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## GEOGRAPHY

# An Example of Crop Dynamics in Minnesota—The Soybean

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*Introduction:* The soybean is a plant which has been domesticated for several thousand years. The exact time and place of this domestication is not known but the domesticated plant is referred to early in Chinese literature (Morse, 1947:138). The hearth of domestication appears to have been northern China but very early it spread as a crop over a considerable part of Eastern Asia and became a common crop in the areas known today as Japan, China and Manchuria, Formosa, and Korea. Until very recent times the soybean was only a botanical curiosity to the European or Western World but in much of Asia it was an important item of diet.

The soybean was introduced into the United States as early as 1804 but remained little more than an exotic plant to be found in botanical gardens for more than one hundred years. By 1924, the United States production of this crop was about 5 million bushels grown on about 1.5 million acres of farmland. By 1961, soybean production in the United States had reached 693 million bushels from about 27 million acres of cropland (Haywood, 1962:19). This extremely rapid expansion of soybean acreage and production is one very excellent example of the ability to change and to adapt on the part of the American farmer. It is thus a recent and impressive example of crop dynamics in the United States.

*Map Explanations:* With the introductory comments on soybeans as basic information, it is possible to look in some detail at this crop and its expansion on the northern fringe of the North American Corn Belt, and specifically, its expansion in Minnesota. This study includes counties that meet the following two criteria; (1) Soy-

beans must occupy at least two percent of the Harvested Cropland of that county. (2) Soybeans must occupy at least one percent of the total land area of that county.

These two criteria are applied in order to set a base, arbitrary though it may be, to the study. This base is necessary for the purpose of delimiting the area of significant soybean production.

The map series 1-6 show the expansion of this crop in Minnesota for each of the agricultural census years from 1934 to 1959.

*Map 1—1934* Seven counties in southeastern Minnesota have from 2 to 5 percent of their cropland in soybeans. This is the first census year that any Minnesota county meets the above listed criteria. During this period soybeans were sometimes used as a soil conservation crop rather than a cash oil seed crop.

*Map 2—1939* By this year soybean production in the country as a whole had become sufficiently important so as to warrant the opening of a separate pit in the Chicago Board of Trade. This map shows minor areal expansion in the southeast part of Minnesota with four counties having from 5 to 10% of their cropland in soybeans.

*Map 3—1944* This census year shows a very considerable expansion of soybeans in southern Minnesota. Several additional counties at this time fulfill the criteria and other ones have increased significantly their acreage in soys. Mower county has more than 10% of its cropland in soys and the spread of this crop is most apparent in two areas, one to the northwest in the Minnesota River valley counties and the other to the north of the Twin Cities, on the Anoka Sandplain.

During the first part of this decade, the war years, production of vegetable oils was promoted and government support prices on soybeans were established.

*Map 4—1949* Continued expansion of this crop to the

<sup>1</sup>This paper represents a small and rather localized portion of a study presently under way at the University of Wisconsin. Dr. Clarence Olmstead, Carrol Rock, and the present writer are participating in that study. Partial financial support has been given by the National Science Foundation.

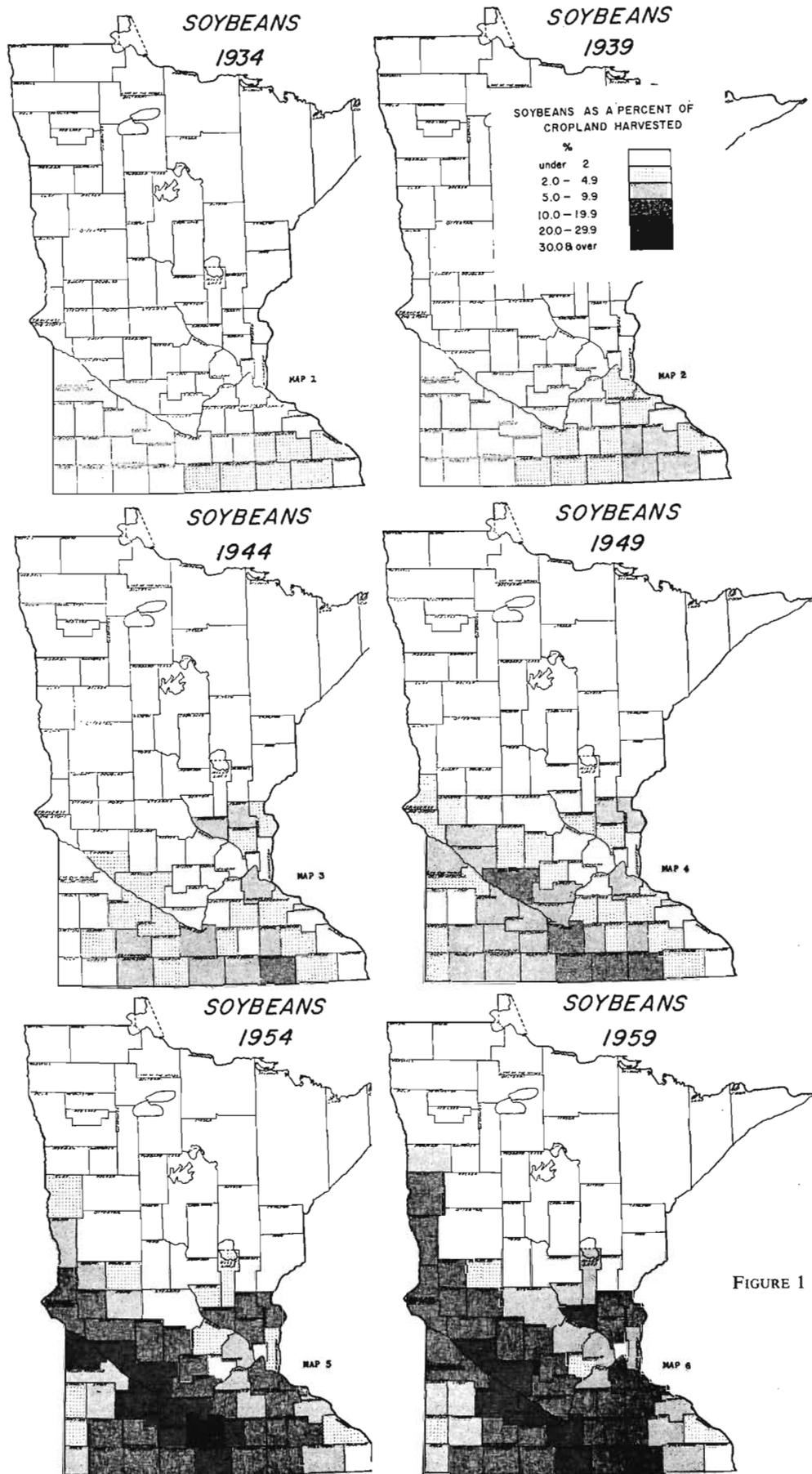
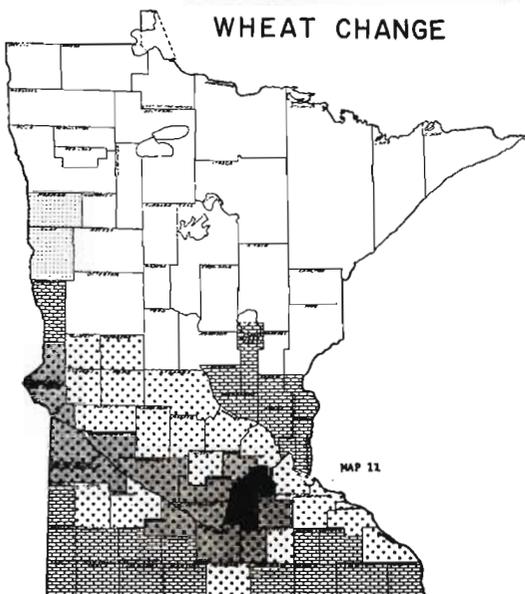
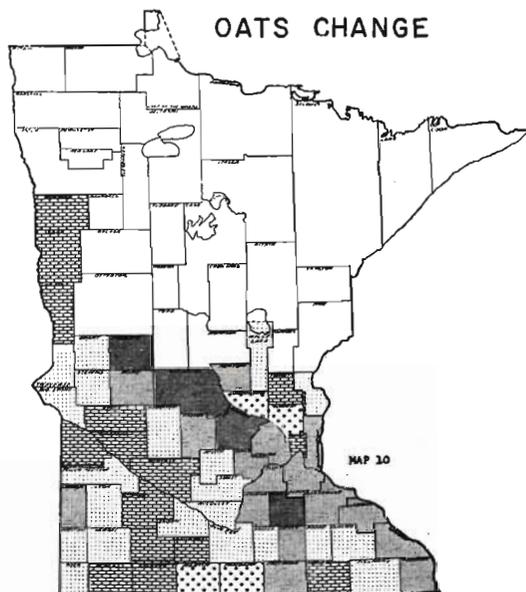
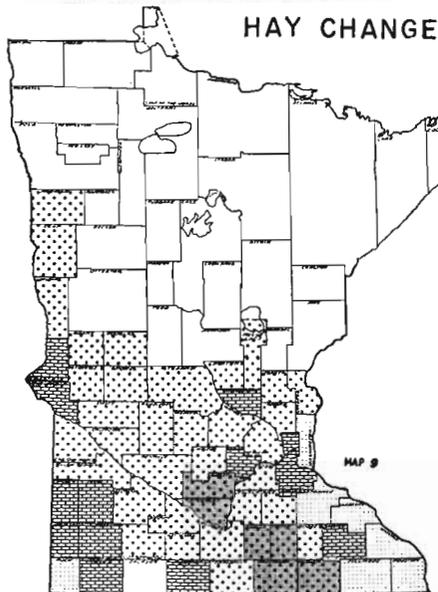
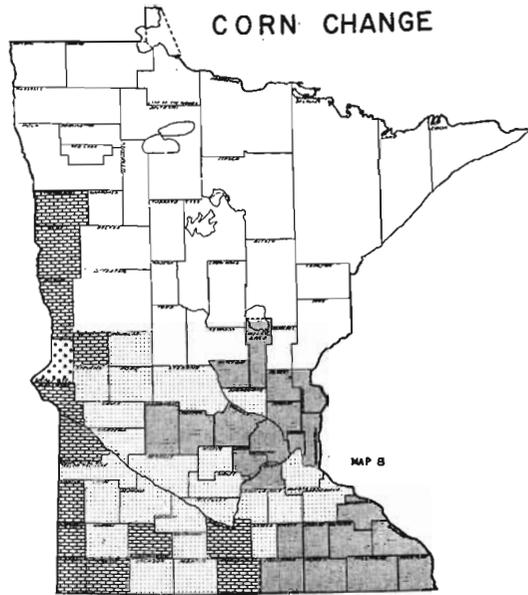
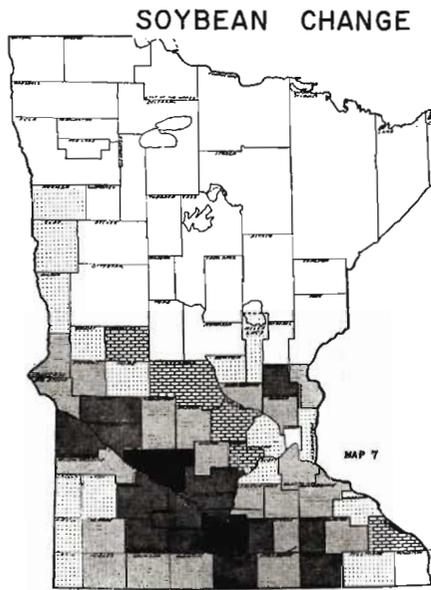


FIGURE 1



CHANGE IN PERCENT OF  
CROPLAND HARVESTED FROM  
1929 - 1954

INCREASE %

- 27.0 and over
- 17.0 - 26.9
- 9.0 - 16.9
- 3.0 - 8.9

STABLE

- 2.9 - +2.9

DECREASE

- 3.0 - -8.9
- 9.0 - -16.9
- 17.0 and under

north and northwest across the Minnesota River. Note that in the stream dissected counties of southeastern Minnesota with the relatively steep slope conditions there has been very little adoption of this crop. This lack of soybeans in an area of steep slopes tends to support the hypothesis of Hoag (1962) that slope is the most significant location determinant for cash grain farming.

*Map 5—1954* Heaviest soybean production is now centered on the counties of the Minnesota River Valley. Blue Earth county has more than 30 percent of its cropland in soybeans. Processing plants are becoming more numerous in the state. Production remains minor in extreme southeastern counties and also in the extreme southwestern coteau counties. Farmers in Carver, Wright, and Stearns counties have not adopted this crop to the same extent as have most other counties surrounding them. A possible explanation for this might be found in the emphasis upon dairying in those counties but this relationship is not studied in this paper and remains a possible topic for future study. During this year there can be seen a pronounced move of soybeans into the southernmost counties of the Red River valley.

*Map 6—1959* This map shows an apparent retreat of soybeans in a few counties of south central Minnesota. In spite of this slight decline in acreage there remains very impressive (over 10% of all cropland harvested) soybean production in the Minnesota Valley, south central, and Anoka sandplain counties. There is also seen on this map a considerable expansion on soybeans to the north in the Red River Valley. New strains of this crop are continually being developed to increase its production in areas of shorter growing seasons and/or more unreliable precipitation.

Map Series 1-6 shows that within a short span of time (from 1934-1959), Minnesota farmers adopted this crop and it became firmly entrenched as a cash crop throughout much of southern Minnesota. This process of change in crop patterns can be viewed from another side. Map Series 7-13 show some of the results of this change in crop emphasis.

*Map 7—Soybean Change 1929-1954* This map shows the obvious increase of soybeans as a crop in Minnesota during these 25 years. This map is something of a composite of the first series. It shows clearly that the expansion of soys into Minnesota has been recent and impressive. With this increase in soybean acreage must come some adjustment in other phases of the cropping picture. One possible adjustment would be a corresponding increase in cropland through land clearing, drainage enterprises, and conversion of permanent pasture into cropland. Another possible adjustment would be a decline in acreage devoted to other crops in order to free cropland for soys. In 1959 soybeans, corn, wheat, oats, and hay accounted for about 92 percent of all Minnesota cropland. These companion and/or competing crops and their changing patterns are of interest to this study.

*Map 8—Corn Change* This map shows a general and pronounced increase in corn acreage during this period.

Only one county shows a decline in corn while several others are stable. Corn appears to remain "king" in most counties of southern Minnesota. Corn does not appear to have given up acreage to the "new" crop of soybeans.

*Map 9—Hay Change* As this map shows, there appears to have been rather widespread and substantial decline in hay acreages in many of the study area counties. There has been a slight hay increase in the southeast but one recalls that this is an area of only slight adoption of soys. It appears that hay crops have given up acreage to soybeans during this period in the study area counties.

*Map 10—Oats Change* Only 4 counties decreased in oat acreages during the period from 1929 to 1954. Some other counties are relatively stable while quite a number show an increase in this crop. In some of the sandplain counties oats may have given up acreage to soys but the general map pattern would suggest that up to 1954 oats had not been replaced by soys to any great degree. Since 1954, however, there is some evidence that oat acreage has declined and that soys may well occupy some fields formerly in oats. Diagram II shows this more recent trend. It appears that in this respect the decline in oats in Minnesota follows by several years a similar decline of oats elsewhere in the Corn Belt states.

*Map 11—Wheat Change* During the period of the map this crop seems to have lost acreage. The decline in wheat acreage appears to be general in much of the study area with many other counties falling within the stable category. During this period only two counties increased wheat acreages. Along with hay crops, wheat seems to have given up some acreage to soybeans.

*Map 12—Soybean Change 1954-1959* This map shows the more recent changes in soybean areas. Note the slight decline in soy emphasis in some counties but also a substantial gain in acreage in soys in counties along the northern fringe of the study area and especially in the Red River valley counties.

*Map 13—Cropland Harvested Change 1929-1959* This map examines the possibility of soybean acreage increases coming from expanded cropland. There appears to be no consistent pattern or relationship. While it shows that a number of "heavy" soybean counties have had some cropland expansion it is also evident that some of these "heavy" soybean counties have had an actual decrease in cropland, note again the Anoka Sandplain in this respect. The relationship between soybean production and "new" cropland is not consistent enough to identify that as a major factor in soybean expansion.

The preceding map series is one of cropland and crop change. Soybeans represent a "new" crop in Minnesota, one that presently occupies very substantial acreages of prime cropland. Some of these acres may have been provided by actual increases due to drainage, clearing, and other land use changes. It is likely however that in many counties soybean acres have increased at the expense of such crops as wheat and hay. More recently, oats may have given up acreages to soys. It is quite possible that

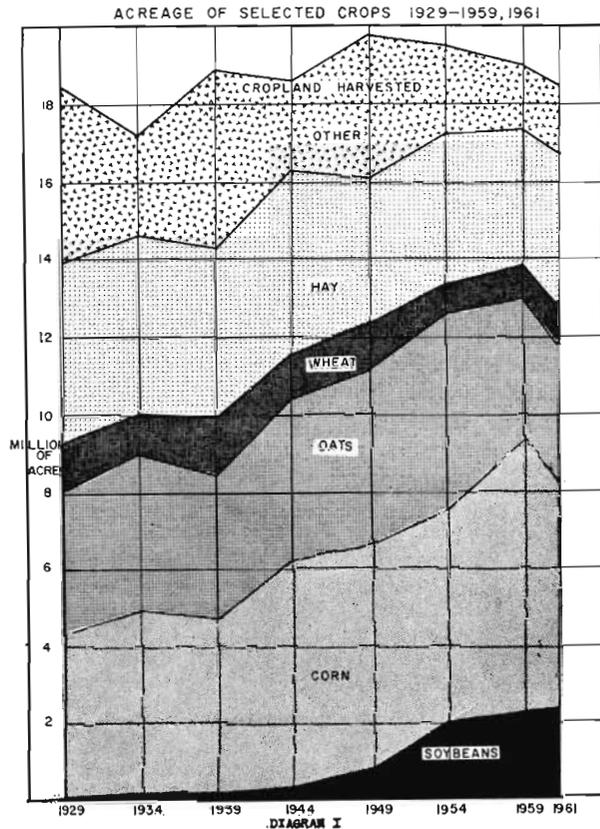
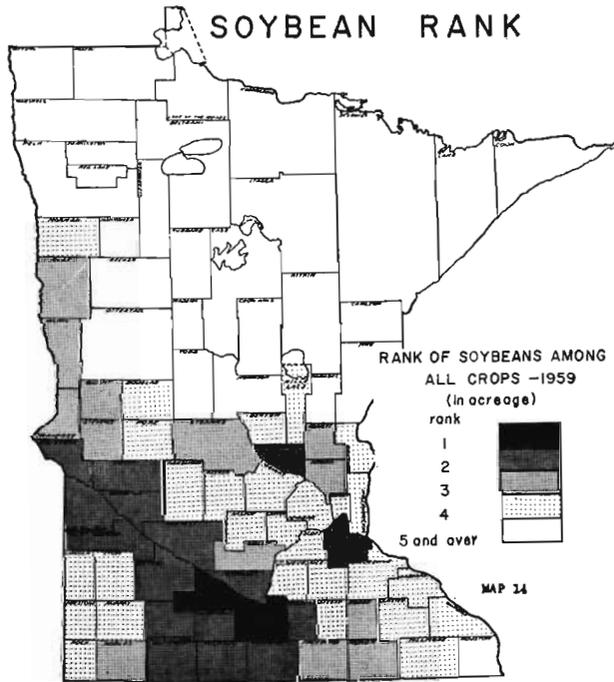
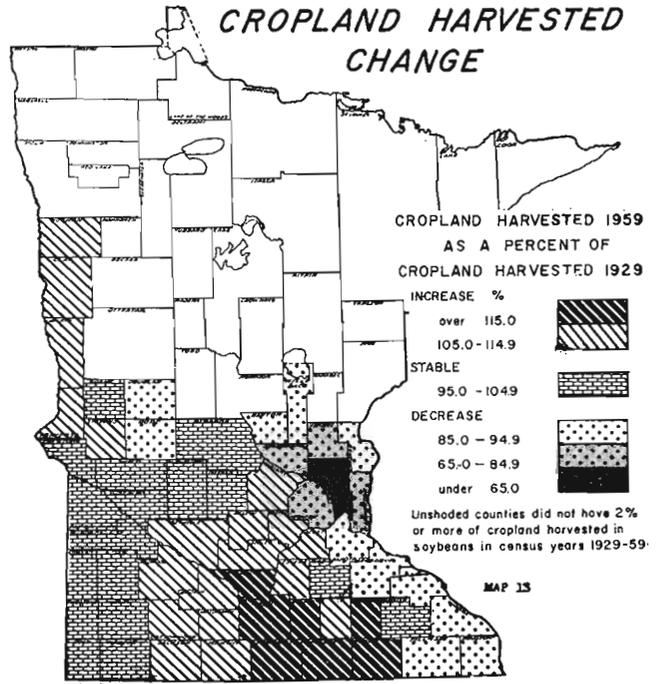
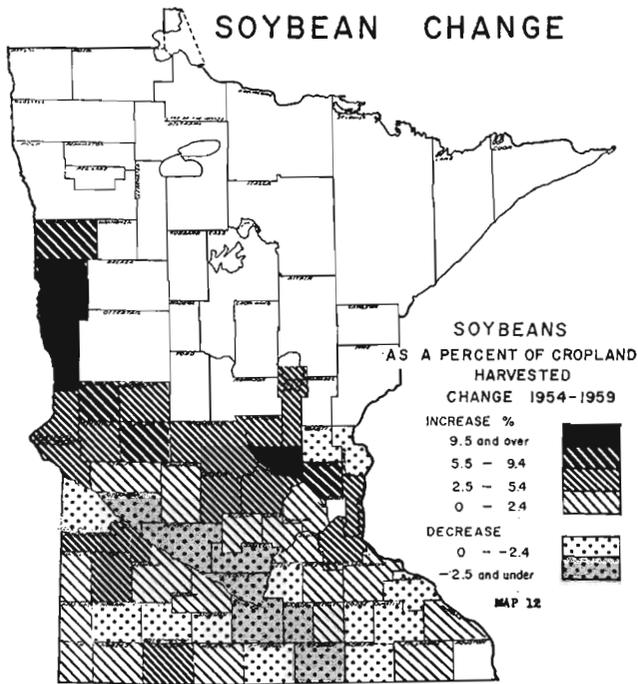


FIGURE 3

crops such as barley and flax have also declined in area but these were not included in the study.

Map 14—Rank of Soybeans 1959 of the 58 Minnesota counties that made up the study area of this paper, there were in 1959, two counties in which soybeans occupied more cropland than any other crop. In these two counties, Brown and Blue Earth, soybeans were of first rank.

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rank. In 16 other counties soys ranked as the number two crop in acreage, in 13 other counties soys were third among all crops. The rather high rank of soybeans in much of southern Minnesota is a very remarkable showing for a crop which was almost unknown to Minnesota farmers prior to World War II.

Diagram Explanation: Diagram I—Acreage of Selected

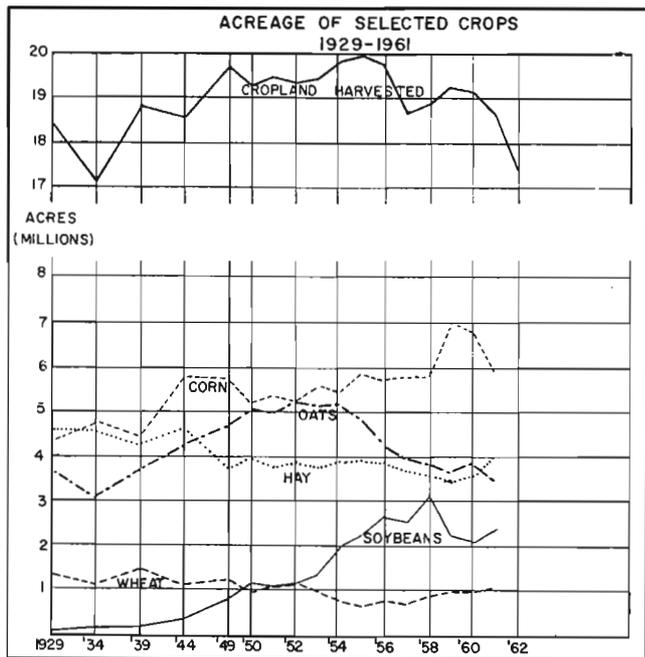


FIGURE 4

*Crops* This diagram is another way of showing crop trends. The five crops that are on the diagram are those mapped in an earlier series in this paper. These five account for almost 92% of all Harvested Cropland in Minnesota in 1959.

*Diagram II - Acreage of Selected Crops* This diagram shows a bit more clearly the acreages in Minnesota that are devoted to specific crops. On this diagram the recent (since 1954) decline in oats acreage is quite apparent. Also the increase in soys during this period led to the observation on that relationship earlier in this paper. Interesting also is the significant decline in total cropland harvested in recent years.

*Conclusion:* These patterns that are seen on the maps of crop changes in Minnesota open up a great many questions that this paper has not considered. How are these

patterns to be explained? What are causes of these various patterns? What will be the long range effects of these changes? These future investigations can be oriented toward the relationship between these patterns on the maps and physical influences such as soils, slope, rainfall amount and reliability, length of growing season and others. These investigations might also consider the relationships between these patterns and cultural factors such as the influence of aggressive soybean promoters and processors, location of processing plants, world conditions that call for a rapid increase in vegetable oils or some other commodity, government programs of support prices and acreage controls on several crops and on cropland itself, the attitudes of the farmers, and a host of other possible relationships. These physical and cultural relationships to the patterns of soybean expansion in Minnesota are logical topics for future investigation.

It is here suggested that the major significance of this study does *not* lie in the crop itself although this is of interest and importance. Rather, the significance of this study is that here is concrete evidence of the adaptability of the American farmer. It is *one* face of change in the very complex pattern of human occupation that is farming. This crop, the soybean, which is a relative newcomer among crops in Minnesota serves as an excellent example of the dynamic nature of American agriculture.

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