

Kumar Varun Vijay

Department of Agricultural economics
Bihar Agricultural University
Sabour, Bhagalpur
India – 813 210

Sargam Swami

Department of Agricultural economics
Bihar Agricultural University
Sabour, Bhagalpur
India – 813 210

Swati Kumari

Department of Agricultural economics
Bihar Agricultural University
Sabour, Bhagalpur
India – 813 210

Aabha

Department of Agricultural economics
Bihar Agricultural University
Sabour, Bhagalpur
India – 813 210

Corresponding Author

Sargam Swami
sargamswamiindia@gmail.com

Sustainable Pest Management for Food Safety and Security

On the global scale of food security and safety and the continuous growth of the population worldwide, potential agriculture production is pre requisite to meet the global demand in a sustainable manner. As, majority of world population belongs to developing and under developed countries where undernourishment is common, it needs keen attention of government, industry and consumer in procuring food in right proportion to every individual. In order to meet the per capita food requirement of vast population some degree of technological innovation should be effectuated such as adoption of biotechnological tools and the implementation of IPM (Integrated Pest Management) methods keeping in view the concerns of environment and public welfare. For the decade, climate change and uneven use of agrochemicals has equally affected the agricultural land, the produced food grain as well as human health. The irrational application of chemicals since 1960s to double the produce has definitely achieved the food requirement of the population to some extent but it has added serious health issues among every section of the country. Hence, to curb the global issue of pest management it requires active coordination among nation to speculate and devise the alternatives to overcome the future consequences of the present. Allocating the whole responsibility in one's hand is precarious so it is the responsibility of every individual nation to speculate and derive better means to evaluate the sensitive issue of today to harness the healthy tomorrow. On the part of it, international organizations would play crucial role as they excel in capacities, they better manage and coordinate and take the leadership on behalf of the rest of the country.

INTRODUCTION

Amidst the rising world population and changing climatic condition, the world today confronted with the challenge of food safety and security along with ecological sustainability. In the coming years, these challenges would get worsened if immediate action is not taken to control. It has been found that nearly one billion people in the world are undernourished or suffers from some chronic disease as a result of food insecurity, increased population, climate change and urban development. It has been anticipated that by the year 2050, the global population would get projected to about 9 billion, thus raising the demand for food, feed and crop (FAO, 2009). Therefore, this study on various factors involved in food insecurities and for ensuring the food safety and security.

FACTORS IMPARTED

Globally the application of chemical fertilizers has increased tremendously since the 1960s responsible for increase in crop production and thus resulting into "Green Revolution". The substantial rise in crop production from the same area of land and the extensive application of fertilizers (nitrogen, phosphorus, and potassium) and intensive irrigation has brought new edge to agriculture, the average yield of rice, wheat, and maize the basic sources for human nutrition, has doubled which have been impossible without application of pesticides. Without this food prices rises and there would had been food crisis around the world and farmer would have suffered to survive in global markets for the essential commodities.

For a while it is judicious but the uneven use of chemicals in long run has damaged the natural resources, destroying the essential microorganisms present in the soil, and the accumulation of chemicals deteriorating the organic layer of the soil and water reservoirs which are the essential factors of crop production. Past research had indicted, globally approximately half of the food and fibre produced is lost to field and storage pests (insects, pathogens, weeds, nematodes, and vertebrate pests) (Pimentel, 1997). This kind of yearly losses put threat to global food security and safety bringing severe economic and nutritional burden to farmers as well as consumer all over the world. Evidence indicates that pests cause 25% loss in rice, 5-10% in wheat, 30% in pulses, 35% in oilseeds, 20% in sugarcane and 50% in cotton (Dhaliwal and Arora, 1996). Overall, insect pests inflict crop losses to the tune of 30-40% in vegetable

(Srinivasan, 1993) in many cases, there is 100% yield loss due to viral diseases vectored by insects (Shivalingaswamy *et al.*, 2002). From some evidence it has been observed that despite the vigorous use of chemicals, insects and pests are deteriorating the yield and also affecting the quality of the produced grain causing massive losses on potential agricultural production as they are becoming resistant after the period of time. While scientific skill to eradicate famines was accomplished during the twentieth century (Devereux 2009) in developing countries, there still inhabit more than one billion food-insecure people in the world (FAO 2009) for whom the food supply will have to be doubled between 2005 and 2050 (Borlaug, 2009). The estimated annual loss of 8-10% (13 million tons of grains lost due to insects and 100 million tons due to failure to store grain properly) occur in stored-food grain products. Most of storage losses are due to inadequate and poor storage facilities, which further allow attacks by insect pests and diseases, causing abundant losses annually (Shankar and Abrol, 2012b). Stored-product insects can cause serious post-harvest losses, estimated to be from 9% in developed countries to 20% or more in developing countries (Pimentel *et al.*, 1991).

CONTROL MEASURES

The global rise in population and per day requirement of food posed threat to the land capacity as it is fixed hence, it needs spectacular attention. Meanwhile, there is growing public concern about the injurious effects of chemical pesticides on human health and the ecosystem. The ongoing scenario of food demand and the use of synthetic chemicals for controlling pre-harvest and post-harvest losses and its effect on environment and the human health needs alternative action which is sustainable and eco-friendly. IPM a sustainable pest management practice has brought big breakthrough in agriculture. It is a continuously evolving and effective method of controlling crop pests to lessen ecological problems in agricultural ecosystems. Soil microbes through their anomalous biological mechanisms play a vital role in ecosystem functioning by preserving soil fertility, improving nutrient cycling, and managing pests. It is beneficial to restore the natural resources, especially soils and water that need to be enriched and renewed as they are already under great stress. Sustainable management of the world's soil resources is necessary to effectively address these issues. Since, food quality and safety have become pressing issues;

it needs major concern of governments, industry, and consumers. Food safety issues basically focus on microorganisms, fungus, or toxins which occur during storage and spoil the quality of the stored grain.

CONCLUSION

Presently, natural resources *viz.*, agricultural land and water are exhausting rapidly and turning the food security and safety as a serious concern in all regions of the globe. Thus, to control the ongoing destructions, better management measures should be regulated as water resources is the primary requirement for extending the agricultural practices hence, application of plant species suitable to regional weather conditions would help to improve water-use efficiency of the area. It is explicit that negative impact of agrochemicals can't be eliminated completely, but it can be controlled by adopting various organic methods. Insect Pest Management one of the crucial management practices that uses biological agent such as bio-pesticides, botanical pesticides and transgenic which is eco-friendly to control insect pests with minimum residues. Some cultural practices that can help protect the crop and reduce pesticide damage include tillage practices that disturb the insect's life cycle and destroy crop residues, changing planting dates to minimize insect impact, and crop rotations that include non-susceptible crops. Push-Pull Strategies Control insect pests and are proven best method to protect the food grains and contributing to food safety and security.

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