To the young, two decades often seems a millenium; to those of us who have experienced this recent era in the Association's history, they are as a fleeting scene. But within this period has transpired many remarkable changes. Especially is this apparent if the comparison is made with the status of agriculture in the world elsewhere, and with that of previous centuries. The changes in agriculture as they relate to sanitation technology should be considered in the light of changes in agriculture as a whole.

The phenomenal biological changes affecting human population in the United States, as well as in other areas of the world, has had counterparts in American agriculture. While we may not have been noticing, almost two million farmers have been dropping from the American farm scene. In 1940 there were 8,800,000 farmers. Today there are only about 6,800,000 farmers who feed some 17,000,000 more people than before, and who produce about 40 per cent more crops. In this period the population of the United States has increased from about 132 to 159 million. In the early part of this century, it required the toil of one farmer to feed about four persons. Twenty years ago his productivity would feed about 12 persons; today each farmer can feed about twenty people. In fact, the excesses of productivity have been and are problems of economic and political importance.

The effects of a prior economic depression resulted in a trend toward reduction in farm family size, and in the number of farm families. The major World War II, which occupied much of the civilized world's efforts in the past two decades, gave tremendous demands for food, and for labor for its production. The developments in farm facilities, and in the nature of agriculture thus have been great. The changes in productivity in agriculture in the past 20 years can be correlated with certain changes in characteristics of farm facilities, as presented in Table 1.

The changes in American agriculture can be associated with three major developments; (a) the use of machinery and mechanization of operations; (b) the use of fertilizers the better to balance nutrients drawn from the soil, and (c) the development and application of powerful preventative such as insecticides, fungicides, weedicides and the like. It has been estimated that the ravages of biological enemies can cost an equivalent of 30 per cent of man's food and forage. The decline in use of animal draft on farms released much acreage for food for man. It also released the labor nominally used in care of the animals for production of food. The relatively greater productivity of machine power negates much of the effects of adverse climatic weather particularly in periods of planting and in harvest. The production per man hour of farm labor in the past 20 years has increased 400 per cent for feed grains, 150 per cent for hay, and 200 per cent for all crops (3). Among other integrated factors in the increase in production of crop foods may be cited hybridization, close-spacing of plants, fertilization, irrigation, improved crop varieties, weed, brush, fungicide, insecticide and other pesticide controls, improved disease free and resistant stocks, fertilization and soil practices.

The acceptance or adoption of these new techniques into agriculture in the past 20 years has been greatly augmented by educational forces. The mechanics of agricultural extension work has been greatly extended not only through colleges of agriculture and county agents, but also through industrial effort and tools of press, radio, and television. The increased capital investment required for successful modern science farming has demanded greater use of the educational tools by the farmer. An increasingly greater percentage of agricultural output is produced by a smaller percentage of the producers. The introduction of new principles and techniques has become more easily accomplished. Tremendously increased sums of money from both government and industry sources have been and are being invested in research for both agricultural production, and utilization.

The changes in the business nature of the farm enterprise are reflected in part in the development of selected types of cooperatives, as shown in Table 2 (2). They are reflected in part also in the trend towards specialization in the production of certain farm crops, and in a decrease in diversification in the farm enterprise. This has been accompanied also by specialization in food processing facilities.

Beyond these general trends in agriculture in the
past two decades, there have been also many developments in agriculture of importance to the milk and food sanitarians. It would be difficult to rank their relative significance; some may have nostalgic implications.

The production of milk in total, and per farm, has increased tremendously; a greater portion is being marketed in the bottled fluid form which implies wider use of better standards. There are fewer cows, and fewer farms, and much greater productivity per cow than formerly. The farms have become better equipped in the specialized function of producing milk. There are in use more milking machines, milking parlors, pipe line milkers, pen barns, manure removers, paved cow yards, barn and milkhouse fans, silage unloaders, hay balers, and hay driers.

It is difficult to evaluate the separate and relative effects of two compartment wash and sanitizing sinks in well designed separated milk houses, of new types of dairy brushes, compounded detergents and sanitizers, warm water, room heaters, power refrigeration, protected water supplies, and enclosed tracks.

In the past twenty years much information has been gained on the nutritional requirements and production and growth performances of farm animals. New principles of dairy and farm animal nutrition have come into their own. Recent studies indicate a majority of dairymen regularly purchase large quantities of supplement for efficient farm feeding. The selection of supplements varies with their relative cost-yield effects, and the availability and quality of the farm feeds. The development of preserved forages was greatly expanded in these recent decades.

The widespread practice of hand milking gave way to machine milking. Rapid or "3 minute" milking enabled integration of highly desirable sanitation practices. Integrated was the routine sanitizing of utensils, the germicide washing and wiping of clipped udders, the immersion of hands in the germicide, the regular use of the strip-cup, the teat-cup sanitation dip, and the prompt removal of milk to the milkhouse. Time and motion suddenly became dairywise and was put to profitable use.

Artificial insemination became essential to modern farm dairying following its introduction in the recent years. In 1939, six associations of dairy cattle breeders used artificial insemination; they had 646 members who owned 33 bulls and 7,539 cows. In 1956, there
were 75 studs with 673,970 members, who owned 2,651 sires and 5,784,000 cows.

In the early thirties, unpasteurized milk was still sold extensively in many cities. The dairy industry already had been through the Herculean and expensive task of elimination of bovine tuberculosis involving the development of reliable test techniques, the actual testing of herds, the establishing of compensatory plans for compulsory slaughter, and the development of programs of area accreditation. The history and experience thus learned with tuberculosis has been used to good advantage in the past two decades in the eradication of Brucellosis. Methods of test, as in the agglutination and ring tests, are now established as counterparts in the plan of calfhood vaccination, compensatory payments, and in accreditation. Many states have invoked statute plans for Brucellosis eradication in dairy herds.

Concurrent with the developments in the past 20 years has been the problem of infections mastitis. Earlier means of control were sought in nutritional, herd management, and in sanitation practices; more recently the seemingly uncontrolled use of antibiotics (also a development of the times) perhaps has created for the dairy industry a serious public health problem. The problem of the incidence of mastitis, and its changing character, is as great, if not greater than ever before, and will require the utmost of scientific talents in the forthcoming decade for its eradication and control.

The use of antibiotics and hormones has been extended to other farm livestock for purposes of greater economic animal growth. Much attention has been given to the public health aspects of carry over of these agents into the edible food, and into their effects as spoilage inhibitors.

Agriculture has for many generations relied upon a limited number of insecticides for dairy, and other food crop work. Within the past decade a number of synthetic powerful insecticides have been developed and introduced, and which have had wide application. A statute amendment (The Pesticide Amendment) to the 1938 Federal Food and Drug Act recognizes the necessity of use of chemicals in pesticide control in the production of food crops. Where the need for the chemical is properly established on petition to the U. S. Department of Agriculture, a residue tolerance under the conditions of its use is then established by the Food and Drug Administration. Although hundreds of residual tolerances have thus far been established for fruit and vegetable crops, none has been provided for milk or milk products. The zero tolerance thus required for milk makes necessary careful consideration of the possible carry over of the pesticides from treated forages fed to cows.

The enactment of the 1938 Federal Food and Drug Act brought new principles of interest not only in food processing, but also in its production. The philosophy of caveat emptor was stricken and the consumer given every right to perceive that a food offered for sale was free of hazard. The 1938 Act specifically delimited the addition of poisonous chemicals to foods and which has been administered under the 'per se' doctrine that any chemical of itself poisonous may not be used in a food, with the aforesaid exceptions of the Pesticide Act. It also specifically prohibited the handling of foods under conditions whereby they may or might be contaminated. This has affected sanitary practices in many areas of fruit and vegetable harvesting, transport to market, personnel housing, and in food storage. Thus the stipulations of the Act have been far reaching. They also are the subject of much scrutiny currently in legislative houses.

There has been extended use of improved principles in regulatory milk ordinances; there has been greater uniformity in the ordinances pertaining to farm milk handling. The development of 3A sanitary standards in the past decade has extended to farm utensils, and to the equipment involved in transport of milk from farm bulk milk tanks and in tank trucks to dairy plants. Many state and community laws have been modernized in line with the extensive problem of transport of meat, milk and other foods to greater distances. Compulsory pasteurization of all milk handled in resale is virtually effective in all cities and most states; direct sale of milk from farms has decreased materially.

Although rodent control has been a problem of man for centuries, the past two decades yielded for the first time a relatively safe chemical 'Pied Piper' (Warfarin) that virtually eliminates the rat population of farms and agricultural communities, as well as areas in cities.
Perhaps less noticeable but nonetheless important to sanitation practices in farm food production has been the modernization in conditions of living in the farm home. So extensive has been this development in the past two decades that in many areas modernity in the farm home ranks with that in the urban-city home. Rapidity and convenience of transport between farm and community, and farm and consolidated school, has enabled rapid acceptance of improved standards of living. It has influenced too the families’ concept of the significance of sanitary practices not only as they relate to farm home life, but also to food handling. In some areas a high percentage of farmers also supplement their income by employment in nearby cities, which increases the trend, presumably, to modernization of farm life (4).

Within the past two decades many improvements have been made in the form of American agriculture; it is probable this trend will continue in order to enable production of food for increased numbers of people anticipated in the coming years. There has been accomplished tremendous advance in the sanitary properties of milk, and other foods. It is probable that changes of similar degree that we have seen, and are now experiencing, will continue in the near future.

QUESTIONS AND ANSWERS
Continued from page 260

"Modern Sanitation", Powell Magazine
"The Sanitarian", N.A.S. 7839 Adoree, Downey, California
"Agriculture and Food Chemistry", A.C.S.
Easton, Pa.
"Journal of Milk and Food Technology", IAMFS, P. O. Box 437, Shelbyville, Indiana

QUESTION: Information on Astell roll technique for bacterial counts in milk.

ANSWER: Information may be obtained from Mr. A. Rowlands, Astell Laboratory Service Co., Ltd., 172 Browhill Road, Cufford London, S. E. 6, England. Special equipment is available for the Astell procedure. Main items are the tube spinner and the counter, or an adapter for a regular colony counter. Bottles previously filled with 4.0 ml. of agar are sterilized and cooled. Required dilution is made so that 0.5 ml. of sample will give the required range of colonies. Special seal is replaced in bottle and it is spun for 4 to 5 minutes. Agar solidifies on walls of tube. Incubate, place in counter and one fourth segments are counted to yield total count per 0.5 ml. of diluted sample. See: Report of Committee on Applied Laboratory Methods – 1956. This Journal page 17, January 1957.

QUESTION: With reference to HTST units does vacuum steam have any distinct advantages over hot water? — G. A. MERCURD, Providence, R. I.

ANSWER: Information is lacking on a comparison of the efficiency of bacterial destruction by heat under vacuum compared with steam pressure. No organisms can survive ten minutes of direct exposure to saturated steam at 120 degree C and 15 pounds. While this does not parallel high temperature short time pasteurization conditions, it does indicate that bacterial destruction is a function of time, temperature and pressure. However, entrapped air may lead to serious sterilization failures since it may collect in pockets and serve as an insulator. Hence vacuum systems which remove air from the pasteurization equipment might be of some value where air entrapment is a problem. Existing vacuum equipment used with HTST pasteurizers is primarily for the purpose of removing volatile gases for the improvement of flavor and is not meant to improve the effectiveness of the pasteurization process.