

Trends in American Agriculture

Their Implications for Biological Warfare against Crop and Animal Resources

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INTRODUCTION

Much of the actual thought on biological warfare against crop and animal resources was a product of the era of 1950–1965. Practically all of the literature on this topic was produced during this same period. Much has changed in American and world agriculture since that time. These changes have altered the nature of the agriculture target and thus the entire scope of biological operations in this arena.

Historically, anti-plant and anti-animal agents were selected for widespread distribution, in a wartime situation, with the intent of killing or rendering unfit for their intended use. For example, during World War II anthrax was pressed into tons of oil-seed cake by the British from December 1942 to April 1943. When dropped and consumed, the resulting disease would deny the Germans access to horse-drawn transportation and destroy cattle, sheep, and swine which served as both food, raw materials for clothing, and a chemical feedstock for the munitions industry (animal fat was used to produce nitroglycerin).

Biological warfare threats still encompass denial of food supplies, but now includes economic objectives, primarily economic loss to the industry by restrictions on international trade and disruption of internal distribution by governmental efforts to isolate and eradicate the disease.

MAJOR TRENDS IN AGRICULTURE

Many of us still retain the idea of the family farm of the 1940s and 1950s, a mostly self-sufficient venture supported by a diversity of animal and plant life. We still see the remains of the old farmsteads with chicken houses, pig pens, and barns for cattle and storage of a variety of grains. Some of this exists in the part-time farmers on the urban edge, but sustainable agricultural production is different.

Today's agriculture is shaped by powerful trends: concentration, decreasing genetic diversity, consolidation of support industries, urbanization, and internationalization of trade. These trends have changed agriculture completely. The biological agents developed by either countries, terrorists, or individuals have also changed.

Concentration

Concentration has occurred on individual farms and within regions. Improved transportation and the economic necessity to lower the cost per unit profit of agricultural commodities have accelerated this trend.

Individual farms are larger and concentrate on the production of large volumes of a single commodity group. The earliest changes were noted in the poultry industry, changing from many small “backyard” flocks to large commercial operations of 250,000 to multi-million bird sites. Typical poultry operations produce about a \$.04 per pound margin to pay for labor. To produce a near-poverty level income of \$16,000 requires the operation to produce approximately 4,000,000 pounds of poultry. Swine and beef production is also consolidated. According to industry officials, the top 40 pork producers control 36% of production today, and, by the year 2002, the top 40 producers will control 90% of the production. In the beef industry, by 2010 the largest 30 feeders will generate 50% of the finished cattle.¹

The second impact of concentration is geographic. Improved transportation has untied the point of production from its market. Specialty products are relocating to areas that offer geographic, climatic, regulatory, or financial advantages. This has resulted in concentrations of certain animals in specific areas, such as poultry in Pennsylvania, Maryland (eastern shore), Virginia, Georgia, and Arkansas; swine in North Carolina and Iowa; and cattle feeding in western Kansas and the border areas of surrounding states.²

For the user of biological agents, the trend to concentration has reduced the target’s geographic area, increased the potential for spread of infectious agents, and magnified the impact of limited use. On the other hand, concentration allows the defense to concentrate its resources for detection, prevention, and restoration.

Decreasing Genetic Diversity

Closely associated with the increasing scale of agriculture is a decreasing genetic diversity. Unlike concentration, decreasing diversity is common to both plant and animal agriculture and is driven by the combination of the buyer’s requirement for uniformity of product and the producer’s desire for maximum productivity. In the animal area, we have seen the virtual disappearance of the brown egg because the breeds that produce brown eggs are heavier and thus more costly to maintain. In the poultry and swine industry, reduced diversity produces less variability in the product and facilitates automation in preparing the end product for the consumer.

The advent of commercially viable biotechnology products in the plant kingdom has even more radically reduced the diversity of the commodities. The desire for superior yields and quality coupled with current gene technology have narrowed the genetic base. Most dramatically, a recent ability to transmit resistance to certain chemicals (herbicides) has resulted in a near monoculture in large plantings of soybean and corn in the United States.³

Decreased genetic diversity is a benefit for the well-financed, sophisticated user of biological agents. The lack of diversity presents the unique opportunity to create a designer organism tailored to the known genetic material of the target. The universal vulnerability of the target also adds to the difficulty of separating a natural infection from an induced disease.

Consolidation of Support Industries

Followers of the stock market have certainly noted the consolidation of suppliers and consumers of agricultural commodities. An outstanding example is Monsanto,

which has made the transition from a chemical to agricultural biotechnology company. This trend, driven by the economies of scale, has reinforced the earlier trends of concentration and lack of genetic diversity by reducing the number of seed stock producers and limiting the sources of supply.

For the biological agent user, this consolidation offers a viable additional method of dissemination. The consolidation reduces the effort and resources required to contaminate a product. A single incident could produce much more damage than in a more dispersed source. From the defensive, less resources would be required to focus on preventive measures.

Urbanization

The trend of urbanization has dominated the last portion of the twentieth century. Agriculture has been virtually eliminated from the fertile river valleys and has been pushed away from the population centers. This trend has been accelerated in recent years by concern for aesthetic and perceived hazards of agriculture arising from disposal of animal waste, use of chemicals on plants, and avoidance of dust and odor. Less than 3% of the U.S. population is considered rural and less than 1% of the population is dependent on agriculture for a livelihood. As a result, the average city has less than a 5-day food supply and that food must travel more than 1,300 miles from field to table.⁴

Urbanization is beneficial for the agricultural producers because it isolates them from the major sources of international movement of plant and animal diseases. Conversely, the urban areas are further removed from their sources of supply. Disruptions in food supplies are much more likely to be felt in a short time and restoration requires a longer period of time.

For the user of biological agents, the urban areas are becoming more vulnerable to disruption. Concentration of population increases the pressure applied to governments to alleviate the situation. The defense is reduced to very costly procedures to assure nutrition, but not satisfactory food, to the population of the urban area.

Internationalization of Trade

This is the most important development for those who would use biological agents against plants or animals. Effective use no longer requires that massive and widespread devastation occurs; the mere presence or suggestion of presence of an organism can have economically devastating consequences. Internationally, this is well illustrated by the number of "free trade" pacts that retain existence of an animal or plant disease as the single most important restriction in international trade of plant and animal products. Even the most casual observer can recall the continuing turmoil over bovine spongiform encephalopathy (BSE) and its effect on the British beef industry.

A biological agent user can achieve economic effects with the mere presence of a disease or create a lesser level of disruption by alleging that such a disease exists. It reduces the resources required for successful biological operations to a level achievable by a single individual.

SUMMARY

Current trends in American agriculture have changed the vulnerability to use of biological weapons against plant and animal resources. The major effect has been a requirement to look again at the model of the U.S. BW program of widespread dissemination of agent and look to attack models requiring much lower levels of resources. The U.S. biological warfare program models must take the effects of these major trends into account when considering the possible widespread dissemination of a biological agent. The models must also acknowledge the lowered levels of resources required to make such attacks given the modern trends in American agriculture.

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