Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 8 [6] May 2019 :171-176

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD
Global Impact Factor 0.876
Universal Impact Factor 0.9804
NAAS Rating 4.95

REVIEW ARTICLE **OPEN ACCESS**

Environmental Extension

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ABSTRACT
Environmental management and cleaner production are rapidly becoming key issues in Agriculture, economics, trading, and business competitiveness. Since the 1980s, important industries have undergone major changes, with rapid growth in size and scale, but with fewer producers. This has strong negative impacts on the natural environment, particularly because of water, air and soil pollution. In most of the area where production takes place, the amount of waste produced is far beyond the sustainable assimilation capacity of the environment. General agricultural extension approaches in India is by the public and private providers broadly include activities relating to technology transfer, education, attitude change, human resource development, dissemination, and collection of information as well as interpreting science for farmers. Little or no emphasis is given to environmental education. There is need for a general review of agricultural and environmental extension strategies to incorporate the broader community's interest. With this background this paper helps to understand the concept of Environmental Extension.
***Key words**: Environment, Extension, Education, Environmental Extension*

Received 09.12.2018 Revised 20.02.2018 Accepted 19.04. 2019

INTRODUCTION

Environmental extension has become important in the field of agriculture to sustain in terms of trade, economics and business. Due to rapid growth in industrial sector, the amount of waste produced is far beyond sustainable assimilation capacity of environment. Indiscriminate use of pesticides and intensive agricultural practices leads to negative impact on the environment. To conserve the environment, environmental education should be provided on critical environment and natural resource issues. In India, general extension approaches include activities relating to technology transfer, education, attitude change, human resource development, dissemination and collection of information as well as interpreting science for farmers. Little or no emphasis is given to environmental education. So, there is a need for review of environmental extension strategies to incorporate the broader community's interest in protecting environment.

Increasing population in India is putting an incredible strain on the environment, developed countries are depleting the natural resources and continued to pollute the environment in the world. By depleting the resources, they are causing environmental pollution which may indirectly lead to global warming. Many non-renewable resources are being depleted due to the over use of fuel and energy. Many parts of the world also suffering from a shortage of food and water. The growth of population puts larger demands on our already limited resources. The environment on earth is suffering from the growth of global population. The depletion of resources and biodiversity, the production of waste, and the destroying of natural habitat are becoming serious problems.

The population of an India is increasing every year, approximately 130 crores based on UN estimates which puts considerable pressure on its natural resources and reduces the gains from development. According to Asian Development Bank estimates 21.9 per cent of the people in India live below National poverty line. It's the who poor people depends largely on environment for their livelihood and who suffers most from the impact of environmental issues. In India poverty and environmental degradation have a nexus between them, poor people are responsible for cause and effect of environmental pollution [1-3]. Where the poor people are forced to deplete the resources to survive and in turn environmental

degradation improvises the people. The interaction of environmental degradation and poverty not only threatens the ecological balance but also physical security, economic well being and health of the poor people. The paper have been reviewed with objectives

- To understand the concept of Environmental extension
- To know about the agricultural factors causing negative effects on environment
- To understand the extension approaches used for environmental protection

CONCEPT OF ENVIRONMENTAL EXTENSION

Environment: The surroundings or condition in which a person, animal or plant lives or operate. Environment is everything that is around us. It can be living or non-living things. It includes physical, chemical and other natural forces. Living things live in their environment. They constantly interact with it and adapt themselves to conditions in their environment. In the environment there are different interactions between animals, plants, Insects soil, water, and other living and non-living things.

Environmental Extension: It is not formal schooling, rather it is a process of social learning in which young people and others should engage in generating and transmitting knowledge about environmental protection aspect as well as receiving it. Environmental extension is providing environmental education through extension approaches.

Functions of environmental extension:

Awareness - to help individuals and social groups acquire an awareness of and sensitivity to the total environment and its allied problems.

Knowledge - to help individuals and social groups gain a variety of experiences with the total environment and to acquire a basic understanding of the environment, its associated problems and humanity's critical responsible presence and role in it.

Attitudes - to help individuals and social groups acquire social values, strong feelings of concern for the environment and the motivation for actively participating in its protection and improvement.

Skills - to help individuals and social groups acquire the skills for working toward the solution of environmental problems and to foster a dialogue between these groups and,

Participation - to help individuals and social groups develop a sense of responsibility and urgency regarding environmental problems to ensure appropriate action to help solve these problems and avoid future problems.

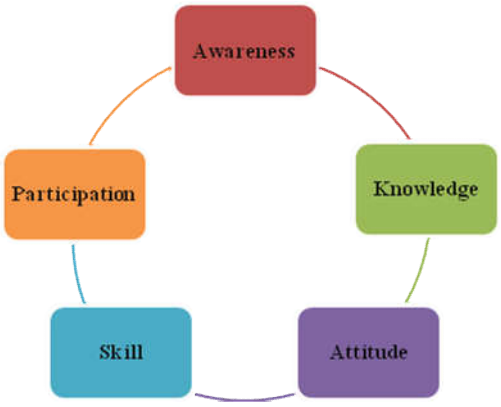

Fig 1: Functions of environmental extension

Objectives of Environmental Extension

To describe and discuss the theoretical and practical aspects of extension.

To describe and analyze the factors influencing behavior, attitude and belief of natural resource managers.

To discuss and design effective extension programs.

To critically evaluate the integration of conservation and production in the landscape.

Agricultural factors causing negative effects on environment

Pesticides
Chemical fertilizers
Irrigation
Tillage
Stubble burning
Animal waste

Anthropogenic source

Effect of pesticides on Environment

The impact of pesticides consists of the effects of pesticides on non-target species. Pesticides are chemical preparations used to kill fungal or animal pests. Over 98% of sprayed insecticides and 95% of herbicides reach a destination other than their target species, because they are sprayed or spread across entire agricultural fields. Runoff can carry pesticides into aquatic environments while wind can carry them to other fields, grazing areas, human settlements and undeveloped areas, potentially affecting other species. Over time, repeated application increases pest resistance, while its effects on other species can facilitate the pest's resurgence.

Each pesticide or pesticide class comes with a specific set of environmental concerns. Such undesirable effects have led many pesticides to be banned, while regulations have limited and/or reduced the use of others. Over time, pesticides have become less persistent and more species-specific, reducing their environmental footprint. Pesticides can kill bees and are strongly implicated in Pollinator decline, the loss of species that pollinate plants, including through the mechanism of colony collapse behavior, in which worker bees from a beehive or western honeybee colony abruptly disappear.

Environmental Effects of Using Chemical Fertilizers

Some of the synthetic compounds used to manufacture chemical fertilizers can have negative environmental effects when allowed to run off into water sources. Nitrogen that flows into surface water by farmland accounts for 51% of human activities. Ammonia nitrogen and nitrate are main pollutant in rivers and lakes, which leads to eutrophication and ground water pollution.

Excessive air- and water-borne nitrogen from fertilizers may cause respiratory ailments, cardiac disease, and several cancers, as well as can "inhibit crop growth, increase allergenic pollen production, and potentially affect the dynamics of several vector-borne diseases, including West Nile virus, malaria, and cholera.

Environmental impacts of irrigation

The environmental impacts of irrigation relate to the changes in quantity and quality of soil and water as a result of irrigation and the effects on natural and social conditions in river basins and downstream of an irrigation scheme. The impacts stem from the altered hydrological conditions caused by the installation and operation of the irrigation scheme.As drainage water moves through the soil profile it may dissolve nutrients (either fertilizer-based or naturally occurring) such as nitrates, leading to a buildup of those nutrients in the ground-water aquifer. High nitrate levels in drinking water can be harmful to humans, particularly infants under 6 months, where it is linked to "blue-baby syndrome".

CASE STUDIES

In India 2.19 million ha have been reported to suffer from waterlogging in irrigation canal commands. Also 3.47 million ha were reported to be seriously salt affected,

In the Indus Plains in Pakistan, more than 2 million hectares of land is waterlogged. The soil of 13.6 million hectares within the Gross Command Area was surveyed, which revealed that 3.1 million hectares (23%) was saline. 23% of this was in Sindh and 13% in the Punjab. More than 3 million ha of water-logged lands have been provided with tube-wells and drains at the cost of billions of rupees, but the reclamation objectives were only partially achieved. The Asian Development Bank (ADB) states that 38% of the irrigated area is now waterlogged and 14% of the surface is too saline for use

In the Nile Delta of Egypt, drainage is being installed in millions of hectares to combat the water-logging resulting from the introduction of massive perennial irrigation after completion of the High Dam at Assuan.

In Mexico, 15% of the 3 million ha of irrigable land is salinized and 10% is waterlogged. In Peru some 0.3 million ha of the 1.05 million ha of irrigable land suffers from degradation.

Estimates indicate that roughly one-third of the irrigated land in the major irrigation countries is already badly affected by salinity or is expected to become so in the near future. Present estimates for Israel are 13% of the irrigated land, Australia 20%, China 15%, Iraq 50%, Egypt 30%. Irrigation-induced salinity occurs in large and small irrigation systems alike

FAO has estimated that by 1990 about 52 million ha of irrigated land will need to have improved drainage systems installed, much of it subsurface drainage to control salinity.

Effect of soil tillage on environment:

Wrong soil tillage results in

Soil compaction

Soil moisture loss

Soil erosion

Destroys soil structure

Siltation of water bodies

Effect of Stubble burning on environment:

Stubble burning is the deliberate setting fire of the straw stubble that remains after wheat and other grains have been harvested. The practice was widespread until the 1990s, when governments increasingly restricted its use.

- Loss of nutrients.
- Pollution from smoke.
- Damage to electrical and electronic equipment from floating threads of conducting waste.
- Risk of fires spreading out of control

There is a perception that stubble burning contributes to atmospheric CO_2. However, carbon dioxide releases are only slightly greater than those from natural decomposition.

STUBBLE BURNING IN INDIA

Stubble burning in Punjab and Haryana in northwest India has been cited as a major cause of Pollution in Delhi. From late September through October of each year, farmers mainly from Punjab and Haryana burn an estimated 35 million tons] of crop waste from their wheat fields after harvesting, as a low-cost straw-disposal practice to reduce the turnaround time between harvesting and sowing for the second (winter) crop. Smoke from this burning produces a cloud of particulates visible in images from space, and has produced a "toxic cloud" in New Delhi, resulting in declarations of an air-pollution emergency.] For this, NGT (National Green Tribunal) slapped a fine of Rs. 2 lakhs on the Delhi Government for not filing an action plan providing incentives and infrastructural assistance to farmers to stop them from burning crop residue to prevent air pollution.

Although harvesters are available such as the Indian-manufactured "Happy Seeder" that shred the crop residues into small pieces and uniformly spread them across the field, as an alternative to burning the crops, farmers complain that the cost of these machines is prohibitive compared to burning the fields.

Effect of Animal waste on Environment:

Water for livestock production is used for drinking, irrigation to grow crops/ pasture and for different animal services such as cleaning. Waste from animals can be dangerous because it carries harmful bacteria which people may drink. Globally, 3.2 percent of human deaths are caused by unsafe water. The environmental impact of meat production varies because of the wide variety of Agricultural practices employed around the world. All agricultural practices have been found to have variety of effects on environment. Some of the environmental effects that have been associated with meat production are pollution through fossil fuel usage, animal methane, effluent waste, and water and land consumption.

The 2006 report *livestock long Shadow*, released by the Food and Agricultural Organsation (FAO) of the United Nations, states that "the livestock sector is a major stressor on many ecosystems and on the planet as a whole. Globally it is one of the largest sources of Green house Gases (GHG) and one of the leading causal factors in the loss of Biodiversity, while in developed and emerging countries it is perhaps the leading source of Water pollution.

Effect of Other Anthropogenic sources on environment:

Anthropogenic carbon dioxide due to:

Burning of fuel
Controlled burn practices
Motor vehicle
Marine vessel
Wood, coal burning fireplaces, stoves, furnace and incinerators

EXTENSION APPROACHES USED FOR ENVIRONMENTAL PROTECTION

1. Environmental Education
2. Environmental Planning
3. Social Learning
4. Watershed Development Approach
5. Environmental extension Training
6. ICT tools

Environmental Education:

Environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution.

As the first International Director of Environmental Education for the United Nations Educational, Scientific, and Cultural Organization (UNESCO), Dr. Stapp had the unique opportunity to work in close association with environmental educators on all continents in preparation for the Belgrade Working Conference on Environmental Education (1975) and the Tbilisi Intergovernmental Conference on Environmental Education (1977).

Environmental education seeks to address the living conditions and lifestyle choices of the population. The aim is to change the consciousness and readiness. Through extension programs that include a focus on environmental education, farmers and their families can participate in the reconstruction of their living conditions with ecological and democratic values of social and economic justice. The involvement of key people such as the youth and local schools' teachers is important for successful environmental education programs.

Social Learning:

Social learning takes place at a wider scale than individual or group learning, up to a societal scale, through social interaction between peers.

Social learning theory is a theory of learning and social behavior which proposes that new behaviors can be acquired by observing and imitating others. It states that learning is a cognitive process that takes place in a social context and can occur purely through observation or direct instruction, even in the absence of motor reproduction or direct reinforcement. In addition to the observation of behavior, learning also occurs through the observation of rewards and punishments, a process known as vicarious reinforcement. When a particular behavior is rewarded regularly, it will most likely persist; conversely, if a particular behavior is constantly punished, it will most likely desist. The theory expands on traditional behavioral theories, in which behavior is governed solely by reinforcements, by placing emphasis on the important roles of various internal processes in the learning individual.

Watershed Development Programme:

To restore the ecological balance. The outcomes are prevention of soil erosion, regeneration of natural vegetation, rain water harvesting and recharging of the ground water table.

This enables,

multi-cropping

diverse agro-based activities

sustainable livelihoods

Integrated approach and scientific management of the natural resources like soil, water, plant, human, animal and environment are required for overall development and sustained production. These natural resources can be best utilized and managed in an effective and gainful manner through watershed approach [2]. Some planning and development work of these vital natural resources in an integrated manner on watershed basis in the NE Region has been started since early seventies. Watershed management encompasses the concept of optimum utilization of soil and water for agricultural production as well as applying together the technical know-how, the people and the environment into a harmonious situation. Both natural resources and the socio-economic situations of any watershed are to be given equal importance. Integrated management of natural resources on watershed basis is the right approach for sustainable development for achieving goals like food security, poverty alleviation, and welfare of weaker sections of the society. The precious and most important human resources remained largely untapped particularly in rural areas and can be mobilized for the purposeful use of our physical, ecological, and biological endowments through integrated watershed development and management programmes. The watershed programme should aim at full employment of the people who are struggling to earn their livelihood also they are not expected to pay attention to the conservation strategy, unless their daily needs of food, fiber and fuel are met.

Environmental Extension Training:

Extension has a great role to play in human resource development.

The contents are made up of two major units:

(1) General aspects of the environment;

The first unit is divided into three activities (lessons) which include:

(a) major components of environment;

(b) farm environment and agro-ecosystem;

(c) environmental hazards and associated problems,

(2) protection and conservation of agricultural resources.

While the second unit has five activities including:

(a) soil pollution and its protection,

(b) hydrology, water pollution and its protection,

(c) tree and homestead management

(d) organic farming and environment
(e) integrated pest management.

To facilitate understanding and use of the modules by the trainers, each activity is accompanied by:

- An activity fact sheet covering the activity title, objectives, equipment, materials needed, time frame and delivery steps;
- Training aids (OHP and slides);
- pre- and post-test sheets including the key answers;

Hand-outs. In addition, there is a checklist of topics discussed in the training module (syllabus) so as to ensure that at the end of the training the trainees should have gained the knowledge and skills listed in the units and activities of the module

ICT TOOLS:

Environmental impact achieved by use of ICT tools:
Dematerialization
Reduction of movement and transport.
Environmental awareness and environmental education
Environmental sensors and environmental monitoring

Information and communications technologies (ICTs) are fundamental in all areas of society today, including in caring for the environment and aiding in the wake of natural disasters. Indeed, ICTs have proved to be essential in this regard; a fact that has been recognized by Governments and civil society worldwide. ICTs gain prominence as tools for environmental sustainability. Another relevant initiative for reducing the polluting impact of ICTs is correct electronic waste (e-waste) management. The rapid evolution of new technologies generates a large amount of e-waste, which can be either totally or partially recycled or reused.

ICTs are crucial to understanding the environment and the impact of climate change. ICTs can also provide tools to help cut greenhouse gas emissions, by, for example, making electricity load and energy management more efficient or modernizing mass transit. They can also be instrumental in providing information on climate change and disaster management. Looking at the broader sustainable development agenda, ICTs are useful in the management and monitoring of soil through remote sensing. They can help to manage water demand in agriculture through drip and advanced irrigation technologies. They can also be used in the monitoring and assessment of air pollution, in forest fire management and in various meteorological applications. There remains vast potential for developing ICT applications in support of sustainable development.

CONCLUSION

Conserving the environment is really a tough task but it can be possible only through the proper implementation of the appropriate strategies, recommendations and policy reforms. In India there is a less emphasis on environmental extension education. ICAR and SAUs should develop a course relating to Environmental Extension. Training, exhibitions and campaigns has to be conducted in order to increase the awareness about negative impact of agriculture on environment among the farming community. There is a need to provide environmental extension strategy, which can reach the target population such as farmers, students, rural extension agents and scientists and results in environmental sustainability.

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CITATION OF THIS ARTICLE

Chaithrashree, J., Amaresh Kumar ., Sahana, S, and Narendra,V.N. Environmental Extension.Bull. Env. Pharmacol. Life Sci., Vol 8 [6] May 2019: 171-176