The size of earthworm populations ranges from only a few to more than 1000 m^2, and depends on a wide range of factors (Edwards and Lofty 1977. Lee 1985). Typical populations seldom exceed 100 to 200 m^2 in cultivated soil or 400 to 500 m^2 in grassland (Edwards 1983). Earthworm populations in soils under some form of conservation tillage or no-till are usually much higher than in plowed or intensively cultivated soils (Edwards and Lofty 1982b).

In temperate regions, earthworms are most active in spring and fall. During winter, they retreat to the deeper soil layers to escape adverse temperature conditions, though they can become quite active again during cool, wet periods when the ground is not frozen. In spring, the peak production of cocoons usually occurs. Earthworms can survive summer drought either as cocoons or by burrowing deep into the soil. Some species construct cells lined with mucus fairly deep in the soil, in which they aestivate in a coiled position during hot, dry periods (Edwards and Lofty 1977). They remain in these cells until the moisture and temperature conditions are favorable for renewed activity.

In no-till soils they are important because they can incorporate a significant amount of crop residues into the soil (Mackay and Kladivko 1985). The feeding activities of *L. terretris* may even make it difficult to maintain the 30% cover of protective crop residues, which is required for cultivation practices to be classified as conservation tillage in the U.S. *L. rubellus* also feeds mainly on surface plant or crop residues, but unlike *L. terrestris,* burrows continuously through the upper horizons of soil rather than forming a permanent vertical burrow.

The most direct way that earthworms contribute to the stability of soil aggregates is through the production of casts (Cades 1993). Fresh earthworm casts are often highly-dispersed, nearly-saturated masses of soil which are unstable and susceptible to erosion. As earthworm casts age, various physical, chemical, and biological processes influence their stabilization. Their organic matter content (Shipitalo and Protz 1988), wet-dry cycles (Marinissen and Dexter 1990), and age all enhance the development of a more stable earthworm cast structure (Marinissen and Dexter 1990).

Earthworms have often been correlated positively with increased soil porosity (Teotia et al. 1950, Hoeksema and Jongerius 1959, Satchell 1967, Ehlers 1975). Hoeksema and Jongerius (1959), working in Dutch orchards, estimated that earthworms could increase the pore space in soil by 75 to 100% and Satchell (1967) estimated that earthworm burrows could account for up to two-thirds of the air-filled pores in soil.

Earthworm burrows can also influence the quality of infiltrating water and the potential for leaching of nutrients and chemicals from agricultural land, because of their dramatic influence on water infiltration and preferential solute flow. The rate of flow of water through earthworm burrows during rainfall events is influenced by a variety of factors, the most important of which are the soil moisture content and rainfall intensity (Edwards et al. 1992).

Research in many parts of the world has shown that inoculation of earthworms into soils with low populations can produce significant increases in yields of crops. Many workers have investigated the effects of inoculating worms into soils in pot experiments (Wollny 1890, Chadwick and Bradley 1948. Baluev 1950, Joshi and Kelkar 1952. Nielson 1953. Spain et at. 1992) and reported considerable increases in root and shoot growth. Aldag and Graff (1974) compared the growth of oat seedlings in pots with 800 g of brown pod sol soil that had been inoculated with eighteen *Eisenia foetida.* The dry matter yield of the oat seedlings was 8.7% greater in the soil with earthworms than in that with no earthworms.

In a series. of greenhouse experiments, Atlavinyte and her co-workers (Atlavinyte et al. 1968, Atlavinyte 1974, Atlavinyte and Vanagas 1982) reported strong positive correlations between the numbers of earthworms added to soil (usually *A. caliginosa)* and the growth of barley. For instance, addition of 400 to 500 individuals of *A. caliginosa* m-2, in one meter square field plots, increased the yield of barley by 78 to 96 %. The increases in barley yields were proportional to the numbers of earthworms that had been added.

In field experiments in the Netherlands, large numbers of earthworms added to soil doubled the dry-matter yield of spring wheat, and increased grass yields fourfold and clover yields tenfold (van Rhee 1965). Kahsnitz (1922) reported that the addition of large numbers of live worms to a garden soil increased the yields of peas and oats by as much as 70%. Hopp and Slater (1948, 1949), working in the midwestern United States, reported that crop plants grown in a poorly-structured soil yielded 3160 kg ha-' when earthworms were added to the soil at a rate of 120 m-2, but only 280 kg ha-' when no worms were added. These workers also investigated the influence of four different species of earthworms on crop yield, and reported that all four species caused consistent increases in yields of millet, lima beans, soybeans, and hay. They reported that the growth of soybeans and clover in soils with poor structure was stimulated more than that of grass and wheat. Dreidax (1931) reported that yields of winter wheat were greater in plots to which live worms were added than in plots with no worms. Uhlen (1953) showed that inoculation of soil with *L. terrestris* and *L. rubellus* increased yields of barley in heavily-manured garden soils.

In field experiments in New Zealand, the addition of introduced European species of lumbricid earthworms to pastures have increased grass yields consistently. Earthworms inoculated on a 10 m grid in a New Zealand pasture, spread evenly throughout the entire field in 7 to 8 years and increased yields of pasture grasses (Hamblyn and Dingwall 1945, Richards 1955, Stockdill 1959). There are many other instances of increased yields caused by earthworms in different parts of New Zealand (Nielson 1953, Waters 1955, Barley 1961, Bar- ley and Kleinig 1964, Kleinig 1966, Noble et al. 1970), yields almost doubling in some instances (Stockdill 1982). Inoculation of worms to pastures with low earthworm populations is now a standard agricultural practice in New Zealand (see Lee, this volume).

Edwards and Lofty (1978) inoculated deep-burrowing species of lumbricids *(L. terrestris* and *A. longa)* into direct-drilled (no-till) field soils with low indigenous populations of earthworms. They compared cereal growth in plots to which the shallow-working species, *A. caliginosa* and *A. chlorotica*, had been added, with that in plots to which no earthworms had been added. They reported significantly improved root and shoot growth in response to the earthworm inoculations. In other field experiments (Edwards and Lofty 1980) added average populations of mixtures of either the deep burrowing species, *L. terrestris* and *A. tonga*, or of the shallow-working species *A. caliginosa* and *A. chlorotica,* to small, replicated field plots. The growth of barley in inoculated plots was compared with that in plots to which no earthworms had been added. Both the numbers of barley plants and the rates of growth of the barley increased significantly in all of the inoculated plots, particularly in response to inoculation with deep-burrowing earthworm species.

The knowledge that earthworms can improve soil fertility, has resulted in many attempts to add earthworms to poor soils in order to improve them or to use organic matter to encourage the build up of earthworm populations. Inoculation of earthworms into soil has been particularly promising in accelerating the reclaimation of flooded areas, such as Dutch polders, that were drained and put into cultivation (van Rhee 1962). For instance, the earthworms, *A. caliginosa and L. terrestris,* were introduced to polder soil at a rate of about 800 worms per tree, in soil planted with fruit trees. The trees grew more rapidly and exhibited greater root growth in the worm-inoculated soils than in those without worms (van Rhee 1969, 1971). The worms that were added multiplied rapidly in the polder soils; *A. caliginosa* increased from 4664 to 384,740 individuals per ha in 3 to 4 years, and *Allolobophora chlorotica* from 2588 to 12,666 individuals per ha over the same period (van Rhee 1969).