

strangely enough these come from only two States: Illinois and Ohio. Texas ranks third, with 9 records of doves banded in South Dakota, Iowa, Kansas, Missouri, Illinois, Indiana, and Ohio. Six doves banded in Illinois, Michigan, Indiana, and Georgia were recovered in Florida, and five others from Illinois, Michigan, Indiana, and Ohio were taken in Alabama. Along with these records of recoveries in the principal winter range of the species, there are many intermediate points represented in the banding records, giving returns for these birds from points scattered through South Carolina, Tennessee, Kentucky, Arkansas, and Missouri.

As in all groups of return records from banded birds, there are a few cases of unusual flight routes, two of which are shown on the map. One is of a young bird that was banded at Kansas City, Kans., in June, 1927, when it was just beginning to fly, and was shot in Luna County, N. Mex., on September 17, 1927. This bird had flown southward instead of following the course due south, as did other birds banded in the same general region. The other record was of a bird banded at Fort Riley, Kans., on July 5, 1926, and shot at Apipilulco, State of Guerrero, Mexico, in January, 1927. This represents the longest migratory flight yet recorded for a mourning dove.

To sum up the meaning of the facts deduced through application of the banding method for determining the migratory movements and status of mourning doves, it has been conclusively shown that these birds are migratory in habit and that their flight is both interstate and international; that they may return to the same point to breed during succeeding years; and that there is a marked tendency for birds reared during summer over a widely distributed area in the northern part of their range to congregate during winter in a relatively restricted region in the South. Establishment of these facts is of importance in considerations of their esthetic worth and economic status and in taking effective steps to afford them adequate protection.

FREDERICK C. LINCOLN,

Associate Biologist, Bureau of Biological Survey.

MORTGAGE Debt on U. S. Long-term loans secured by farm
 Farms Increasing But land and buildings continue to
 at a Decreasing Rate grow in importance as a means of
 financing the American farmer.

According to recent estimates, the total farm-mortgage debt rose from \$7,857,700,000 in 1920 to \$9,360,620,000 on January 1, 1925, and further increased to \$9,468,526,000 by January 1, 1928. These figures represent an increase of 19 per cent from 1920 to 1925 and a further rise of 1 per cent from 1925 to 1928.

For the 3-year period ended January 1, 1928, the largest relative increase in mortgage debt occurred in the South Atlantic States, an increase of 12 per cent above the debt in 1925. The debt in the East South Central group increased 7 per cent, in the West South Central and East North Central 5 per cent, and in the Pacific group 3 per cent.

Four geographic divisions showed declines in amount of farm mortgage debt, the Mountain States having a reduction of 7 per cent below the amount in 1925, the West North Central 2 per cent, the Middle Atlantic States 3 per cent, and the New England group 1 per cent.

Debt on full-owner farms and part-owner farms constitutes much the most important part of all farm-mortgage debt, the total for these forms of tenure being \$5,560,017,000 in 1928, while debt on all tenant-operated farms amounted to \$3,644,009,000, and debt on farms operated by managers was only \$264,500,000.

Of a total of 22,352 farms which had not changed ownership or tenure during the period 1925 to 1928, 8,159 carried mortgages on January 1, 1925, and 8,327 had mortgages on January 1, 1928. This was an increase of about 2 per cent. All forms of tenure showed increases in the percentage of farms mortgaged. The frequency of debt among all full owners in the above group increased from 36.8 per cent to 37.1 per cent, and on tenant-operated farms from 35.9 to 37.5 per cent, while the mortgage frequency of the total of these classes, plus manager-operated farms, rose from 36.5 per cent to 37.3 per cent of the number of farms reported.

Debt on Part-Owner Farms

Part-owner farms generally have a much higher frequency of debt on the land owned than do farms of other forms of tenure. This increase of approximately 40 per cent is a natural consequence of the heavier financing requirements for operating additional land. Farms operated by tenants usually have lower frequency of farms mortgaged than do farms operated by owners, partly because the owner generally does not finance current farm operations. However, the percentage of mortgaged tenant-operated farms appears to have increased to a point not far below the frequency of mortgaged owner-operated farms.

Inquiry concerning mortgage changes on those farms which transferred title during the three years following 1925 indicates that the number of such farms mortgaged had increased also, and that the amount of mortgage debt carried was larger than in 1925. Mortgage debt often arises incident to transfer of land whereby the buyer obtains a loan on the land as a means of partial payment.

As a whole, the results indicate that farmers have been using their land as security for loans to an increasing extent during recent years and that this has been true of farms which have remained in possession of the same owners as well as of those which have changed hands.

Certain significant differences appear in the debt changes occurring in the various geographic divisions. In general, the States of the South Atlantic, East South Central, and West South Central groups showed increases in the order named. On the other hand, the Western States, which have been farmed a shorter period of time, showed the greatest decreases. It may be noted that the mountain and western lands were the first to show marked decline in value after the World War. Now it appears that the western areas are the first to show reductions in the volume of farm mortgages.

Increases For Each Form of Tenure

Increases for the country as a whole appeared for each form of tenure although tenant-operated farms showed a greater rise than did farms operated by their owners. This increase of debt on tenant farms probably was due in part to the fact that the debt on this class of farms in 1925 was a definitely smaller percentage of their value than was the case with owner-operated farms, and consequently loan

agencies were willing to increase the loans on many tenant farms having moderate encumbrance, despite a generally more restrictive policy on new loans and a frequent reduction on renewal of loans.

Ratios of debt to value of mortgaged farms offer further light on developments in farm mortgages. The reports from over 22,300 farms scattered throughout the country, when taken as a group, showed a ratio of debt to value of full-owner farms of 40.4 on January 1, 1925, and of 39 three years later. The ratio on tenant-operated farms rose from 36.6 to 37.5 and on manager farms from 32.1 to 32.7. The similar ratio for the total of these farms declined from 38.5 to 38.1.

When the data are adjusted to reflect current conditions in each State and are expressed as a ratio of total mortgage debt to the value of all farms, whether mortgaged or not, it is found that the ratio rose from 11.8 in 1920 to 18.9 in 1925, and to 20.9 in 1928. It thus appears that the amount of farm mortgages at the beginning of 1928 was slightly over one-fifth of the value of all farm land and buildings in the United States.

DAVID L. WICKENS,
Agricultural Economist, Bureau of Agricultural Economics.

NEMAS Causing Plant Galls Controlled Best Through Crop Rotation

The control of plant diseases caused by eelworms or nematodes, often called nemas, is extremely difficult because the soil around infested

plants is always contaminated and is a source of continual reinfestation. If nemic pests were restricted to the plants proper, control would be possible by destroying them. A hot-water treatment could be applied to valuable nursery stock, such as bulbs, corms, tubers, and dormant and even growing plants. Such a treatment is already in use to rid bulbs of the bulb or stem nema, *Tylenchus dipsaci* (110° to 111.5° F. for two and one-half hours); to kill the root-knot nema, *Caconema radiculicola* (formerly called *Heterodera radiculicola*), in infested roots (118° for half an hour); or to cure strawberry plants of the strawberry nema, *Aphelenchus fragariae* (118° for half an hour). The value of this method in the fight against noxious nemas is not limited to the saving of valuable plants. It affords also an opportunity to check the distribution of such pests through infested nursery stock.

The main problem, however, in our battle against nemic pests is to grow crops on contaminated soil to free it of the infestation. Chemicals of various kinds (carbon bisulphide, calcium cyanide, etc.) have been tried, with more or less success but in no instance with full satisfaction. The reasons for nonsuccess are varied. The soil is an extremely difficult object for chemical treatment because of its varied chemical and physical structure. Chemicals applied in solid, fluid, or gaseous form may be changed before their action takes place, and soil water, air pockets, etc., interfere. Such treatments may be impracticable also because of the expense involved or because of danger to health during application. Drowning also has been tried but thus far without great success. The root-knot nema was found to be still active after five months' submersion. Fallow with absolute control of the weeds and repeated tillage exposing the soil well to the sun's rays has been found very helpful in the fight against root knot, but not so