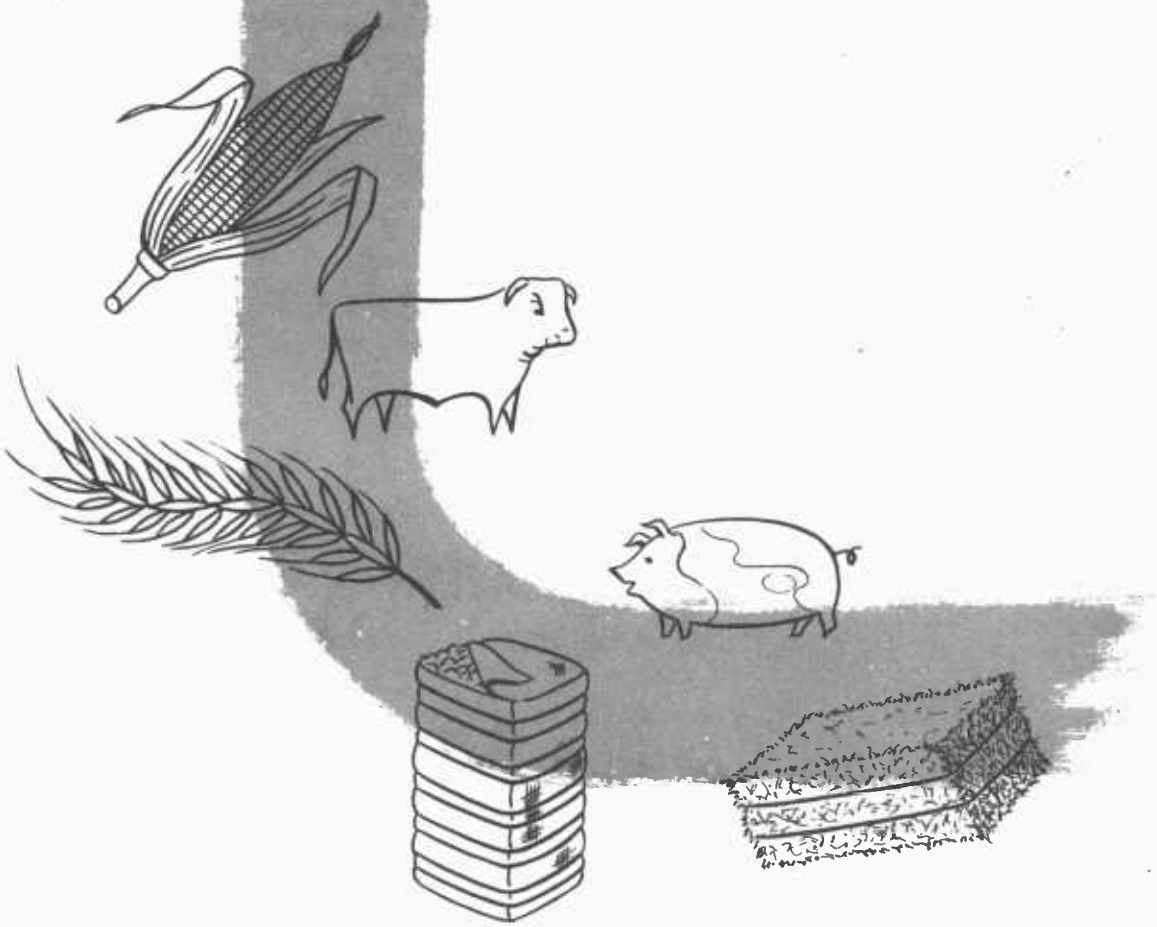
FARM OUTPUT

Past Changes and Projected Needs



UNITED STATES DEPARTMENT OF AGRICULTURE,
Agricultural Research Service
Agriculture Information Bulletin No. 162
Washington, D.C.
August 1956

CONTENTS

Prepared in

Production Economics Research Branch

Agricultural Research Service

United States Department of Agriculture

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C. - Price 25 cents

FOREWORD

Our farmers have an excellent record in expanding farm output to meet increases in market demand for farm products, over the long run and in times of emergency. Adoption by farmers of improved technology, resulting from both governmental and private research, was the dominant influence in the remarkable step-up in farm output during World War II and the post-war years. Currently, our production is out of balance with markets, and production of some commodities is in excess of market demands. But the continued growth of population and the potential increases in consumer purchasing power point to the need for even greater production in the longer run period ahead, and to desirable adjustments in production.

Some indication of the dimensions of the production job during the next few decades can help to provide broad guides for more effective programming of production research. This is the chief purpose of the present report. No attempt has been made to "forecast" either the size of the production job in prospect or the actual volume of farm output that may be forthcoming. Rather, for purposes of analysis, projections were made of the composition and the total volume of farm production needed under favorable economic conditions. These projections of production approach the upper limit of what might be needed. The projections of production that may be needed are based on specific assumptions regarding growth in population, increase in consumer incomes, and trends in consumer preferences for farm products. Essentially, the future production levels that are projected reflect potential market requirements under conditions of full employment and favorable demand for farm products in a peacetime economy. Obviously, many unforeseen factors, both economic and noneconomic, may change the picture in the years ahead. In this event, a quite different volume and composition of production needs would result.

This analysis of the job ahead, measured against the background of past trends in production and the factors that underlie these trends, points up the broad outline of the adjustments that may be needed to balance farm production with changing market demand in the years ahead.

Changes in technology and economic forces dominate a growing economy. As a result, appraisals of future prospects for farm production may soon become out of date. Consequently, analyses such as those presented here need to be a continuing activity if they are to serve their maximum usefulness.

Sherman E. Johnson
Director, Farm and Land Management
Research

FARM OUTPUT

Past Changes and Projected Needs

by

Glen T. Barton and Robert O. Rogers
Agricultural Economists
Production Economics Research Branch
Agricultural Research Service

SUMMARY AND CONCLUSIONS

In the past, use of improved technology has assured growth in output from United States farms sufficient to meet increasing market demands for farm products. The record on this score was especially noteworthy when demand rose sharply during World War II and the years immediately following. Farm output during the last few years has exceeded market requirements. But further growth in the population of the United States and rising consumer incomes will mean increasing needs for farm products. The past record would indicate that these increased future needs can be met relatively easily. The difficulties that may be encountered, however, will depend partly on the size of the job ahead.

The chief purpose of this report, here summarized, is to describe and analyze the size of the production job ahead for our farmers. The estimates of future production needs used in the analysis are based on projections of potential demands for agricultural products in 1960 and 1975 under specific assumptions regarding growth in our economy and the upward trend in our population. This report is one of several already published or planned from a series of studies on longtime prospects for agriculture initiated in the United States Department of Agriculture and designed primarily to provide guides for production research programming.

The volume of farm output needed in 1975 may be about a third larger than the output in 1951-53. Annual increases required in farm output between the two dates may be half again as large as occurred during the long-run period, 1910-12 to 1951-53, and about a fifth greater than the post-World War II annual increase registered from 1944-46 to 1951-53.

The shift in source of farm power since World War I has resulted in significant increases in output of farm products for human use. Replacement of farm horses and mules by tractors and other motor vehicles

has released 70 million acres of cropland and large quantities of other resources to production of agricultural commodities for human use. This means of increasing our output will be insignificant in the future. Consequently, if in comparing the annual size of the job ahead with past performance, we leave out the direct effects of changes in source of farm power, the future job per year could be nearly double the performance attained since 1910 and in the post-World War II period and more than 3-1/2 times the annual increase registered during the interwar period of the 1920's and 1930's.

Our projected needs for livestock production in 1975 may be about 45 percent above production in 1951-53. Increases needed in production of meat animals and of poultry products may be greater than the increases needed in production of milk. The future annual step-up needed for livestock production as a whole, and for meat animals and poultry and eggs, might be considerably greater than the long-term and post-World War II annual increases, although only a half to two-thirds as great as the rapid average annual upswing experienced during World War II.

The projections call for an increase in total crop production of a fourth from 1951-53 to 1975. Pasture output may need to be upped by more than a third. The size of the job ahead varies considerably among crop groups. The substantial increase in needs for livestock production is reflected in the projections for feed grains, hay, pasture, and soybeans - presently our chief source of protein feed for livestock. Increases of about a third or more from 1951-53 to 1975 might be needed for all these crops.

Substantial downward adjustments in production of food grains may be required. Only a moderate increase in production of cotton may be needed. Additional increases needed in production of truck crops and fruits may be of about the same order of magnitude as those for feed crops.

Yearly future additions to our overall crop production from 1951-53 to 1975 may be about one-half greater than the long-term and a third greater than the post-World War II average annual performance, but only a little more than half as great as the rapid annual step-up during World War II. The size of the job, by past standards, varies considerably among crop groups. Production of feed grains, for example, may need to increase each year at about 5-1/2 times the long-term annual increase. The future job in production of hay and forage also may be substantial - twice the long-term yearly additions and greater than that during World War II. Yearly additions required for fruit production may exceed the average performance in the various historical periods

used for comparison.

Our future requirements for crop and pasture production can be attained through a combination of several factors, including: (1) Shifting of acreages among crops, (2) adding to cropland and pastureland area, and (3) increasing production per acre. If we assume that the yields of crops and pasture in 1975 will be the same as in 1951-53, an addition of more than 150 million acres of cropland equivalent may be needed to fulfill production requirements. Land economists have projected a net increase in cropland of approximately 25 million acres between 1951-53 and 1975. Thus, about five-sixths of our additional needed production may have to be obtained from greater output per acre, or from other technological improvement.

If no additions are made to our cropland base, the yearly increase needed in crop production per acre might be more than double that experienced in the long-term and post-World War II periods. It might be three times the average increase experienced in the interwar period, but less than two-thirds as large as during World War II.

There are marked differences in the probable timing of our future production needs. Generally, the annual increases required in the longer run period ahead (1960 to 1975) may be substantially greater than those needed in the intermediate period (1951-53, or 1955, to 1960). The relatively small increase needed in farm output during the intermediate period is largely due to the fact that farm output was in excess of market requirements in 1951-53 and 1955. Also, the projections of needed production assume that accumulated stocks will be worked off before 1960; if this is not the case, production needs in 1960 could be less than projected.

Several implications for production research programming are suggested by the analyses in this report. Under projected conditions there would be need for continuing efforts to maintain or to increase crop yields. This would appear to be necessary even in the case of crops for which moderate increases, or decreases, in production requirements are projected, as the acreage of cropland released thereby might well be needed to fulfill production needs for other crops.

Differences in timing of future production needs also provide some tentative guides to production research programming. Analysis of the data suggests that current emphasis should be placed on solution of problems in connection with production adjustments and acreage diversion in the immediate period ahead. At the same time, additional research is needed to provide a further basis for efficient increases in

production. The relatively greatest need for increasing crop and pasture yields may occur in the longer run period after 1960. Apparently, special emphasis should be placed on hay and forage crops. Raising of hay and pasture yields appears to be a particularly challenging problem when judged against the past performance of these crops. These improvements are necessary to provide the basis for expanded livestock production. More efficient conversion of feeds through livestock is a part of the challenge of providing the additional meats and livestock products needed in the decades ahead.

The difficulties that will be encountered in meeting future production needs will depend on several factors. The size of the future production job appears to be large when judged by past performance. However, there are indications that technological developments encouraging more intensive agriculture are becoming of increasing importance. Further use of commercial fertilizer, supplemental irrigation, and other presently known improved practices can result in a substantial step-up in farm output. The important questions may revolve around how rather than whether we can meet production requirements in the years ahead. A study is underway that will throw additional light on the possibilities of increasing crop yields on the basis of present technology. Increased efficiency in the use of feed by livestock can result in gains equivalent to raising yields or adding cropland or pasture acres. It is planned to explore also the possibilities of increasing production via this route.

Obviously, the first task of production research is to provide farmers with the technological know-how necessary in meeting production needs. In addition to fulfilling this obligation, however, a major problem in the period ahead will lie in the development of techniques that will continue to enable farmers to meet production requirements with decreasing costs per unit in terms of labor, land, and other production resources. A third obligation is the provision of economic guides as to the most profitable adjustments for farmers in meeting changing market requirements.

BACKGROUND INFORMATION

Farmers in the United States have an excellent record in meeting the Nation's need for food, fiber, and tobacco (fig. 1). Their quick response to the stepped-up demands during World War II and the postwar years was especially noteworthy. Remarkable increases in farm output have occurred in the last few years. Output in 1955 was 12 percent above output in 1947-49, and 4 percent above the previous record of 1954. Much of the rise in output is explained by greater crop yields. Improved technology is still exerting an upward pressure on both yields and total output.

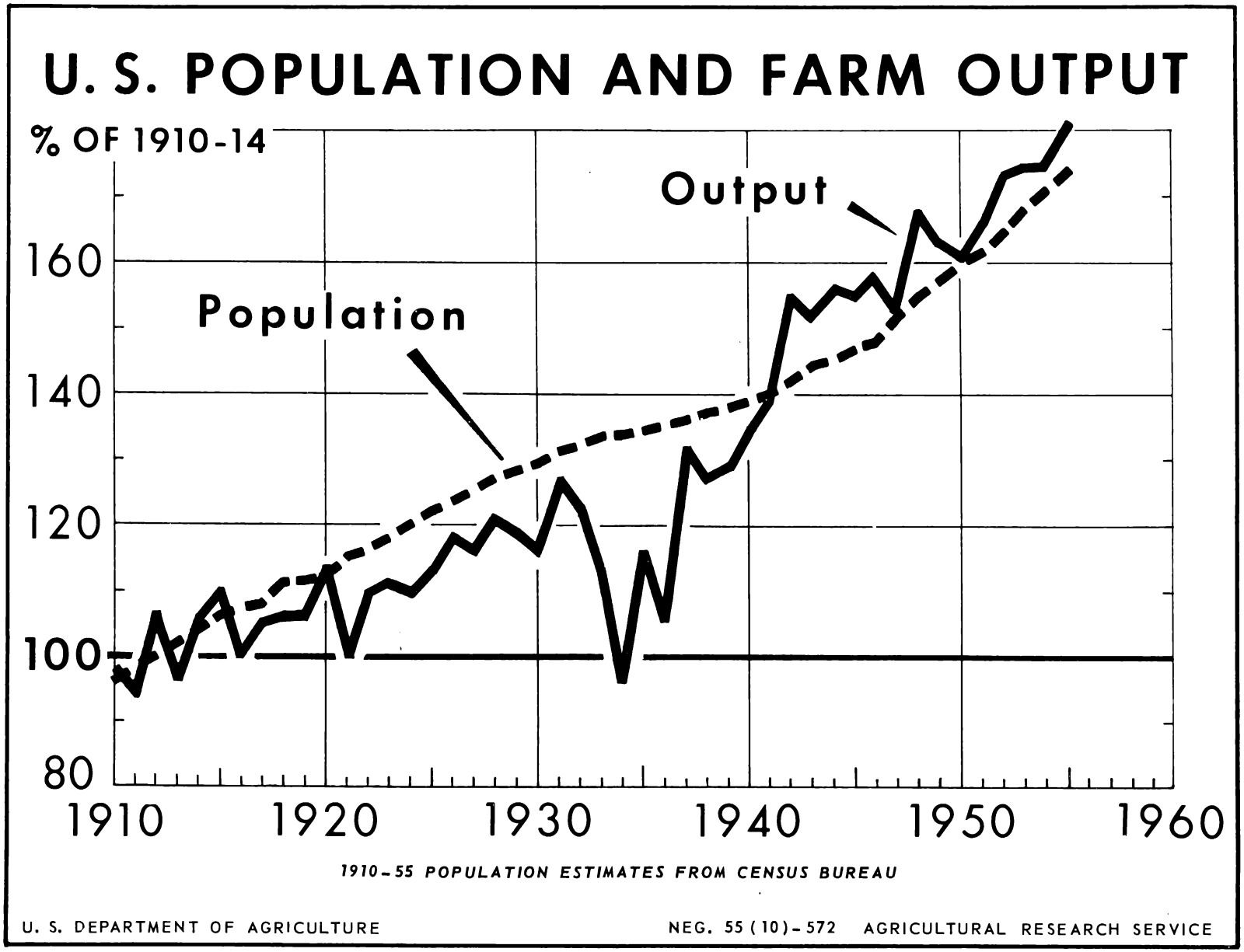

U. S. POPULATION AND FARM OUTPUT
% OF 1910-14
Output
Population
160
140
120
100
80
1910
1920
1930
1940
1950
1960
1910-55 POPULATION ESTIMATES FROM CENSUS BUREAU
U. S. DEPARTMENT OF AGRICULTURE
NEG. 55 (10)-572 AGRICULTURAL RESEARCH SERVICE

Figure 1

The total flow of products from farms during the last few years has been more than enough to meet market demands. However, the current "surplus" problem should be viewed in proper perspective. As the surplus production is concentrated in relatively few products, the problem is largely one of achieving a better balanced production. In the aggregate, our annual farm output during the last few years probably has exceeded market requirements by less than 5 percent on an average. A year of generally unfavorable weather or a sudden spurt in emergency demand could change the picture quickly. Moreover, continued rapid growth in population and income will increase the longer term demand for farm products.

Research and the resultant flow of improved technology have been basic to the excellent production record of our farmers. The role of research is likely to be even more important on this score in the future. What is the magnitude and nature of the production job ahead for farmers in the United States during the next 20 years? What are the chief obstacles to doing the job that research can help farmers overcome? This study should help to provide answers to these questions.

The studies of long-term prospects for agriculture that are underway in the U. S. Department of Agriculture are designed primarily to provide a factual background for production research programming at national, regional, and commodity levels. Particular emphasis is given to the evaluation of production prospects and projected requirements.

Considerable progress has been made on four phases of the work: (1) Projections have been made of potential requirements for farm products in 1960 and 1975 under specific assumptions regarding future levels of economic activity. 1/ (2) Research workers in the Agricultural Research Service have made projections of probable changes in the acreages of cropland and pastureland under the same economic assumptions. 2/ (3) This report evaluates future production requirements in terms of acreage and yield requirements for individual products and groups of products. (4) Work on farm production potentials also is underway.

1/ The results of this work are reported in The Long-Run Demand for Farm Products, by Rex F. Daly, Agr. Econ. Res. v. 8, No. 3, July 1956.

2/ Wooten, Hugh H., and Anderson, James R., Agricultural Land Resources in the United States - With Special Reference to Present and Potential Cropland and Pasture. U. S. Dept. Agr., Agr. Inform. Bul. 140, June 1955.

Thus far, it has centered chiefly on development of estimates of increases in crop yields that are economically attainable from presently known technology. Plans also call for development of similar estimates of economically attainable increases in production per animal and in efficiency in use of feed by livestock. The results of work on these four phases of the project will make possible a comparison of production possibilities with projected requirements for farm products. An analysis of this comparison should reveal some of the likely problem areas where need for development of new technology is relatively greatest. It should reveal also the major types of production-adjustment problems that lie ahead.

The chief purpose of this report is to measure the size of the future farm production job. Projected requirements for farm products are expressed in terms of farm production units for individual products, and groups of products are aggregated in terms of index numbers. The possible impacts on farm production resources are measured against the background of historical trends and changes.

Assumptions Used in Making Projections

Information regarding the size of the production job ahead presented here relies on projections of market requirements for farm products based on specific assumptions. The data are in no sense forcasts. The conditions assumed are considered reasonable, but many forces, economic and noneconomic, might enter the picture to modify growth in demand. Population may well increase at a faster rate than was assumed, for example. Exports may provide a smaller or a larger market for our farm products than was assumed. The assumptions used in projecting the demand for farm products and the nature of the projections should be clearly understood in order to interpret properly the results presented in this report. The significance of the 1975 date used in making the projections should be recognized in appraising the size of the future production job. No doubt even greater needs for farm products may arise from additions to our population in the years beyond 1975. These increased needs would provide a further challenge to production research.

Some major assumptions used in the demand projections and some of the more important conclusions follow: 3/

3/ For more details regarding assumptions, see footnote 1, page 5.

(1) Most detailed projections assume that United States population in 1975 will reach a level about a third greater than in 1951-53. 4/ Compared with the average for 1951-53, by 1960 the population may increase by more than 10 percent.

(2) The growth in the economy and the rise in productivity might result in real consumer income per capita in 1975 almost two-thirds greater than in 1951-53. This increase in real income could raise per capita consumption of farm products and could modify the types of products in greatest demand. The rate of change in per capita consumption and the degree of substitution of some products for others may vary considerably among different farm products, however.

(3) The level of prices and price relationships that existed in 1953 are generally assumed for 1975. Further, it is assumed that there will be no major wars or economic depressions between now and 1975.

(4) No major changes are projected in the level of exports and imports of farm products. However, a fairly high level of trading is assumed.

(5) Various relationships that existed in the 1951-53 period also are held constant. From the standpoint of the present report, the more important of these are livestock productivity, efficiency of feed use by livestock, sources of feed, and seeding rates. In general, probable supply response is not considered in projecting the demand for farm products.

The assumption that the efficiency of feed use by livestock would be the same as in 1951-53 in effect increases the magnitude of production needs projected for 1960 and 1975. Fuller use of presently known technology undoubtedly could result in increases in efficiency of feed use and hence could reduce the need for feed crops below the levels projected.

4/ This is based on the Series "C" projection of the Bureau of the Census reported in Current Population Reports, Series P-25, No. 78, August 21, 1953. In a subsequent report, Series P-25, No. 123, October 20, 1955, projections of 1975 population were increased moderately. The analysis in this report is based on the Census projections of 1953. The probable effect of the upward revision in population on conclusions reached is discussed in a later section.

TOTAL FARM OUTPUT

The projected requirements for farm products for 1975 could mean a volume of farm output about a third greater than in 1951-53 (fig. 2). To meet projected requirements, production of livestock and livestock products may have to rise to a level approximately 45 percent above the 1951-53 average and crop production might need to increase by a fourth (table 1). Further reduction in number of horses and mules on farms would occur, but compared with past changes this would be a minor influence.

Table 1. - Farm production needed to meet projected requirements in 1975, and related data, United States 1/

Item	Unit	Average 1951-53	1955 2/	Projected 1975	Percentage change - 1951-53 to 1975	Percentage change - 1955 to 1975
					Percent	Percent
Farm production:						
Total farm output	Index 3/	106	112	142	34	27
All livestock and livestock products 4/	do	112	122	162	45	33
All crops	do	102	105	128	25	22
Feed used by farm horses and mules 5/	do	65	46	21	-68	-54
U. S. population	Millions, July 1	157	165	207	32	25

1/ For an explanation of indexes used here and elsewhere in the report, see Changes in Farm Production and Efficiency, U. S. Dept. Agr., Agr. Res. Serv. ARS 43-15, June 1955.

2/ Preliminary.

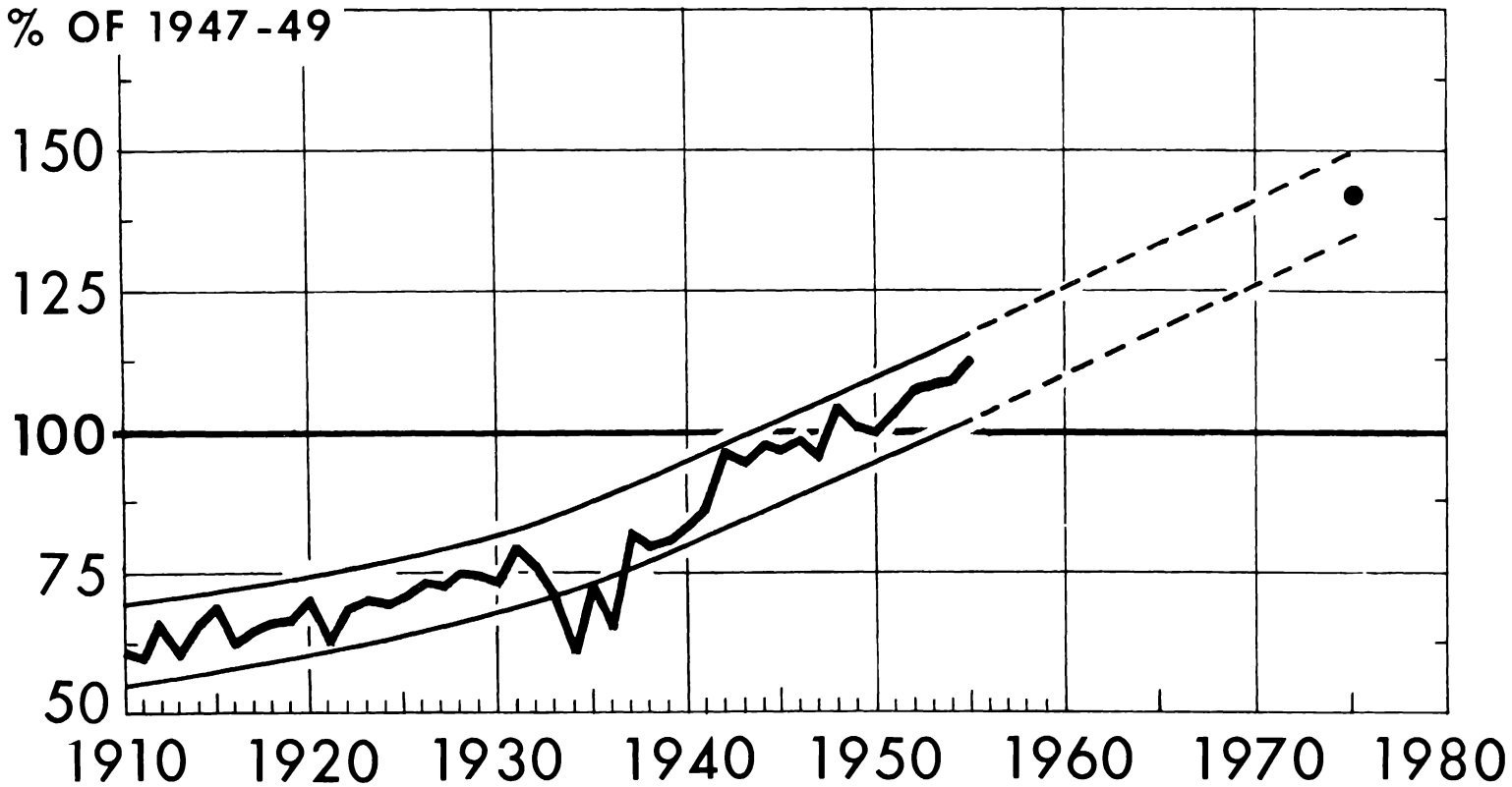
3/ 1947-49=100.

4/ Excludes horses and mules.

5/ Hay and concentrates only. Not included in total farm output.

FARM OUTPUT

Past Trends and Potential Needs *



SOURCE: AGRICULTURAL MARKETING SERVICE AND AGRICULTURAL RESEARCH SERVICE COOPERATING

* ASSUMING U. S. POPULATION INCREASE OF ABOUT ONE-THIRD AND AN INCREASE IN AVERAGE PER CAPITA CONSUMPTION OF ABOUT A TENTH FROM 1951-53 TO 1975.

U. S. DEPARTMENT OF AGRICULTURE NEG. 56(5)-914 AGRICULTURAL RESEARCH SERVICE

Figure 2

In table 1, and in many of the tables that follow, data for 1954 or 1955 are given as a point of reference. However, little or no attention is given to the data for these years in the analysis, as the average for the period 1951-53 probably represents a more stable base from which to measure the magnitude of the projections. Use of a single year, such as 1954 or 1955, as a basing point can give a distorted picture because of the undue influence of weather and other factors on yields and production in any given year.

The increase in farm output by 1975 may be only slightly greater, percentagewise, than the increase projected in the population, despite a projected increase of about a tenth in per capita consumption of farm products. Output could rise at about the same rate as U. S. population for two main reasons. First, our annual farm output in 1951-53 exceeded requirements for farm products in that period by somewhat less than 5 percent. Second, the projected percentage increase in volume of exports is not as great as the percentage increase in the U. S. population.

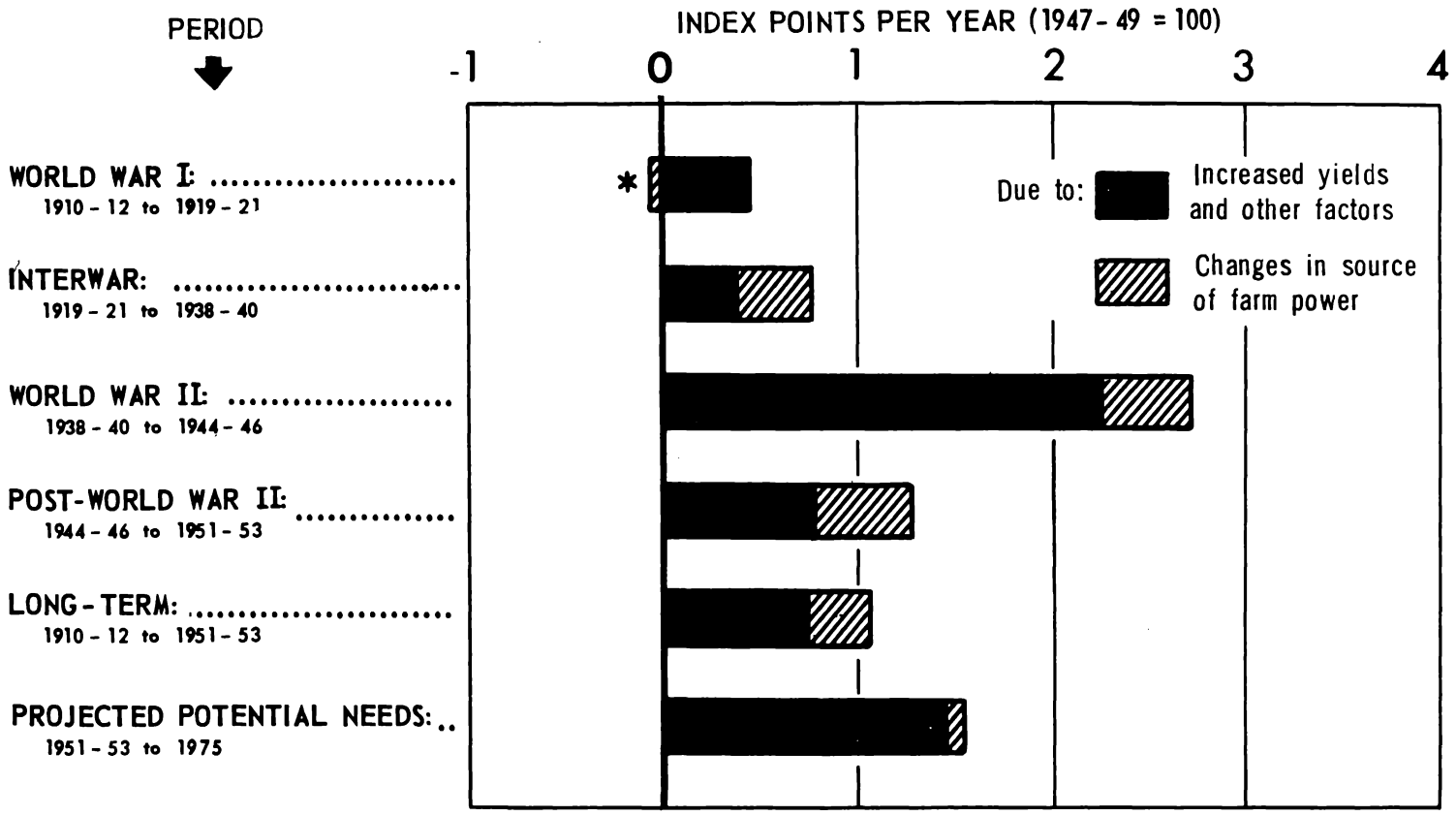
The size of the job ahead does not appear large if it is compared with the remarkable rise in farm output in recent years. Output increased by 6 points from 1951-53 to 1955 (table 1). The step-up in this 3-year period was one-sixth of the increase projected as needed during the 23-year span from 1951-53 to 1975. Although 1955 was a relatively favorable production year from the standpoint of weather and other factors, there can be little doubt that improved technology was a dominant factor in the record output.

The size of the future production job of farmers can be further visualized if it is compared with historical changes in farm output (fig. 3). The annual increase in total farm output needed between 1951-53 and 1975 may be almost half again as great as the average long-term rate of increase since 1910. It may be about a fourth higher than the post-World War II rate, but less than 60 percent of the peak rate of increase during World War II.

A more accurate measurement of the size of the job ahead can be made if account is taken of the important contribution that farm mechanization has made to our past increases in volume of farm output. As tractors and other motor vehicles replaced horses and mules as a source of farm power, millions of acres of cropland and pastureland and other production resources were diverted from raising, feeding, and maintaining draft animals to the production of agricultural commodities for human use. As can be seen from the data in table 2, this change in source of farm power was responsible for half the increase in farm output during the interwar period and nearly 40 percent of the increase

Past Attainment and Potential Needs

ANNUAL CHANGES IN FARM OUTPUT



*INCREASE IN HORSES AND MULES RESULTED IN OUTPUT DECREASE

U. S. DEPARTMENT OF AGRICULTURE NEG. 56(5)-2148 AGRICULTURAL RESEARCH SERVICE

Figure 3

Table 2. - Average annual change in farm output and total population, United States, specified periods and 1975 projections

Period	Farm output 1/			U. S. population
	Total	Contribution of-		
		Direct effects of changes in source of farm power 2/	Other factors	
	Index points	Index points	Index points	Millions
World War I:				
1910-12 to 1919-21	0.44	3/ -0.06	0.50	1.44
Interwar:				
1919-21 to 1938-40	.77	.39	.38	1.28
World War II:				
1938-40 to 1944-46	2.72	.46	2.26	1.45
Post-World War II:				
1944-46 to 1951-53	1.29	.51	.78	2.47
Long-term:				
1910-12 to 1951-53	1.07	.32	.75	1.54
Projection:				
1951-53 to 1975	4/ 1.55	.10	1.45	5/ 2.17

1/ Changes in output are measured in index points, with the average of the years 1947-49 taken as a base period, or 100 points. This provides a measure of absolute change.

2/ Contribution of transfer of cropland and other production resources from feeding and maintenance of farm horses and mules to production for market.

3/ The number of horses and mules on farms increased during this period.

4/ Increase in output needs.

5/ Assumed increase in population.

during the post-World War II period.

Horses and mules are rapidly fading from the farm scene. Their numbers have been reduced from 26 million in 1919-21 to about 4.5 million in 1955, releasing 70 million acres of cropland for production for market (table 3).

Table 3. - Horses and mules on farms and acreage of harvested crops used for producing their feed, United States, specified periods 1910-55, and 1975 projections

Period	Horses and mules on farms, January 1	Acreage of harvested crops used for producing horse and mule feed 1/
	Millions	Millions
1910-12	24.8	74
1919-21	25.8	80
1938-40	14.8	44
1944-46	11.9	31
1951-53	6.3	15
1955 2/	4.6	10
Projected 1975	2.0	4

1/ Acreage used for producing hay and concentrates for horses and mules on farms.

2/ Preliminary.

For purposes of the demand projections, it is assumed that horses and mules on farms in 1975 will total about 2 million. Thus, further release of production resources because of the shift in the source of farm power will be a nominal factor in increasing farm output in the years ahead. Production of our needed additions of food, fiber, and tobacco must be based on other factors. In the past, these factors have included increases in yields of crops and livestock and additions to our cropland area.

The production job ahead looms much larger when it is measured in terms of factors other than the direct effects of change in the source of farm power (col. 3, table 2). On this basis, the size of the future

job per year could be nearly twice as great as for the long-term and post-World War II periods and nearly two-thirds as large as during World War II. Although the size of the job ahead appears to be large when judged by past performance, it does not necessarily follow that obtaining the needed production will be more difficult in the future than in the past. There are some indications that further use of commercial fertilizer, supplemental irrigation, and other known improved practices can provide the basis for a substantial step-up in farm output. 6/ An analysis of our future production potential will be the subject of a subsequent report.

LIVESTOCK PRODUCTION

A marked increase in the need for livestock production is the dominating feature of the pattern of the production job ahead (fig. 4). Relatively greater production of food in the form of meat and livestock products means relatively greater use of farm production resources. More land, labor, and other production goods and services are required to meet food needs in the form of livestock and livestock products than in the form of direct crop foods. The influence of the increased demand for livestock production on the pattern of crop needs and its potential impact on our cropland and pastureland resources are analyzed in the section that follows.

Projected increases in production of livestock and livestock products vary considerably by kinds of livestock (table 4). Compared with 1951-53, we may need to increase by about 50 percent or more the production of cattle and calves, and poultry products. Projected increases for sheep and lambs are the lowest in the meat-animal group. Needed additions to hog production could total about 40 percent of 1951-53. Production requirements for milk might be only about one-third larger than in 1951-53.

Several things should be kept in mind in appraising the significance of the differences in increased needs among the various kinds of livestock. Production of milk exceeded market requirements in 1951-53, for example. Consequently, the needed increase in production of milk is less than the step-up in market requirements. A fairly high degree

---

6/ See, for example, Agriculture's Capacity to Produce - Possibilities Under Specified Conditions, U. S. Dept. Agr., Agr. Inform. Bul. 88, June 1952.

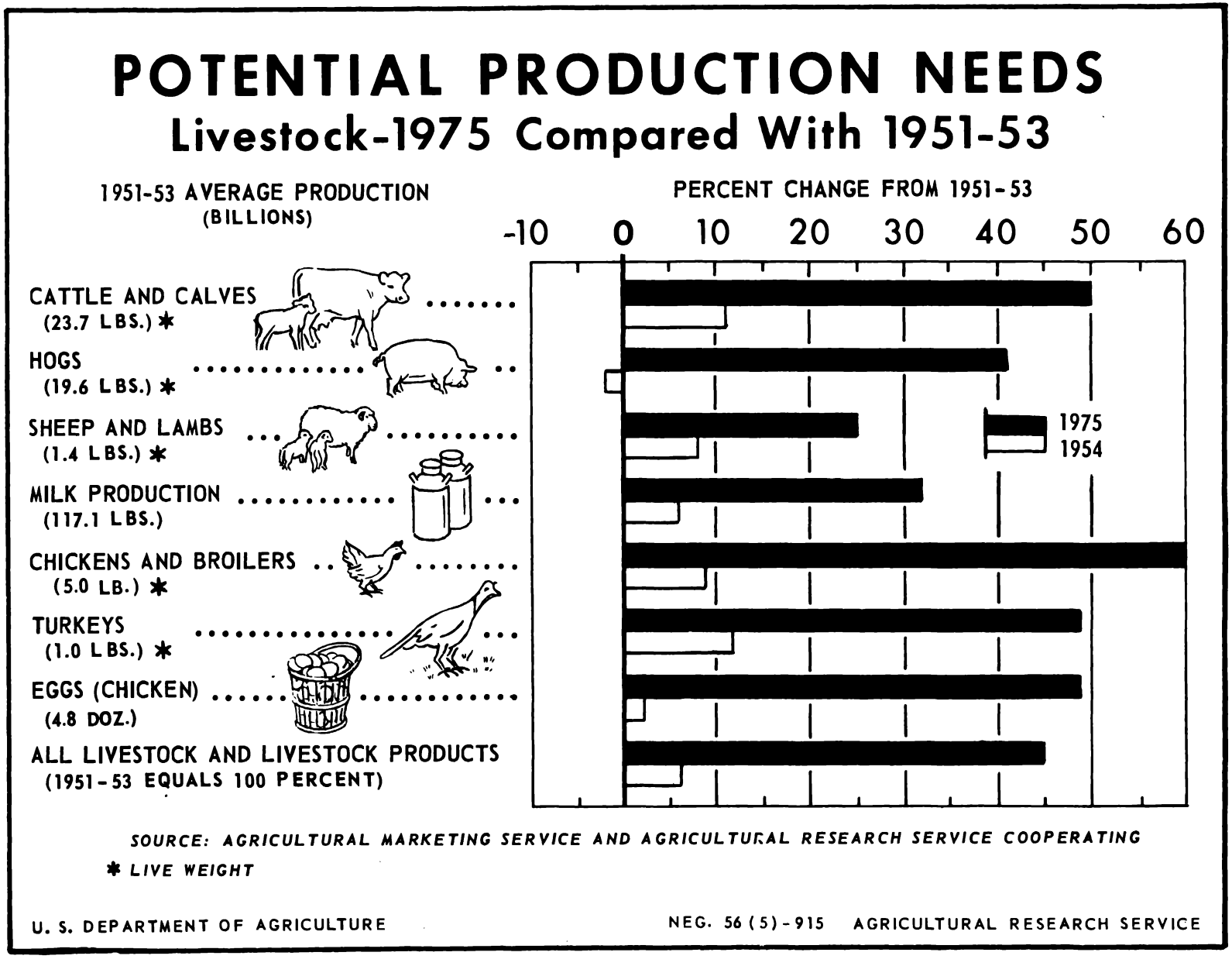

POTENTIAL PRODUCTION NEEDS
Livestock-1975 Compared With 1951-53
1951-53 AVERAGE PRODUCTION
(BILLIONS)
PERCENT CHANGE FROM 1951-53
-10
0
10
20
30
40
50
60
CATTLE AND CALVES
(23.7 LBS.) *
HOGS
(19.6 LBS.) *
SHEEP AND LAMBS
(1.4 LBS.) *
MILK PRODUCTION
(117.1 LBS.)
CHICKENS AND BROILERS
(5.0 LB.) *
TURKEYS
(1.0 LBS.) *
EGGS (CHICKEN)
(4.8 DOZ.)
ALL LIVESTOCK AND LIVESTOCK PRODUCTS
(1951-53 EQUALS 100 PERCENT)
1975
1954
SOURCE: AGRICULTURAL MARKETING SERVICE AND AGRICULTURAL RESEARCH SERVICE COOPERATING
* LIVE WEIGHT
U. S. DEPARTMENT OF AGRICULTURE
NEG. 56(5)-915 AGRICULTURAL RESEARCH SERVICE

Figure 4

Table 4. - Change in production needed to meet projected requirements for livestock products in 1975, and related data, United States

Item	Unit of production	Average 1951-53	1954 1/	Projected 1975	
				Change from 1951-53	Change from 1954
				Percent	Percent
Meat animals:	Mil. lbs.				
Cattle and calves	liveweight	23,669	26,156	50	36
Sheep and lambs	do	1,398	1,510	25	16
Hogs	do	19,567	19,085	41	44
Milk production	Mil. lbs.	117,062	123,502	32	25
Poultry and eggs:					
Chicken eggs	Mil. doz.	4,833	4,908	49	47
Broilers and chickens	Mil. lbs.	5,044	5,520	60	46
Turkeys	do	975	1,091	49	33
All livestock and livestock products 2/	Index 3/	112	119	45	36

1/ Preliminary.
2/ Excludes horses and mules.
3/ 1947-49=100.

of substitution among meats and other livestock products is possible, and this reduces the precision with which specific potential needs can be projected. Finally, it is difficult to pick any one year or any short period as a base that reflects average or "normal" relationships in production among all the different kinds of livestock.

The latter point is illustrated when the 1954 position on livestock production is compared with the position in 1951-53. Wide variations from the 1951-53 base may be reflected in nearly any single year as the general level of productivity moves up. The 1954 production of cattle and calves, for example, was "abnormally" high, mainly because of our position in the cattle cycle.

Attainment of livestock production projected for 1975 would call for an annual increase, from 1951-53 to 1975, two-thirds as large as occurred during World War II (table 5). The annual job may be more than twice

Table 5. - Average annual change in livestock production, United States, specified periods and 1975 projections 1/

Period	All livestock and livestock products 2/	Meat animals	Poultry and eggs	Milk
	Index points	Index points	Index points	Bil. lbs.
World War I: 1910-12 to 1919-21	0.51	0.44	0.26	3/
Interwar: 1919-21 to 1938-40	.97	.72	.95	3/
World War II: 1938-40 to 1944-46	3.27	3.28	5.72	1.81
Post-World War II: 1944-46 to 1951-53	1.29	1.47	2.53	4/ -.16
Long-term: 1910-12 to 1951-53	1.26	1.16	1.76	3/
Projected production needs: 1951-53 to 1975	2.14	2.23	2.75	1.61

1/ See table 2, footnote 1.
2/ Excludes horses and mules.
3/ Data not available.
4/ Production of milk decreased during this period.

that recorded in the interwar period, and about two-thirds greater than in both the long-term and post-World War II periods.

The average yearly increase needed by 1975 in production of poultry and eggs was exceeded in the World War II period. But the job ahead in poultry production is large when compared with either the interwar or long-term experience. The yearly step-up required in production of meat animals may be 3 times as great as during the interwar period and about twice the size of the average long-term job recorded. It might average only two-thirds of the sharp annual rise of World War II, however. But the sharp increase in that period was accomplished partly by reducing large feed inventories that had accumulated prior to World War II and by bringing additional acreages into production of feed grains that were under allotment programs during the early years of the period. These reserves would not be available for the longer range production job ahead.

The annual increase needed in production of milk from 1951-53 to 1975 may be almost 90 percent as great as the average yearly step-up recorded during the World War II period. The size of the job ahead contrasts sharply with experience during the post-World War II period, however. Total production of milk was actually lower in 1951-53 than in 1944-46. Increased requirements for consumption of fluid milk during this period were met by a shift in utilization of the milk produced, an increasing proportion of which was marketed as whole fluid milk. The shift in utilization of milk also was a significant factor in meeting the stepped-up demand for whole fluid milk during World War II.

The projected increases in production of milk and cattle also are likely to call for a greater increase in acreage or yields of pasture and forage than in the past. Possibilities for the easy substitution of productive livestock for horses and mules will not be available to the same extent.

An additional aspect of the job ahead in livestock production is the need for increasing the efficiency with which farm labor is used on livestock enterprises. In the past, livestock production per man-hour has risen at a much slower rate than has crop production per man-hour (fig. 5). Further reductions in labor requirements can be an important means of meeting projected production needs for livestock with increasing efficiency in use of production resources.

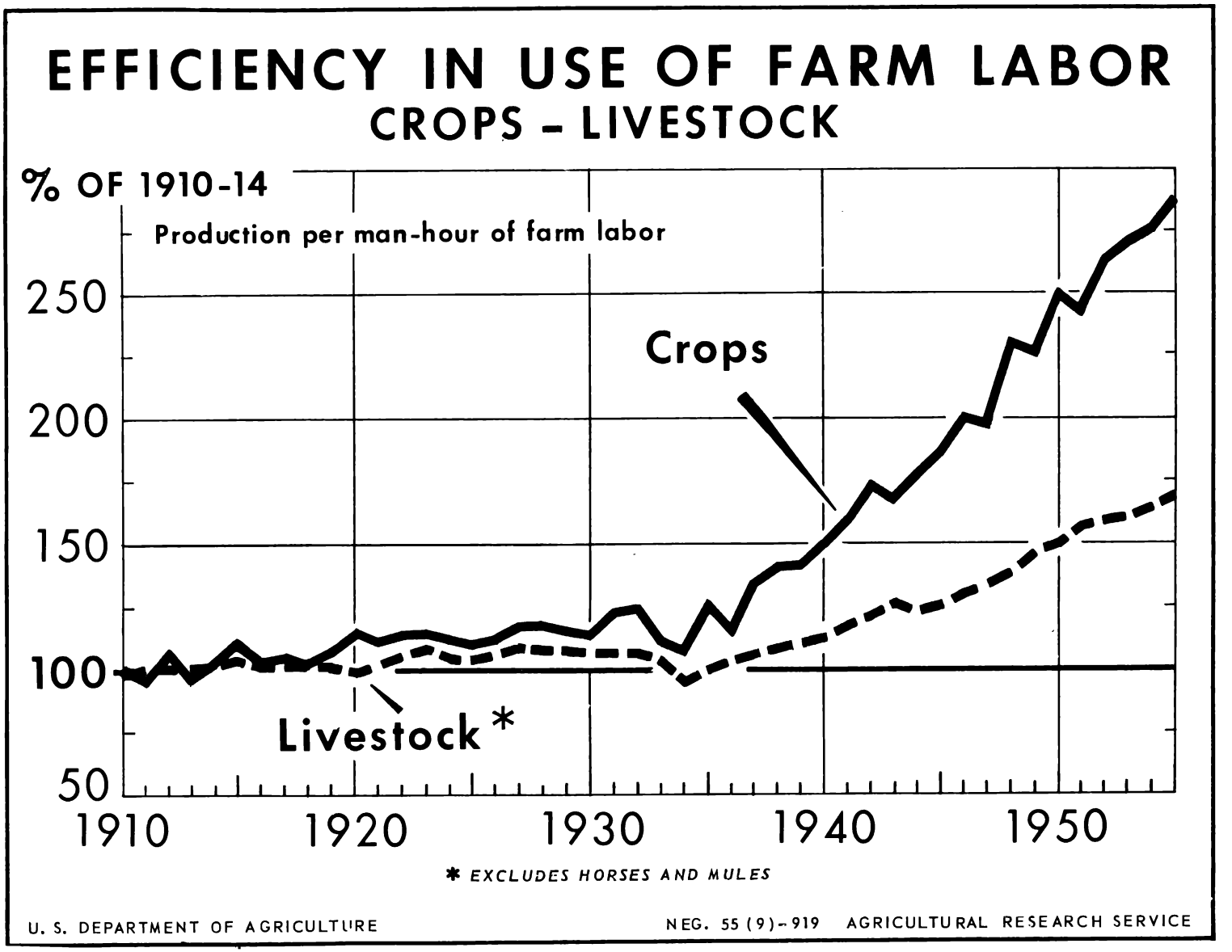

EFFICIENCY IN USE OF FARM LABOR
CROPS - LIVESTOCK
% OF 1910-14
Production per man-hour of farm labor
250
200
150
100
50
Crops
Livestock *
1910
1920
1930
1940
1950
* EXCLUDES HORSES AND MULES
U. S. DEPARTMENT OF AGRICULTURE
NEG. 55 (9)-919 AGRICULTURAL RESEARCH SERVICE

Figure 5

CROP AND PASTURE PRODUCTION

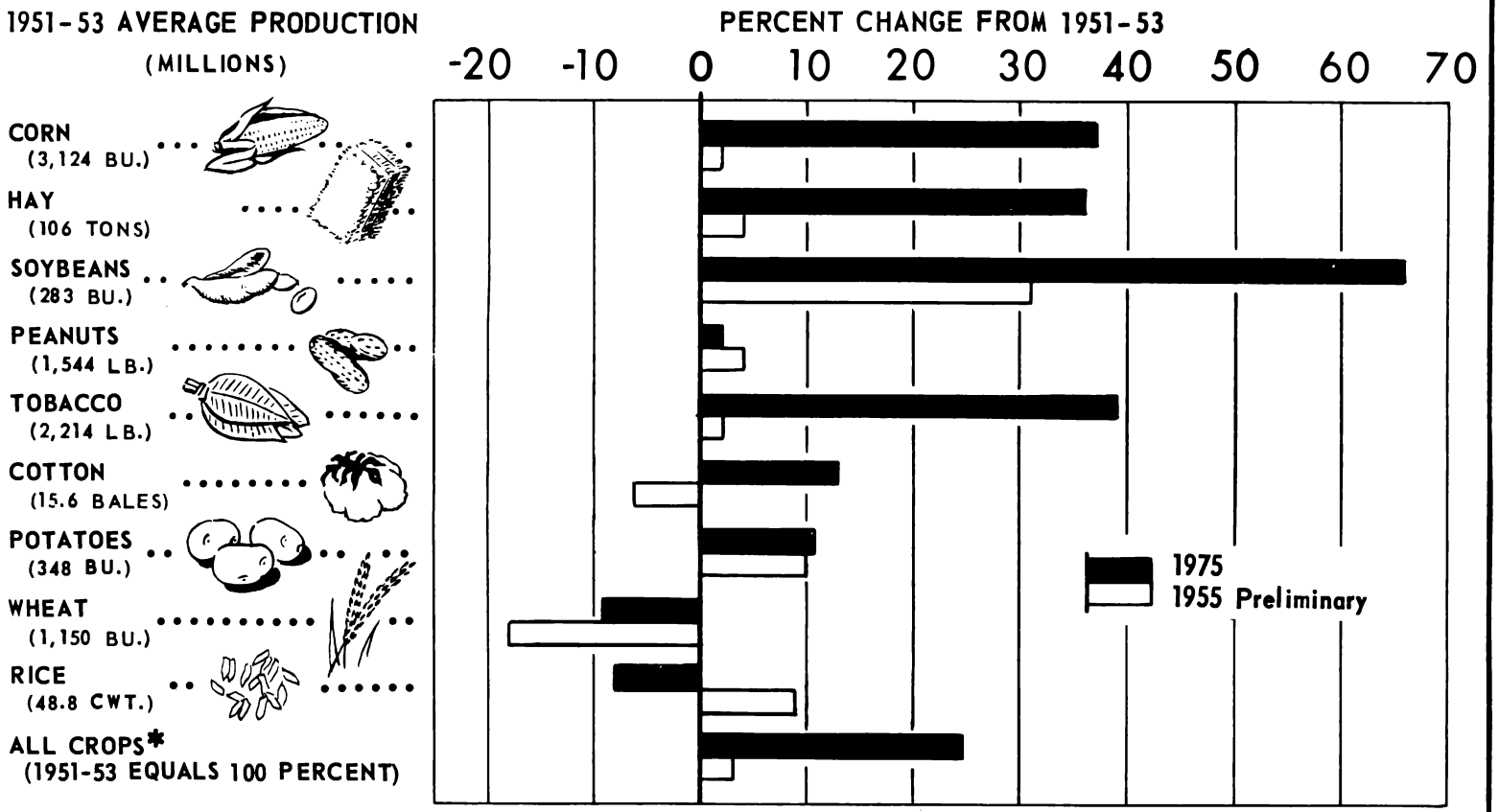
As indicated previously, total crop production projected as needed in 1975 is about 25 percent above actual production in 1951-53. The corresponding increase projected for livestock production is around 45 percent. The smaller rise projected for crops is partly explained by differences between crops and livestock in the extent to which production exceeded market requirements in 1951-53. Variation in the relative amount of "surplus" production in 1951-53 also partly accounts for variations among individual crops with respect to increases needed in production (fig. 6 and table 6). Stepped-up demands for livestock and livestock products are reflected in the substantial increases in need for production of feed crops. The additional outturn of corn needed may be more than a third greater than production in 1951-53. Hay and pasture production may need to be upped by about the same proportion. A part of the increased need for corn might be met by greater expansion of other feed grains, such as barley, oats, and grain sorghums, than is indicated. Production of soybeans - presently our chief source of protein feed for livestock - may need to increase by around two-thirds between 1951-53 and 1975. This would imply relatively large supplies, and possibly large exports, of soybean oil. About half of the needed increase in soybean production had been recorded by 1955, partly as a result of acreage diversion programs from "surplus" crops. To the extent that other sources of high-protein feed are developed, these supplies would offset the need for increasing the production of soybeans.

Substantial increases in production of truck crops, fruits, and tobacco, 1951-53 to 1975, also are projected. On the other hand, production requirements in 1975 for the major food grains - wheat and rice - may be less than the production of 1951-53. Only moderate increases in production needs for cotton and potatoes may be called for. Changes in export demand could affect considerably the projected needs for wheat, rice, and cotton.

The variation among important groups of crops in the size of the production job ahead is further portrayed by the data in table 7. The average yearly increase in production of feed grains needed between 1951-53 and 1975 is 5-1/2 times the average annual long-term increase. The size of the job is substantial when measured against annual increases in any other period shown, except for the marked step-up during World War II. But the sharp increase obtained in the latter period was made possible partly because of more favorable weather and production controls that were in effect in the early years of the period.

POTENTIAL PRODUCTION NEEDS

Crops – 1975 Compared With 1951-53



SOURCE: AGRICULTURAL MARKETING SERVICE AND AGRICULTURAL RESEARCH SERVICE COOPERATING

**INCLUDES ESTIMATED NEEDS FOR ALL CROP PRODUCTION EXCEPT PASTURE*

U. S. DEPARTMENT OF AGRICULTURE NEG. 56 (5) - 916 AGRICULTURAL RESEARCH SERVICE

Figure 6

Table 6. - Change in production needed to meet projected requirements for crops and pasture in 1975, and related data, United States

Item	Unit of production	Average 1951-53	1955 1/	Projected 1975	
				Change from 1951-53	Change from 1955
				Percent	Percent
Feed grains:					
Corn, all	Mil. bu.	3,124	3,185	37	34
Oats	do	1,264	1,576	29	4
Barley	do	241	391	40	-14
Sorghum grain	do	118	233	2/ 105	4
Hay, all	Mil. tons	106	110	36	31
Oil crops:					
Soybeans for beans	Mil. bu.	283	371	66	26
Peanuts, picked and threshed	Mil. lb.	1,544	1,610	2	-2
Flaxseed	Mil. bu.	33.8	40.6	8	-10
Food grains:					
Wheat, all	Mil. bu.	1,150	938	-9	12
Rice (rough)	Mil. cwt.	48.8	53.4	-8	-16
Rye	Mil. bu.	18.5	29.2	19	-24
Vegetables:					
Potatoes	Mil. bu.	348	382	11	1
Sweetpotatoes	do	31	38	35	11
Beans, dry (cleaned)	Mil. lb.	1,590	1,729	5	-4
Peas, dry field (uncleaned)	do	326	279	-2	14
Truck crops 3/	Index 4/	110	112	43	40
Fruits and nuts	do	104	107	38	35
Tobacco	Mil. lb.	2,214	2,256	39	37
Cotton	Mil. bales	15.6	14.7	13	20
All crops	Index 4/	102	105	25	22
Pasture	Percent	100	5/	35	5/

1/ Preliminary.
2/ The large increase indicated for sorghum grain is due chiefly to the low production in 1952 and 1953.
3/ Excludes farm gardens.
4/ 1947-49=100.
5/ Data not available.

The job ahead in production of hay and forage could involve an annual increase about double the long-term change and slightly greater than the average rise during World War II. Production of oil crops (soybeans, peanuts, and flaxseed) may need to rise less per year than in the long-term and post-World War II periods and less than a third as much annually as during World War II.

The annual increase called for in production of fruits from 1951-53 to 1975 may exceed the increase attained in any period shown in table 7. Needed yearly additions to production of tobacco might be less than half those attained during World War II, but they could exceed annual increases recorded in the other periods. The job ahead in production of all vegetables appears to be moderate when compared with past performance. Downward adjustments in production of food grains from the 1951-53 level appear to be needed. The annual step-up required in cotton production from 1951-53 to 1975 may be more than twice the average long-term increase, but only about 10 percent as large as the yearly rise during the post-World War II period.

The size of the job ahead in total crop production is further described by the data in table 8. Overall, annual increases needed in crop production from 1951-53 to 1975 could exceed those attained in any period under consideration, except for the rapid spurt during World War II.

The last two columns of table 8 provide data on changes in crop production per acre and in cropland area - two routes by which our crop production can be increased. Net additions to our cropland base have been projected at a million acres a year between 1951-53 and 1975. This is equal to the rate of increase since pre-World War II. If the projected increase in cropland materializes, the average yearly increase needed in crop production per acre could be about half again as large as in the long-term and post-World War II periods, more than double the annual increase during the interwar period, but less than half that recorded during World War II. If it is assumed that the area of cropland in 1975 will be the same as in 1951-53, crop production per acre may need to increase at a substantially faster pace. As previously indicated, however, additional cropland could be made available if needed.

Based on available information, a bigger job is ahead in raising pasture yields than in upping crop production per acre. Little change in total acreage of pasture by 1975 has been projected. 7/ Thus, an average

---

7/ See Wooten, Hugh H., and Anderson, James R., footnote 2, page 6.

Average 7. - Average annual change in crop production by crop groups, United States, specified periods and 1975 projections 1/

Period	Feed grains	Hay and forage	Oil crops	Vege-tables 2/	Fruit and nuts	Food grains	Tobacco	Cotton
	Index points	Index points	Index points	Index points	Index points	Index points	Index points	Index points
World War I:								
1910-12 to 1919-21	0.51	1.86	0.07	0.81	-0.11	2.00	1.41	-2.18
Interwar:								
1919-21 to 1938-40	-.44	.47	1.74	1.23	1.65	-.24	.75	.44
World War II:								
1938-40 to 1944-46	2.78	1.62	6.45	2.33	1.50	3.50	4.07	-2.50
Post-World War II:								
1944-46 to 1951-53	-.10	-.14	2.71	-.90	.29	.76	1.00	5.57
Long-term:								
1910-12 to 1951-53	.30	.84	2.23	.93	1.01	.97	1.42	.31
Projected production needs:								
1951-53 to 1975	1.65	1.66	2.07	.81	1.76	-.34	1.87	.65

1/ See table 2, footnote 1.

2/ Includes farm gardens, as well as truck crops, potatoes, sweetpotatoes, dry beans, and dry peas.

Table 8. - Average annual change in crop production and related data, United States, specified periods and 1975 projections 1/

Period	Crop production	Crop production per acre 2/	Cropland used 3/
	Index points	Index points	Million acres
World War I: 1910-12 to 1919-21	0.63	-0.18	3.98
Interwar: 1919-21 to 1938-40	.35	.38	-.15
World War II: 1938-40 to 1944-46	2.07	1.88	1.00
Post-World War II: 1944-46 to 1951-53	.86	.57	.93
Long-term: 1910-12 to 1951-53	.75	.51	1.11
Projected production needs: 1951-53 to 1975	1.14	4/ .83	4/ 1.00
		5/ 1.17	5/ 0

1/ See table 2, footnote 1.

2/ An index of crop production per acre was derived by dividing the index of crop production by an index of cropland used for crops.

3/ Estimated acreage from which one or more crops were harvested plus acreage of crop failure and summer fallow. Cropland pasture not included.

4/ Based on cropland projections made by H. H. Wooten, and J. R. Anderson, table 21. See footnote 2, page 6.

5/ Assuming 1951-53 acreage.

increase in pasture yields of around 35 percent, as shown in table 6, may be called for to meet projected requirements for 1975. Data on past trends in pasture yields are not available. However, it appears that very little change in overall yield of pasture and range lands occurred between 1920 and 1950. Total acreage of all pasture and range lands decreased by about 5 percent between the two dates. 8/ Total pasture and range consumed by livestock, in terms of feed units, probably dropped by about the same proportion during the period. 9/ The apparent lack of change in overall yields during the period was likely the net result of divergent trends in yields of various classes of pasture and range land. Average yield of cropland pasture, for example, may well have increased.

Further insight into the magnitude and variation in the size of the production job ahead can be gained if we express 1975 production requirements, alternatively, in terms of needed yields and of needed acreage. The data in table 9 present the picture in terms of "required" yields. These are the yields that might be needed to meet projected production requirements if the acreage of each crop were maintained at the 1951-53 level.

Substantial increases in yields may be required for many crops, especially feed grains, hay, pasture, and soybeans. Required yields for 1975 could be below the 1951-53 average for others, notably the food grains.

The data presented in table 9 should be clearly understood. They portray the size of the job in 1975 under the assumption that production requirements will be met solely by increasing per acre yields. Actually, the job will be done by a combination of factors. These include additions to our cropland base and shifts in acreage among crops, as well as increases in yields per acre. For example, a necessary goal might be to push yields of some crops above the calculated "required" yield level. This might be needed to release acreage for production of other crops or pasture where greater difficulty is encountered in increasing yields to the required level.

Fulfillment of production needs in 1975 solely through increases in area of cropland and pasture would represent a sharp departure from

---

8/ See footnote 2, page 6, Wooten, Hugh H., and Anderson, James R., table 14, page 29 .

9/ Jennings, R. D., Consumption of Feed by Livestock, 1909-47. U. S. Dept. Agr. Cir. 836. Dec. 1949.

Table 9. - Crop production requirements for 1975, in terms of yields per harvested acre, and related data, United States

Item	Unit of yield	Average 1951-53	1955 1/	Projected 1975 2/	Change 1951-53 to 1975	Change 1955 to 1975
Feed grains:						
Corn, all	Bu.	38.7	39.8	52.9	14.2	13.1
Oats	do	33.2	38.5	43.0	9.8	4.5
Barley	do	27.5	27.4	38.6	11.1	11.2
Sorghum grain	do	18.0	18.5	36.9	18.9	18.4
Hay, all	Ton	1.43	1.48	1.94	.51	.46
Oil crops:						
Soybeans for beans	Bu.	19.9	20.0	33.1	13.2	13.1
Peanuts, picked and threshed	Lb.	925	956	943	18	-13
Flaxseed	Bu.	8.7	8.3	9.4	.7	1.1
Food grains:						
Wheat, all	do	17.2	19.9	15.7	-1.5	-4.2
Rice (rough)	Cwt.	24.[illegible]	29.3	22.1	-2.1	-7.2
Rye	Bu.	12.4	14.1	14.8	2.4	.7
Vegetables:						
Potatoes	do	245	271	273	28	2
Sweetpotatoes	do	94	108	127	33	19
Beans, dry (cleaned)	Lb.	1,173	1,103	1,227	54	124
Peas, dry field (uncleaned)	do	1,273	957	1,246	-27	289
Truck crops 3/	Percent	100	4/	143	43	4/
Fruits and nuts	do	100	4/	139	39	4/
Tobacco	Lb.	1,281	1,494	1,782	501	288
Cotton	do	291	416	330	39	-86
Average crop production per acre	Index 5/	101	107	128	27	21

1/ Preliminary.

2/ Production needs projected for 1975 divided by 1951-53 harvested acreage.

3/ Excludes farm gardens.

4/ Data not available.

5/ 1947-49=100.

past trends. The size of the 1975 job, measured in these terms, is indicated by the data in table 10 and shown graphically in figure 7. The projections of cropland requirements for 1975 were calculated under the assumption that the 1951-53 average yields of crops and pasture will be maintained.

If production needs were to be met via this route, we might need to bring in the equivalent of more than 150 million additional acres of cropland. This compares with the projection of about 25 million additional acres of cropland equivalent made by Wooten and Anderson. 10/ Thus, unless future additions to our cropland area exceed the rate since pre-World War II, only about a sixth of our additional crop and pasture production may be forthcoming from expansion in cropland acreage. This could mean that five-sixths of the job would have to be done by getting increased yields per acre, or through other advances in technology.

The data in table 10 also afford clues regarding the scope of possible adjustment problems. In addition, they indicate the crops for which increased yields may be most urgent. Feed grains, hay, soybeans, and pasture account for more than 75 percent of our cropland equivalent acreage. As substantial increases in production requirements for these crops are projected, raising their per acre yields or increasing the acreage available for their production, or both, will be of the utmost importance during the next 20 years, particularly in the latter part of the period.

Many problems might be encountered in attaining the needed shifts in acreage. An acre of a given crop may not be easily substituted for an acre of another crop. The problem finally becomes a question of alternatives within regions and on individual farms.

Farmers will tend to make production adjustments that prove profitable to them. One means of increasing the relative profitability of a given enterprise is to lower its production costs. Reduction in farm labor requirements often can contribute to this end. Increase in labor efficiency in producing hay crops - the acreage of which needs to be expanded over the longer run - has lagged behind that of other crops (fig. 8). A substantial step-up in hay production per man-hour might aid in production adjustment, and might also prove a means of getting needed increases in production with greater efficiency in use of production resources.

10/ See footnote 2, page 6.

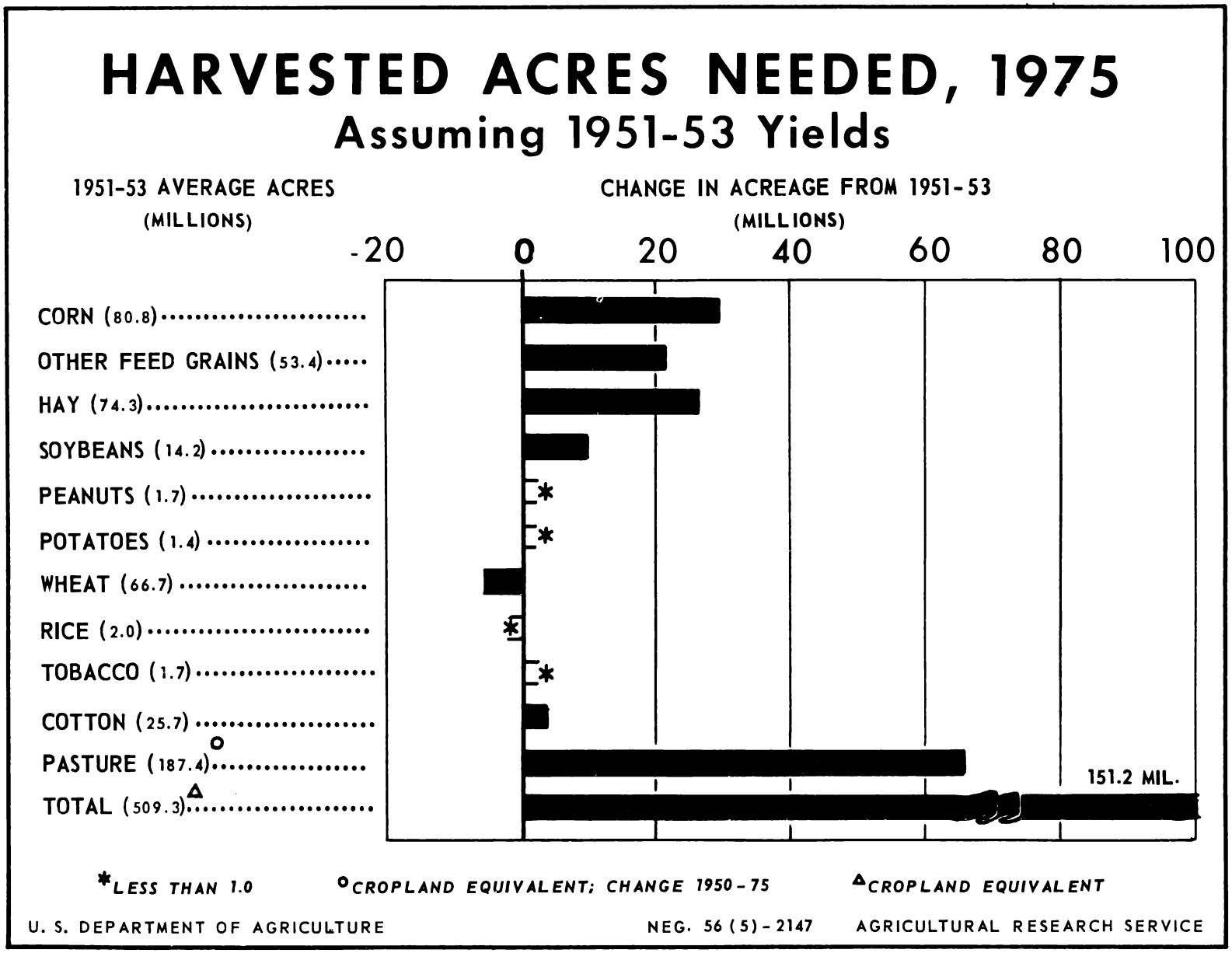

HARVESTED ACRES NEEDED, 1975
Assuming 1951-53 Yields
1951-53 AVERAGE ACRES
(MILLIONS)
CHANGE IN ACREAGE FROM 1951-53
(MILLIONS)
-20
0
20
40
60
80
100
CORN (80.8)
OTHER FEED GRAINS (53.4)
HAY (74.3)
SOYBEANS (14.2)
PEANUTS (1.7)
POTATOES (1.4)
WHEAT (66.7)
RICE (2.0)
TOBACCO (1.7)
COTTON (25.7)
PASTURE (187.4)°
TOTAL (509.3)△
151.2 MIL.
*LESS THAN 1.0
°CROPLAND EQUIVALENT; CHANGE 1950-75
△CROPLAND EQUIVALENT
U. S. DEPARTMENT OF AGRICULTURE
NEG. 56 (5)-2147
AGRICULTURAL RESEARCH SERVICE

Figure 7

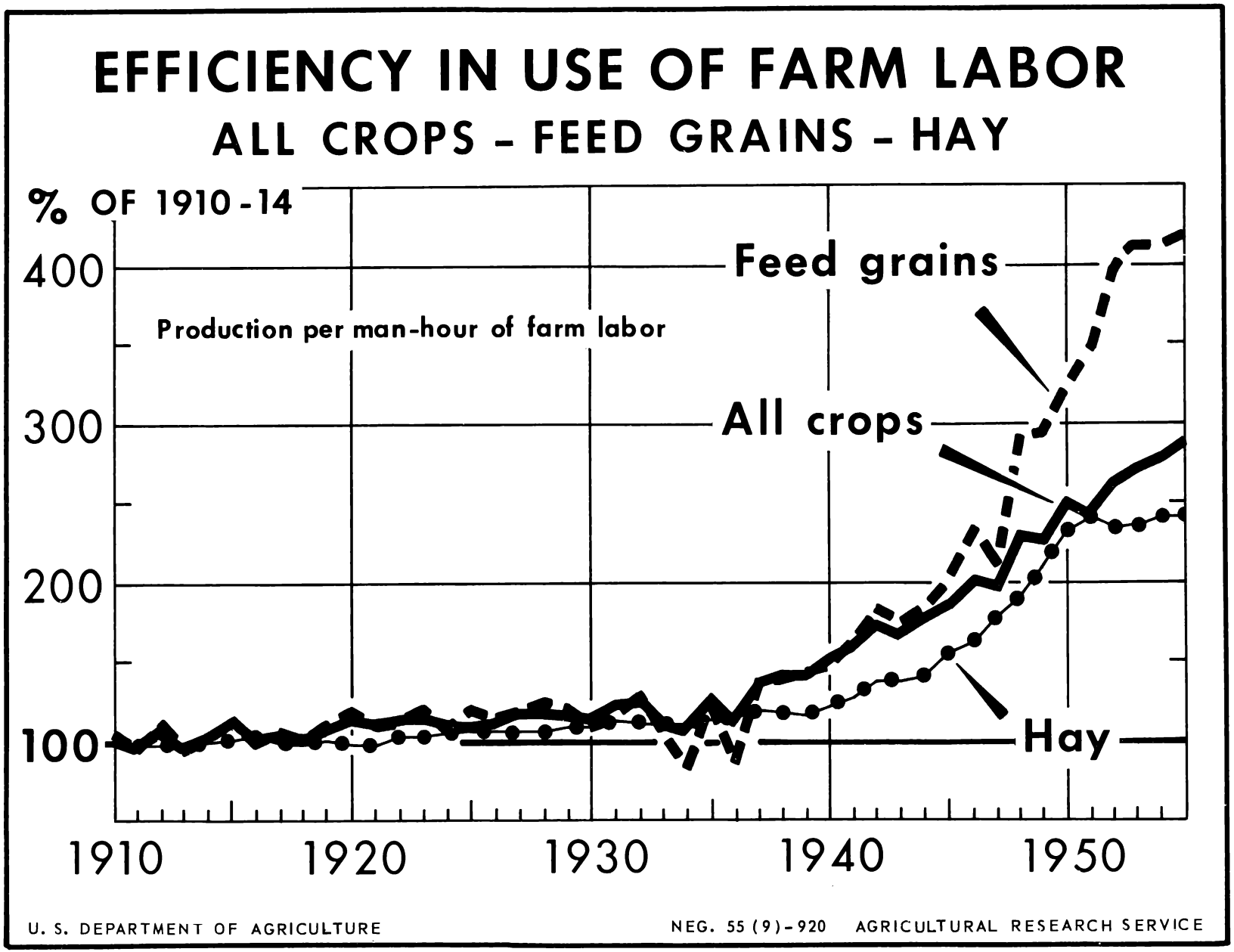

EFFICIENCY IN USE OF FARM LABOR
ALL CROPS - FEED GRAINS - HAY
% OF 1910-14
400
300
200
100
Production per man-hour of farm labor
Feed grains
All crops
Hay
1910
1920
1930
1940
1950
U. S. DEPARTMENT OF AGRICULTURE
NEG. 55 (9)-920 AGRICULTURAL RESEARCH SERVICE

Figure 8

Table 10. - Production requirements for crops and pasture in 1975 in terms of harvested acres, and related data, United States

Item	Average 1951-53	1955 1/	Projected 1975 2/	Change - 1951-53 to 1975	Change - 1955 to 1975
	1,000 acres	1,000 acres	1,000 acres	1,000 acres	1,000 acres
Feed grains:					
Corn, all	80,814	79,955	110,439	29,625	30,484
Oats	38,055	40,933	49,247	11,192	8,314
Barley	8,755	14,247	12,291	3,536	-1,956
Sorghum grain	6,566	12,597	13,444	6,878	847
Hay, all	74,297	73,984	100,699	26,402	26,715
Oil crops:					
Soybeans for beans	14,187	18,559	23,568	9,381	5,009
Peanuts, picked and threshed	1,670	1,685	1,703	33	18
Flaxseed	3,888	4,922	4,195	307	-727
Food grains:					
Wheat, all	66,693	47,222	61,047	-5,646	13,825
Rice	2,020	1,822	1,847	-173	25
Rye	1,492	2,066	1,782	290	-284
Vegetables:					
Potatoes	1,420	1,407	1,580	160	173
Sweetpotatoes	330	357	447	117	90
Beans, dry	1,355	1,567	1,417	62	-150
Peas, dry field	256	292	251	-5	-41
Tobacco	1,728	1,510	2,404	676	894
Cotton	25,737	16,882	29,196	3,459	12,314
Total of specified crops	329,263	320,007	415,557	86,294	95,550
Pasture	3/ 187,373	4/	5/ 252,954	5/ 65,581	4/
Total of specified crops and pasture	516,636	---	6/ 668,511	6/151,875	---

1/ Preliminary.

2/ Production needs projected for 1975 divided by 1951-53 yield per harvested acre.

3/ Cropland equivalent for 1950 based chiefly on data in tables 29 and 32 of Relative Use of Feeds for Livestock Including Pasture - by States, by R. D. Jennings. U. S. Dept. Agr. Statis. Bul. 153, Feb. 1955. Feed units from "aftermath" pasture were excluded from calculations of cropland equivalent as this cropland area is accounted for in acreage of hay, small grain, and so on. The data on feed units per acre of pasture derived from Statistical Bulletin 153 were subsequently revised. These revised data were used in deriving the following factors for calculating cropland equivalent: Cropland pasture 1.000; open permanent 0.198; woodland 0.096; and grazing land not on farms 0.057.

4/ Data not available.

5/ Cropland equivalent. Change measured from 1950 to 1975.

6/ Does not include acreage in summer fallow, crop failure, and soil improvement crops.

Some of the assumptions used in making the projections should be kept in mind in interpreting the data in table 10. The "composition" of livestock feed in 1975 was assumed to be about the same as in 1951-53. Therefore, the substitution of feed grains for forage or pasture and other substitutions among crop products could be a partial means of fulfilling overall production needs in 1975. This might not reduce greatly the overall needs in terms of cropland equivalent, however, unless yields of many crops are increased substantially. But increased efficiency in use of livestock feed could reduce substantially the cropland requirements, as measured in table 10. As feeding rates were assumed at about 1951-53 levels, this potentiality was not considered in making the projections of production needs for 1975.

Finally, in interpreting the various measures of size of the future production job, it should be reemphasized that the important questions more nearly revolve around how, rather than whether we can meet production needs. As noted previously, there are many indications that substantial increases in farm output are possible from greater use of presently known improved practices.

TIMING OF PRODUCTION REQUIREMENTS

Thus far, the description of the size of the future production job has relied chiefly on comparisons of production requirements in 1975 with production attained in 1951-53. Use of the demand projections for 1960, as well as for 1975, permits an analysis of the possible variation over time in the future production job. Such an appraisal is needed in view of the current "surplus" situation, and it also has important implications to production research programming.

The total output requirement projected for 1960 is less than 10 percent greater than the volume of output attained in 1951-53 (table 11). The record output achieved in 1955 is quite near the level projected as needed 5 years hence. A greater relative increase may be called for in livestock production than in crop production in the period immediately ahead, regardless of whether 1951-53 or 1955 is used as a basing point.

Production in excess of market requirements in 1951-53 and 1955 largely explains the relatively small increase needed in farm output during the intermediate period ahead. The fact that excess production in 1951-53 and 1955 was concentrated chiefly in crops also is a major factor behind the proportionately greater increase needed in livestock production.

Table 11. - Farm production needed to meet projected requirements in 1960 and related data, United States

Item	Unit	Average 1951-53	1955 1/	Projected 1960	Percentage change 1951-53 to 1960	Percentage change 1955 to 1960
					Percent	Percent
Farm production:						
Total farm output	Index 2/	106	112	114	8	2
All livestock and livestock products 3/	do	112	122	127	13	4
All crops	do	102	105	106	4	1
Feed used by farm horses and mules 4/	do	65	46	43	-34	-7
U. S. population	Millions, July 1	157	165	176	12	7

1/ Preliminary.
2/ 1947-49=100.
3/ Excludes horses and mules.
4/ Hay and concentrates only. Not included in total farm output.

The projections of production needs assume that accumulated stocks as of 1951-53 or 1955 will be worked off before 1960. To the extent that this is not the case, production needed in 1960 could be less than projected.

Annual increases in farm output needed in the longer run period ahead may be substantially greater than those required in the intermediate period (table 12). When measurement is made in terms of factors other than direct effects of changes in source of farm power, the average increase needed from 1960 to 1975 may be more than double the increase required in the intermediate period.

Table 12. - Average annual change in farm output needed to meet projected requirements, United States, by subperiods, 1951-53 to 1975

Period	Farm output 1/			Assumed increase in U. S. population
	Total	Contribution of-		
		Direct effects of changes in source of farm power	Other factors	
	Index points	Index points	Index points	Millions
1951-53 to 1975	1.55	0.10	1.45	2.17
Intermediate:				
1951-53 to 1960 2/	1.00	.14	.86	2.38
1955 to 1960 2/ 3/	.40	.03	.37	2.20
Longer run:				
1960 to 1975	1.87	.08	1.79	2.07

1/ See footnotes, table 2.

2/ Output exceeded market requirements in both 1951-53 and 1955, whereas output for 1960 and 1975 is the volume needed to meet projected market requirements. This is the chief reason why the average increase in output needed in the intermediate period is smaller than in the longer run period. The projections also assume that stock accumulations as of 1951-53 or 1955 would be worked off before 1960; otherwise, projected needs for output in 1960 could be less than indicated in the table.

3/ Data for 1955 are preliminary.

At least two factors account for the substantially larger job in the longer run period. As noted previously, the excess of annual output relative to market requirements in recent years in effect reduces the average annual increase required in production from 1951-53 or 1955 to 1960. This factor would not operate for the period 1960 to 1975, as production projected for both 1960 and 1975 is of the same magnitude as projected market requirements for these years. In making the projections of needed production, it was assumed that accumulated stocks as of 1951-53 would be worked off before 1960; otherwise, need for output in 1960 would be less than projected. Working off of surplus stocks

between 1955 and 1960 could reduce annual increases needed in output in the years between these dates.

Also, the projected shifts in source of farm power would have a differential effect on rates of increase in farm output in the intermediate and longer run periods. The absolute contribution to the increase in output from the shift in source of power may be greater in the intermediate than in the longer run period. In fact, the projections made may understate the rapidity with which the number of farm horses and mules will reach the assumed level of 2 million. If this shift is virtually completed by 1960, the need for increasing output through other means during the intermediate period would be reduced considerably.

A more detailed picture of differences in the timing of future production needs is shown by the data in table 13. Annual increases needed in total livestock production may be larger in the longer run period.

Table 13. - Average annual change in livestock production needed to meet projected requirements, United States, by subperiods, 1951-53 to 1975 1/

Period	All livestock and livestock products	Meat animals	Poultry and eggs	Milk
	Index points	Index points	Index points	Bil. lbs.
1951-53 to 1975 ------	2.14	2.23	2.75	1.61
Intermediate:				
1951-53 to 1960 -----	1.81	1.64	2.78	1.30
1954 to 1960 2/ -----	1.30	1.40	2.53	.67
Longer run:				
1960 to 1975 --------	2.31	2.55	2.73	1.77

1/ See table 2, footnote 1.
2/ Preliminary.

As might be expected, there are marked differences among crop groups in the timing of future production needs (table 14). Longer run increases

Table 14. - Average annual change in crop and pasture production needed to meet projected requirements, United States, by subperiods, 1951-53 to 1975

Period	Pasture 1/	All crops	Feed grains	Hay and forage	Oil crops	Vege-tables	Fruits and nuts	Food grains	To-bacco	Cotton
	Index points	Index points	Index points	Index points	Index points	Index points	Index points	Index points	Index points	Index points
1951-53 to 1975	1.52	1.14	1.65	1.66	2.07	0.81	1.76	-0.34	1.87	0.65
Intermediate:										
1951-53 to 1960	1.38	.54	1.30	1.58	1.75	.70	1.62	-1.82	.80	-.94
1955 to 1960 2/	3/	.20	-.12	1.26	-2.20	.52	1.94	-.12	.82	-.30
Longer run:										
1960 to 1975	1.60	1.47	1.83	1.70	2.23	.87	1.83	.45	2.45	1.49

1/ Annual increase in needs for pasture are measured in index points with 1951-53 taken as 100. Annual increases in needs for crop production are measured in index points (1947-49=100), as in previous tables. See footnote 1, table 2.

2/ Preliminary.

3/ Data not available.

needed in total crop production may be almost 3 times as large as those from 1951-53 to 1960 and more than 7 times as great as those from 1955 to 1960. As noted previously, this largely reflects production well in excess of market requirements in 1951-53 and 1955.

Much greater yearly additions to production of feed grains may be called for in the longer run than in the intermediate period. The need for stepping up production of pasture, hay, and forage may be about as great per year in the intermediate period as in the longer run, however. The 1955 level of production of feed grains, food grains, cotton, and oil crops as a group would appear to be more than sufficient to meet projected requirements for 1960. In addition, again it should be noted that projected requirements assume that accumulated stocks will be worked off before 1960.

Annual increases required in production of both vegetables and fruits may be about the same in the intermediate and longer run periods. Further downward adjustment in output of food grains appears to be necessary by 1960, regardless of whether 1951-53 or 1955 is taken as a point of comparison. Conditional on medical findings and their effect on demand, additional production requirements for tobacco may be substantially greater in the longer run than in the intermediate period.

EFFECTS OF REVISIONS IN POPULATION PROJECTIONS ON PRODUCTION REQUIREMENTS

As noted previously, the estimates of future production requirements presented in this report are not forecasts, but projections based on specific assumptions. One important assumption is the level of future population of the United States. The population levels assumed for 1960 and 1975 were based on the Series "C" projections of the Bureau of the Census made in August 1953. Subsequently, in October 1955, the Bureau of the Census revised its population projections.

The effects of the census revisions on the population assumptions used in this report are to raise the population projection for 1960 by less than 1 percent and that for 1975 by about 5 percent. Projected requirements for farm production for the 2 years would be increased by about the same proportion, as domestic market requirements account for most of the total market requirements for farm production.

The rather small increase in the population projections for 1960 would have a nominal effect on projected production needs for that year. On the other hand, an upward revision of about 5 percent in population

for 1975 would have a fairly important effect on the longer term projection of production needs.

The upward revision in the population projection for 1975 affects the analysis made in this report in at least two important respects. First, the size of the 1975 production job would be greater than was previously envisaged. Specifically, each measure presented, such as total output, required yields, and required acreage, would need to be changed by 4 to 5 percent. However, various indications of potential production capacity are such that the conclusion still holds that it is chiefly a question of "how" rather than of "can" we attain farm production requirements.

The more important aspect of the population revisions relates to the probable timing of our future production job. The nominal increase in the population projection for 1960, in conjunction with the more substantial upward revision for 1975, reinforces the general conclusion reached in the preceding section regarding probable timing of the future production job. The proposition that the current output level is quite near that projected as needed in 1960 would be unchanged for all practical purposes by the population revisions. Production requirements for 1975 might be raised by around 5 percent, however. In this event, the disparity between the size of the future production job in the intermediate period (1951-53 or 1955 to 1960) and the longer term period (1960 to 1975) would be greater than was indicated in the preceding section.

APPENDIX

One technique used in the preceding analyses to measure the size of the future production job was to express average annual changes in production in terms of index points for various historical and projected periods. This method provides a measure of absolute change per year for various selected periods. For farm output as a whole, or for important subaggregates of production, the method results in data equivalent to annual changes in production of a given crop expressed in terms of bushels, tons, and so on.

An alternative, and more frequently used, technique of measuring annual changes in production is the calculation of average annual percentage rate of change. Such average annual percentage rates of change for various periods would represent percentage changes from bases of varying magnitude. Consequently, such percentage rates do not provide comparable measures of absolute change among periods. Chiefly for this reason, the method of index points was used in this report.

For supplemental use, and for those who prefer the other type of measure, data in five of the more important text tables are shown in the following appendix tables in terms of average annual percentage changes.

Table 15. - Average annual rate of change in farm output and total population, United States, specified periods and 1975 projections

Period	Farm output			U. S. population
	Total	Contribution of-		
		Direct effects of changes in source of farm power 1/	Other factors	
	Percent	Percent	Percent	Percent
World War I:				
1910-12 to 1919-21	0.70	2/ -0.10	0.80	1.45
Interwar:				
1919-21 to 1938-40	1.06	.54	.52	1.09
World War II:				
1938-40 to 1944-46	3.11	.53	2.58	1.08
Post-World War II:				
1944-46 to 1951-53	1.28	.50	.78	1.68
Long-term:				
1919-12 to 1951-53	1.31	.39	.92	1.27
Projection:				
1951-53 to 1975	3/ 1.27	.09	1.18	4/ 1.21

1/ Contribution of transfer of cropland and other production resources from feeding and maintenance of farm horses and mules to production for market.

2/ The number of horses and mules on farms increased during this period.

3/ Increase in output needs.

4/ Assumed increase in population.

Table 16. - Average annual rate of change in livestock production, United States, specified periods and 1975 projections

Period	All livestock and livestock products 1/	Meat animals	Poultry and eggs	Milk
	Percent	Percent	Percent	Percent
World War I:				
1910-12 to 1919-21	0.81	0.65	0.52	2/
Interwar:				
1919-21 to 1938-40	1.31	.93	1.63	2/
World War II:				
1938-40 to 1944-46	3.57	3.56	7.04	1.62
Post-World War II:				
1944-46 to 1951-53	1.20	1.36	2.31	3/ -.14
Long-term:				
1910-12 to 1951-53	1.51	1.32	2.27	2/
Projected potential needs:				
1951-53 to 1975	1.59	1.63	1.86	1.20

1/ Excludes horses and mules.
2/ Data not available.
3/ Production of milk decreased during this period.

Table 17. - Average annual rate of change in crop production by crop groups, United States, specified periods and 1975 projections

Period	Feed grains	Hay and forage	Oil crops	Vegetables 1/	Fruit and nuts	Food grains	Tobacco	Cotton
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
World War I:								
1910-12 to 1919-21	0.57	2.31	0.51	1.31	-0.18	3.23	2.49	-2.50
Interwar:								
1919-21 to 1938-40	-.51	.50	6.78	1.60	2.20	-.34	1.07	.54
World War II:								
1938-40 to 1944-46	3.07	1.57	12.94	2.46	1.56	4.60	4.62	-3.19
Post-World War II:								
1944-46 to 1951-53	-.09	-.14	2.92	-.90	.28	.83	.95	6.53
Long-term:								
1910-12 to 1951-53	.32	.94	5.25	1.23	1.25	1.34	1.87	.30
Projected potential needs:								
1951-53 to 1975	1.41	1.32	1.65	.77	1.44	-.39	1.45	.56

1/ Includes farm gardens, as well as truck crops, potatoes, sweetpotatoes, dry beans, and dry peas.

Table 18. - Average annual rate of change in crop production and related data, United States, specified periods and 1975 projections

Period	Crop production	Crop production per acre 1/	Cropland used 2/
	Percent	Percent	Percent
World War I:			
1910-12 to 1919-21	0.86	-0.22	1.14
Interwar:			
1919-21 to 1938-40	.44	.47	-.05
World War II:			
1938-40 to 1944-46	3.34	2.08	.27
Post-World War II:			
1944-46 to 1951-53	.87	.58	.10
Long-term:			
1910-12 to 1951-53	.88	.57	.23
Projected potential needs:			
1951-53 to 1975	1.00	3/ .75	3/ .17
		4/ 1.03	4/ 0

1/ An index of crop production per acre was derived by dividing the index of crop production by an index of cropland used for crops.

2/ Estimated acreage from which one or more crops were harvested plus acreage of crop failure and summer fallow. Cropland pasture not included.

3/ Based on cropland projections made by Wooten, Hugh H., and Anderson, James R., table 21. See footnote 2, page 5.

4/ Assuming 1951-53 acreage.

Table 19. - Average annual rate of change in farm output needed to meet projected requirements, United States, by subperiods, 1951-53 to 1975

Period	Farm output			Assumed change in U. S. population
	Total	Contribution of-		
		Direct effects of changes in source of farm power 1/	Other factors	
	Percent	Percent	Percent	Percent
1951-53 to 1975	1.27	.09	1.18	1.21
Intermediate:				
1951-53 to 1960 2/	.94	.13	.81	1.44
Longer run:				
1960 to 1975	1.44	.06	1.38	1.09

1/ See table 2, footnote 2.
2/ See table 12, footnote 2.

* U. S. GOVERNMENT PRINTING OFFICE : 1956 O - 397083