cultivation.

SOURCES OF AMMONIA

A test was conducted with ammonia carriers for the purpose of determining the source from which the ammonia in potato fertilizer may be most economically derived. The test included nine different carriers and one combination, in which half of the ammonia was derived from an organic and half from a mineral

source. The ammonia from each source was applied in a complete fertilizer previous to planting.

Table X shows the organic sources of ammonia leading in production, followed by a formula containing half organic and half mineral carriers. In view of the fact that inorganic nitrogen is less expensive, it is believed that the use of a formula in which a part of the ammonia is derived from cotton seed meal and a part from sulphate of ammonia would prove a more economical fertilizer than one in which all the ammonia is derived from an organic source.

TABLE X—SOURCES OF AMMONIA

Average Yields of Red Bliss for Years 1928 to 1932 Inclusive

Fertilizer: 800 pounds per acre analyzing 8% Phosphoric Acid, 4% Ammonia and 4% Potash applied at time of planting

Average Date Planted: March 8 **Average Date Harvested: June 10**

SOURCE OF AMMONIA	Yield in Bushels per Acre				Days Required to Mature
	Marketable	Culls	Rot	**Total**	
Cotton Seed Meal	49.96	12.21	.69	**62.86**	95
Dried Blood	47.48	11.48	1.13	**60.09**	95
Urea	46.69	12.13	.62	**59.44**	95
½ Nitrate of Soda and ½ Cotton Seed Meal	46.25	10.65	.80	**57.70**	95
Sulphate of Ammonia	45.08	11.43	1.37	**57.88**	95
Leunasaltpeter	41.18	11.99	1.16	**54.33**	95
Calurea	40.52	11.73	.62	**52.87**	95
Cyanamid	39.43	11.87	.76	**52.06**	95
Nitrate of Soda	36.53	10.86	1.68	**49.07**	95
Calcium Nitrate	34.95	10.55	1.21	**46.71**	95

SOURCES OF POTASH

The test to determine the source of potash that should be used in potato fertilizer was begun in 1928. The four principal potash carriers which are commercially available are being used in this study. The potash from each source is applied in a com-

plete fertilizer previous to planting. The data resulting from the five-year test show a slight yield advantage in favor of sulphate of potash magnesia with kainit second and muriate third, although in view of the fact that the higher yields result from the more expensive materials, there seems to be little choice between the three leading carriers from the standpoint of production.

TABLE XI—SOURCES OF POTASH

Average Yields of Red Bliss for Years 1928 to 1932 Inclusive

Fertilizer: 800 pounds per acre analyzing 8% Phosphoric Acid, 4% Ammonia and 4% Potash applied at time of planting

Average Date Planted: March 3 **Average Date Harvested: June 7**

SOURCE OF POTASH	Yield in Bushels per Acre				Days Required to Mature
	Marketable	Culls	Rot	**Total**	
Sulphate of Potash Magnesia	34.29	10.65	.21	**45.15**	97
Kainit	32.13	9.37	.25	**41.75**	97
Muriate of Potash	30.82	10.50	.40	**41.72**	97
Sulphate of Potash	30.41	11.40	.25	**42.06**	97

MISCELLANEOUS PLANT NUTRIENTS

A study is being conducted for the purpose of determining whether or not Irish potato yields on the ridge lands of South Georgia can be increased by supplementing commercial fertilizers with such materials as lime, bluestone and sulphur, as shown in Table XII. The data at hand show increases in yield obtained from the use of stable manure, sulphur and lime. However, since lime causes an alkaline reaction in the soil which favors the development of scab, the market value of the resulting crop is reduced to such an extent that its use is not recommended. Also, it will be noted that the increase resulting from sulphur is so small that it is doubtful if its use would be advisable under the conditions of the test.

As will be observed from the table, stable manure alone has produced the highest yield although even better results should be obtained when used in combination with a complete fertilizer

carrying 6 to 8 per cent phosphoric acid, 2 to 3 per cent ammonia and 6 to 8 per cent potash. It is a good practice to broadcast heavy applications of manure on the land previous to breaking. Lighter applications of well rotted manure may be applied in the furrow two or three weeks before planting if it is thoroughly mixed with the soil. Fresh stable manure should not be used as an Irish potato fertilizer.

TABLE XII—MISCELLANEOUS PLANT NUTRIENTS

Average Yields of Red Bliss for Years 1928 to 1932 Inclusive

Fertilizer: 800 pounds per acre analyzing 8% Phosphoric Acid, 4% Ammonia and 4% Potash

Average Date Planted: March 3 **Average Date Harvested: June 9**

TREATMENT	Yield in Bushels per Acre				Days Required to Mature
	Market-able	Culls	Rot	**Total**	
Stable Manure (5 tons per acre)..	52.99	9.18	1.51	**63.68**	99
8-4-4 (100 Pounds Sulphur).....	44.18	6.37	.03	**50.58**	99
8-4-4 (1000 Pounds Lime).....	43.01	7.08	.30	**50.39**	99
8-4-4.....	39.86	7.70	.81	**48.37**	99
8-4-4 (50 Pounds Blue Stone).....	38.27	6.17	.23	**44.67**	99

SPACING TEST (DRILL)

A spacing test was conducted with Irish potatoes in which plantings were made at 4, 8, 12 and 16 inch intervals in the drill, the row width remaining constant, for each spacing. The rate of application of fertilizer was based on the number of hills per acre. For example, a planting spaced 12 inches in the drill received 800 pounds per acre, whereas a planting spaced 4 inches in the drill carried three times the number of plants and therefore received 2400 pounds of fertilizer per acre; or the same amount per plant as was applied in the twelve-inch spacing.

Taking into consideration comparative costs of seed and fertilizer for the various spacings, it seems that the widest margin of profit may be expected from potatoes planted 8 inches in the drill, in rows 3 to 3½ feet wide.

TABLE XIII—SPACING TEST (DRILL)

Average Yields of Red Bliss for Years 1929 to 1932 Inclusive

Fertilizer: 800 pounds per acre analyzing 8% Phosphoric Acid, 4% Ammonia and 4% Potash-basic rate of application

Average Date Planted: March 7 Average Date Harvested: June 17

SPACING	Yield in Bushels per Acre				Days Required to Mature
	Marketable	Culls	Rot	**Total**	
4 Inches	69.05	16.27	1.15	**86.47**	103
8 Inches	67.08	8.44	.62	**76.14**	103
12 Inches	52.50	8.36	.58	**61.44**	103
16 Inches	52.33	6.52	.37	**59.22**	103

PLANTING DATES

A study of the effect of planting dates on potato yields was begun in 1922, in which plantings were begun March 1 and continued at fifteen-day intervals through May 1. This test shows considerable losses in yields obtained from plantings made after April 1 as indicated in Table XIV. In order to determine the possibilities of plantings made earlier than March 1, a new test was begun in 1929 in which plantings were begun February 15. Results of this test, as shown in Table XV, indicate that the highest yields of marketable potatoes may be expected from plantings made between the dates of February 15 and March 15, decided reductions in yield resulting from later plantings.

TABLE XIV—PLANTING DATES

Average Yields of Red Bliss for Years 1922 to 1928 Inclusive

Fertilizer: 800 pounds per acre analyzing 8% Phosphoric Acid, 4% Ammonia and 4% Potash

DATE PLANTED	Yield in Bushels per Acre			Days Required to Mature
	Marketable	Culls	**Total**	
March 1*	51.28	9.24	**60.52**	92
March 15	49.64	6.41	**56.05**	90
April 1	50.34	7.13	**57.47**	88
April 15*	31.00	4.78	**35.78**	86
May 1†	10.34	3.40	**13.74**	85

*Six-year average.
†Five-year average.

TABLE XV—PLANTING DATES

Average Yields of Red Bliss for Years 1929 to 1932 Inclusive

Fertilizer: 800 pounds per acre analyzing 8% Phosphoric Acid, 4% Ammonia and 4% Potash

DATE PLANTED	Yield in Bushels per Acre				Days Required to Mature
	Marketable	Culls	Rot	**Total**	
February 15	73.49	5.14	2.83	**81.46**	108
March 1	68.12	7.84	4.22	**80.18**	103
March 15	70.11	6.01	6.80	**82.92**	93
April 1	27.97	6.09	2.03	**36.09**	89
April 15	3.24	1.43	.69	**5.36**	87
May 1	.03	.10	.03	**.16**	74

METHOD AND DEPTH OF PLANTING

Irish potatoes may be planted either by hand or with a machine, although hand planting is almost exclusively practiced in

the early commercial potato section of Georgia. When planted by hand the usual practice is to drop the seed pieces into an open furrow in which the fertilizer has been placed and thoroughly mixed with the soil several days in advance of the planting operation. Quicker germination results if a fresh furrow is opened immediately ahead of the droppers and the seed pieces covered before the soil dries out. Potatoes should be planted to a depth of 2 inches below the ground level and should be covered with 2 to 3 inches of soil.

CULTIVATION

The early potato crop should be planted before the soil is warm enough to cause quick germination; consequently if early weed growth is held in check it is necessary to cultivate before the young plants show above the ground. A weeder or a spike tooth harrow run at right angles to the rows is excellent for this purpose and may be used to advantage until the plants are about two inches high. For later cultivations the two-horse cultivator may be used with excellent results. Each time the potatoes are cultivated a small amount of soil should be thrown to the plants so that at the last cultivation the potatoes will be on a low ridge, as potatoes grown on ridges normally produce as well as those grown on a level and the ridges facilitate harvesting.

INSECT AND DISEASE CONTROL

Because of the mild seasonal conditions prevailing in the early commercial potato section of Georgia, insects and diseases winter over with little difficulty and invariably are present as a menace to the young crop in the early spring. There follows a list of the important insect and disease pests with suggested control measures.

INSECTS

Colorado Potato Beetle: The only leaf eating insect of particular danger to the potato crop is the Colorado potato beetle. This insect may be satisfactorily controlled by dusting with the following poison mixtures applied at the rate of 5 to 10 pounds per acre at each application:

Mixture 1. Arsenate of Lead one part, hydrated lime eight parts.

Mixture 2. Calcium arsenate one part, hydrated lime eight parts.

Mixture 3. Paris green one part, hydrated lime twenty-five parts.

Dusting should begin as soon as the first beetles appear and applications should be repeated at ten-day intervals throughout the entire growing period, or as long as the beetles are present. The above poisons should be thoroughly mixed with lime and applied with a dust gun while the foliage is damp.

Flea Beetle: Another leaf eating insect that occasionally attacks Irish potatoes is the flea beetle. This insect may be controlled by spraying with a 4-4-50 Bordeaux mixture and arsenate of lead mixed in the proportion of 2 pounds of lead to 50 gallons of Bordeaux.

Plant Lice: Among the most destructive sucking insects attacking potatoes are lice and white fly. Of these, lice are the more destructive, although it is only at rare intervals that they do any appreciable amount of damage. This insect may be controlled by spraying with Black Leaf 40, three-fourths of a pint of which is mixed with 100 gallons of water.

DISEASES

Seed-borne diseases and their control are discussed under the heading Seed Potato Treatment.

Potato Blights: The two diseases causing the greatest injury to potato foliage are early blight and late blight. Of the two, early blight is of more general occurrence and more difficult to control. In the commercial potato section along the Georgia coast these diseases are usually present, although they seldom cause noticeable damage. Spraying with a 4-4-50 Bordeaux mixture tends to control the disease and to keep the vegetative parts of the plant healthy and vigorous throughout the entire growing season, thereby increasing the yield.

The first spray application should be made soon after a full stand is obtained. This should be repeated at two-week intervals until the potatoes have been sprayed at least three times.

SPRAYING

The most essential factor in spraying with Bordeaux mixture is thorough coverage. The under surface, as well as the top of the leaves, should be completely covered if effective control is realized. This may be made possible by proper nozzle adjustment and sufficient pressure. These may best be realized by the use of a power sprayer equipped with a spray boom capable of covering three to five rows each trip.

PREPARATION OF BORDEAUX MIXTURE

Stock solutions of bluestone (copper sulphate) and lime should be prepared in advance of the time to begin spraying. These solutions may be prepared in the following manner:

Take two fifty-gallon wooden barrels; into one put 40 gallons of water and in it suspend 40 pounds of bluestone in a bag just beneath the surface. (If the bluestone is placed in the bottom of the barrel it will not be readily taken into solution.)

Into the other barrel put 40 pounds of rock lime and slake it slowly. Let the slaking process continue at least twenty-four hours in order that lumps and granules do not remain. Then add enough water to make 40 gallons. Where rock lime is not available, hydrated lime (ordinary builder's lime) may be substituted by using one and one-half times as much (60 pounds to 40 gallons of water). Each time before dipping from the lime barrel, it should be well stirred.

To make 50 gallons of a 4-4-50 Bordeaux mixture, put into the spray tank 42 gallons of clear water. Take 4 gallons of lime water from the lime barrel and pour it through a strainer into the spray tank and stir thoroughly. Then take 4 gallons of stock solution from the bluestone barrel and pour it into the spray tank. Again stir until a uniform mixture is obtained. This will give 50 gallons of a 4-4-50 Bordeaux mixture.

COMBINATION SPRAY

When necessary to spray for protection against beetles and blight, a combination spray may be prepared by adding 2 pounds of powdered arsenate of lead or of calcium arsenate to 50 gallons of Bordeaux.

Stock Solutions will keep indefinitely but Bordeaux should be used immediately after it is made up; never use Bordeaux that has been left over from the previous day. Metal containers should not be used in preparing and handling Bordeaux.

HARVESTING

Early potato crops are usually dug before they reach full maturity in order that the grower may obtain the higher prices which are normally paid in the early part of a season.

The method of harvesting ranges from hand digging, which is paid for on a piece-work basis, to digging with turnplows, "middle-busters" and machine diggers.

Where turnplows or "middle-busters" are used there is likelihood of losing a considerable portion of the potatoes not thrown onto the surface of the newly turned soil. Additional furrows with large scrapes usually bring enough of the hidden potatoes to the surface to make the operation well worth while.

Two factors are highly important in determining when to dig the early crop. The first, of course, is the stage of maturity, and the second the time closely competing sections will be on the market. The early producing section of Georgia should take advantage of the slight lull which usually occurs between the marketing season of Florida and that of the potato growing section to the immediate north.

Also, it should be remembered that Irish potatoes harvested during the hot summer months should not be exposed to the sun. Possibly thirty minutes will cause blistering which is followed by severe rotting with the result that cars often arrive at their destination with the potatoes in bad condition.

CONTAINERS

The type of package or container in which the early potato crop is marketed in Georgia varies considerably, although the

heavy stave barrel with cotton or burlap cover is more substantial and thus less likely to be crushed or broken in transit or to show slack or settled pack in the market. This container is more expensive than the veneer barrel, but because of its greater durability seems to be preferred. When barrels are not available, other containers such as the 100-pound bag and bushel hampers may be used. The hamper does not ship well, however, because it is lacking in rigidity, often resulting in crushed packages upon arrival at its destination.

GRADING AND PACKING

Appearance is an important factor in the successful marketing of Irish potatoes. Care must be exercised in digging and handling to prevent unsightly appearance caused by the presence of cuts, bruises and other defects.

Not only is it important that potatoes be attractive in appearance but also that they be separated into well defined grades. The work of grading may be facilitated and recognized standard packages put up if the grade specifications adopted by the United States Bureau of Agricultural Economics are adhered to.

The revised specifications of Irish potato grades follow:

United States No. 1 shall consist of potatoes of similar varietal characteristics which are not badly misshapen, which are free from freezing injury and soft rot, and from damage caused by dirt or other foreign matter, sunburn, second growth, growth cracks, hollow heart, cuts, scab, blight, dry rot, disease, insects, or mechanical or other means.

The diameter of potatoes of round varieties shall be not less than 1⅞ inches and of potatoes of long varieties 1¾ inches, but lots of potatoes which are not less than 1½ inches in diameter and which meet the remaining requirements of this grade may be designated United States No. 1, 1½ inches minimum.

In order to allow for variations incident to proper grading and handling, not more than 5 per cent, by weight, of any lot may be below the prescribed size. In addition, not more than 5 per cent, by weight, may be damaged by hollow heart, and not more than 6 per cent may be below the remaining requirements

of this grade; but not to exceed one-sixth of this amount, or 1 per cent, shall be allowed for potatoes affected by soft rot.

United States No. 2 shall consist of potatoes of similar varietal characteristics which are free from freezing injury and soft rot and from serious damage caused by sunburn, second growth, growth cracks, hollow heart, cuts, scab, blight, dry rot, disease, insects, or mechanical or other means.

The diameter of potatoes of this grade shall be not less than 1½ inches.

In order to allow for variations incident to proper grading and handling, not more than 5 per cent, by weight, of any lot may be below the prescribed size, and, in addition, not more than 6 per cent, by weight, may be below the remaining requirements of this grade; but not to exceed one-sixth of this tolerance, or 1 per cent, shall be allowed for potatoes affected by soft rot.

United States Fancy shall consist of potatoes of one variety which are mature, bright, well shaped, free from freezing injury, soft rot, dirt or other foreign matter, sunburn, second growth, growth cracks, hollow heart, cuts, scab, blight, dry rot, disease, insect or mechanical injury, and other defects.

The size shall be stated in terms of minimum diameter or minimum weight or of range in diameter or weight following the grade name, but in no case shall the diameter be less than 2 inches.

In order to allow for variations incident to proper grading and handling, not more than 5 per cent, by weight, of any lot may vary from the size stated, and, in addition, not more than 6 per cent, by weight, of any lot may be below the remaining requirements of this grade; but not to exceed one-sixth of this tolerance, or 1 per cent, shall be allowed for potatoes affected by soft rot.

MARKETING

Marketing the early crop of potatoes offers a distinctly different problem from that involved in the disposal of the late crop, due to the fact that the early crop is much more perishable. The general practice is to gather, grade, pack and start the potatoes immediately to market. In the early commercial potato section

of Georgia the bulk of the commercial crop is marketed through a well organized produce exchange which assumes all responsibility for the transaction. Cash track and f. o. b. sales are perhaps better methods of marketing for both the individual and the exchange. Shipment on consignment is usually a bad practice and should not be resorted to as it often results not only in the loss of the product to the grower, but also in the additional loss of transportation charges.

SUMMARY

Work with Irish potatoes at the Georgia Coastal Plain Experiment Station covers a period of eleven years (1922 to 1932, inclusive).

The Irish potato is perhaps third in importance among the commercial truck crops of the coastal plain area.

The early commercial plantings are confined almost exclusively to the area along the Atlantic coast. Late plantings have not proved successful in the coastal plain area.

A well drained soil of loose texture, but retentive of moisture and slightly acid in reaction, is desirable for the production of this crop.

A system of crop rotation should be followed which will provide a liberal humus content and also favor insect and disease control.

Soil that is to be planted to early potatoes should be plowed early, preferably in the fall. Deep plowing is essential for heavy production.

The varieties best adapted for the early market are Irish Cobbler, Red Bliss and Green Mountain.

It is highly important to procure pure seed potatoes that are free from diseases.

Twelve to 15 bushels of potatoes normally are required to plant an acre.

The most effective seed potato disinfectant is corrosive sublimate; under no condition should seed be planted without being treated.

Treat potatoes before cutting. Remove all diseased seed pieces and immerse from one to two hours.

One-ounce seed pieces produced the most profitable returns under the conditions of the test at the Station.

Data obtained from a study of Irish potato fertilizer requirements indicate that the most desirable combination of plant food elements for this crop is a formula consisting of 6 to 8 per cent phosphoric acid, 6 to 8 per cent ammonia and 8 to 10 per cent potash.

Fertilizers of high concentration produce about the same yields as standard mixtures.

Increases in yield have resulted from applications of 1600 pounds of fertilizer per acre, although under the conditions of this test, 1200 pounds seem to give the most profitable returns.

Organic nitrogen carriers are showing to best advantage in a test with sources of ammonia. Cotton seed meal seems to be the best single source, while among the mineral sources, sulphate of ammonia has produced the highest yield. A combination of the two should be most satisfactory.

There is little difference in the yield of marketable potatoes resulting from the use of the commercially available sources of potash.

The addition of miscellaneous plant nutrients such as lime, sulphur and bluestone seems to be of little, if any, benefit when used to supplement commercial fertilizers on the ridge lands of South Georgia.

Spacing tests with Irish potatoes indicate that the most profitable returns may be expected from plantings spaced 8 inches in the drill and 3 feet in the row.

The highest yield of marketable potatoes has been obtained from plantings made between February 15 and March 15 in the Tifton section.

Irish potatoes in the early producing section of Georgia should be planted slightly below a level on well-drained soils and should be covered to a depth of 2 to 3 inches.

Potatoes should be cultivated often enough to prevent weed growth and to maintain a soil mulch. Slight ridging also facilitates harvesting.

There are effective control measures for insects and diseases attacking this crop.

The early potato crop should be harvested when there is the least competition in the market with closely competing sections.

The bulk of the crop is marketed in stave or veneer barrels with cloth or burlap tops.

Proper grading and packing are highly essential in the successful marketing of Irish potatoes.