International POPs Elimination Project

Fostering Active and Efficient Civil Society Participation in Preparation for Implementation of the Stockholm Convention

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Non-POPs strategy for crops protection

Environmental Experts Association

Romania
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About the International POPs Elimination Project

On May 1, 2004, the International POPs Elimination Network (IPEN http://www.ipen.org) began a global NGO project called the International POPs Elimination Project (IPEP) in partnership with the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Program (UNEP). The Global Environment Facility (GEF) provided core funding for the project.

IPEP has three principal objectives:

- Encourage and enable NGOs in 40 developing and transitional countries to engage in activities that provide concrete and immediate contributions to country efforts in preparing for the implementation of the Stockholm Convention;

- Enhance the skills and knowledge of NGOs to help build their capacity as effective stakeholders in the Convention implementation process;

- Help establish regional and national NGO coordination and capacity in all regions of the world in support of longer term efforts to achieve chemical safety.

IPEP will support preparation of reports on country situation, hotspots, policy briefs, and regional activities. Three principal types of activities will be supported by IPEP: participation in the National Implementation Plan, training and awareness workshops, and public information and awareness campaigns.

For more information, please see http://www.ipen.org

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Description of topic

Persistent Organic Pollutants (POPs) are chemicals that remain intact in the environment for long periods, are extremely toxic for humans and wildlife, accumulate in fatty tissues, are volatile, and have a global circulation through the atmosphere and seawater.

The Stockholm Convention on Persistent Organic Pollutants focuses on reducing and where appropriate, eliminating 12 POPs of international concern. These POPs include nine pesticides: aldrin, chlordane, dichlorodiphenyltrichloroethane (DDT), dieldrin, endrin, heptachlor, hexachlorobenzene (also an industrial chemical and unintended by-products), mirex and toxaphene; two industrial chemicals – polychlorinated (PCBs – also unintended by-products) and hexachlorobenzene (HCB); and four by-products – polychlorinated dibenzo-p-dioxins (PCDD) and dibenzo-furans (PCDF) as well as HCB and PCBs.

The POPs emission sources are situated in four main economic sectors: agriculture, industry, transportation and energy, to which could be added other sources that include the human settlements with waste landfills and incinerators (including those handling hospital wastes).

Agriculture and POPs

Agriculture is the main economical sector where chlorinated pesticides have been used and the effects of this are felt today. Although the damage to human health and the environment has been not been fully characterized, it has been sufficient for 151 governments to agree that nine chlorinated pesticides should be reduced with the goal of

elimination under the Stockholm Convention. The impact of pesticides used in agriculture on water-tables is in the form of diffuse pollution and is actually measured in the underground and surface waters.

Releases of POPs used in the agricultural sector into atmosphere occur either from stationary sources, like pesticides application on land and heat production, or mobile sources which are mostly related to off road vehicles (tractors and other means).

The following table shows the period of time when the POPs have been applied in Romania

Table 1					
Period of time/ POPs	**1975- 1980**	**1981-1985**	**1986-1990**	**1991-1995**	**1995-2000**
Aldrin					
Dieldrin					
Endrin					
Chlordane					
DDT					
Heptachlor					
Hexachlorobenzene					
Toxaphene					
Mirex					

Legend

	Applied
	Not applied
	Some products consented

The use of chlorinated pesticides in Romania began in 1948. The first products were based on DDT then others based on chlordane, dieldrin, endrin, aldrin, heptachlor and toxaphene were used. All these products had been imported, except those based on DDT and heptachlor which were locally produced.

The respective substances were used in the form of powders, granular or liquid forms on large agricultural areas and meadows and alfalfa cultures. Since 1965 the DDT pesticides have no longer been applied on meadows and alfalfa cultures.

The dieldrin based pesticides were used in Romania during 1965-1970, especially for seeds treatment. Beside the persistent chlorinated pesticides, the most frequently used products were based on DDT and heptachlor. No consents were granted after 1988 for the use of these types of products in Romania.

Nowadays the only chlorinated insecticides are those based on Lindane and these are used for seeds treatment.

Table 2	
Environmental parameter	**Emission sources**
Air	The pesticides emitted from the agriculture sector have been reduced according to the production decrease between 1989 and 2001. The emission of Lindane in the atmosphere during this period dropped about 91.3 % and Pentachlorophenol applied as fungicide and herbicide 88%.
Water	The annual loads of chlorinated pesticides on tributary areas of the inland rivers in the period 1985 – 2001 are monitored as part of routine analysis. The concentration values of pesticides decreased after the significant peak in the years of the 1990 – 1991 due to the influence/effects of the plant protection substances applied in earlier years. This interpretation should be carefully considered because the monitoring system is not perfect. The number of samples distributed in time and on the tributary inland river basins needs to be increased in order to improve the certainty degree of the veridical conclusions drawn.

Agricultural environment and hedges importance for biological control as an alternative to POPs utilization

Dependence on synthetic pesticides/POPs is one of the most adverse aspects of intensive agriculture. Pesticide use and trade in illegal, often unlabeled pesticides endangered the well-being of farmers, local people and the natural environment.

The existence of hedges/shrubs near or inside large agricultural plots is of great importance for maintaining a healthy environment. They represent an eco-tone zone, contributing to the specific biodiversity equilibrium between agricultural mono-cultures and natural vegetation, hosting a wide range of biodiversity.

The production of great land surfaces suitable for mechanized agriculture has destroyed the majority of hedges. This has resulted in biodiversity loss, connected with those biotopes, essential in biological control of crop areas. Organic and environmentally friendly cultures were not considered a viable alternative and their benefits for people's health were ignored.

The advantages of having hedges or hedge-rows have been well known for centuries by peasants interested in preserving them near their land crops. Chemical pesticides - POPs and fertilizers as we know them today were missing.

POPs were introduced in great quantity during the 20th century for obtaining high crop production with no apparent hazard adverse effects, at least initially. Unfortunately, the POPs being used to destroy crop pests (insects, rodents, fungus etc) were - and still are - very dangerous. They poisoned not only pests, but also soils, water table and crops. They have also penetrated deep into the food chain and consequently into the human body.

They are easily transmitted across placenta and accumulate in maternal milk - inducing lethal diseases and congenital malformations.

Political changes in Central and Eastern Europe and the transition period over the last 15 years has had a deep impact on agriculture. Production declined dramatically and the use of pesticides dropped significantly compared to the EU-15 countries. Pesticides use, monitoring of their residues and relevant legislation must be accompanied by steps toward an organic agriculture extension. Quality and food security in the future must be the principal way of action throughout the EU to build a healthy society.

Because of the high dependency on agrochemical usage and its negative side-effects in many Western countries, agriculture is returning to one of biological control exerted by animals/wildlife associated with hedges/hedgerows. Rebuilding hedge/hedgerow ecosystems will reduce POPs negative effects. EU accession offers the countries possibilities to maintain extensive farming by supporting organic farming and ensuring ecological agriculture.

Hedges/hedgerows have an important role by reducing the use of phytoncides or other volatile substances by their inhibitive action on some pests and weed killers in adjacent areas.

Hedges/hedgerows and their functionality

Hedges/hedgerows are a very rich transitory ecosystem (eco-tone) made up of different floral and animal populations occupying a certain habitat. Usually these ecosystems include varied species of wooden vegetation of different sizes – bushes, trees and herbs too. Spontaneous or planted hedges/hedgerows represent a protective belt for crops and a refuge for wildlife and domestic animals.

Hedges/hedgerows have a changing vegetation connected with the seasons and years, microclimate, development stages and size of vegetation, site and location (slope, sunshine, soil albedo (reflected sunlight), soil composition and texture, water table, wind direction or shelter), proximity crops a/o. Selection of the hedge species and density of plantation must be connected with regional characteristics, their adaptation to these and our expectation of them.

Hedges species	
high size deciduous trees	*Robinia pseudacacia, Tilia platyphyllos, T. cordata, Fagus sylvatica, F. orientalis, Castanea sativa, Quercus robur, Q. petraea, Acer platanoides, A. campestre, A. pseudoplatanus, Fraxinus excelsior, Ulmus campestris, Populus tremula, P. alba, Salix alba, S. triandra, S. fragilis, S. purpurea, S. caprea, Rhus typhina a/o*

medium size deciduous trees	*Sorbus torminalis, S. aucuparia, Alnus incana, A. glutinosa, Betula verrucosa, B. alba, Carpinus betulus, Caragana arborescens, Prunus cerasus, P. spinosa, Malus sylvestris, Crataegus monogyna C. oxyacantha, Cornus mas, C. sanguinea, Sambucus racemosa a/o*
coniferous tree	*Taxus bacata, Thuya occidentalis, Larix decidua, Picea glauca, P. pungens, Pinus strobus, P. nigra, Tsuga canadensis*
bushes	*Ligustrum vulgare, Berberis vulgaris, Rubus idaeus, Ribes nigrum, R. rubrum, R. alpinum, Corylus avellana, C. colurna, Philadelphus coronaries, Viburnum opulus, Syringa vulgaris, Cotoneaster, Ribes sanguneum, Rosa rugosa, R. canina, Euonymus europaeus, Forsithya sp., Spirea sp., Pinus mugo, P. virginiana, Juniperus sp.*

Hedges are primary feeding areas for animals living mainly on vegetation (sap, nectar, pollen, leaves, twigs, roots, fruits, grains a/o) and secondary feeding ones for the rest of the animals. At the same time, the hedges serve as shelters for animals of hunting interest as well as for predators, the natural enemies of the crop pests. Biodiversity is closely connected with various types of hedges (species, age, width, hight and densioty of plantations). Their skirt is successfully used by apiarists (bee keepers) while people and cattle could rest in their shadows during summertime. The loss of hedges/hedgerows around crops as well as on slopes/hillsides means a simultaneouse lost of a significant number of spontaneous vegetation and animal species.

Generally speaking hedges, together with talus (sloping rocks) as their support, carry out five useful functions:

- climate regulation
- hydraulic regulation and soils conservation against erosion
- species balance – inside and outside of their territory
- productivity – biomass source
- improvement of environment and agricultural conditions

Agricultural environment and necessity of hedges presence

In many developing countries, including Romania, agriculture, the environment and forestry have not co-existed in a sustainable manner on private property for many years. Developing countries have scarce resources to manage the existing natural forests, natural habitats and implicitly a sustainable agriculture system. After the Second World War the hedges became a burden for extensive agriculture and consequently remained unmanaged or destroyed without being replaced, especially on the Romanian Plain. At the same time in the cities and the villages the ordered geometry of concrete imposed itself over the natural wave-shaped lines of the landscape.

Runaway hedges/hedgerow deforestation produced:

- land degradation – erosion increases even on light slopes;
- drainage decrease and swamp generation;
- diminution of crops vigor, loss of wildlife habitats and recreational areas;
- damage to oxygen reservoirs; timber diminution and difficulties in the transport sector.

Besides the human life frame depreciation and landscape degradation, the cumulative effect of deforestation and natural loss of hedges lead to the former and latter mentioned consequences, which outline the present overview at both local and national level.

Land degradation

Depending on the method used to destroy soil production capacity, there can be seen different types of land deterioration together with their negative, measurable, consequences due to the loss of hedges/hedgerows, as following:

- soils eroded by water ⇒ loss of fertile soils ⇒ increased sedimentation rate of running waters and lakes;
- soils eroded by wind action ⇒ extension of dry lands / desertification ⇒ loss of fertile soils;
- soils with displacement phenomenon ⇒ accentuate erosion on the light slopes, landslides and landfalls ⇒ danger for sediment slide;
- soils degraded by human action ⇒ loss of soil texture and of associated fauna;
- humidity deficit of soils due to free wind circulation ⇒ increased evapo-transpiration effect ⇒ extension of dry lands / desertification.

Statistics reveal that Romania that almost half (47%) of the entire surface of agricultural land, respectively 7 million ha, is affected by deterioration processes. From these 7 million ha about 3.9 million is land with no measurable erosion effect. The other 3.1 ha is land with medium to strong erosion effect, of which 3.0 million ha suffer water erosion and 0.1 million ha has wind erosion.

An exhaustive assessment of the damages induced by soil deterioration is difficult to estimate. However, the data available shows there is significant damage, mostly in the agriculture and forestry field. Fighting against soil degradation has become a priority in the present socio-economic context of Romania. Consequently, our project team is proposing one of the most important means for controlling and rebuilding the degraded lands – the shrubs recovery as an alternative policy to using POPs in pest biological control.

The above mentioned aspects emphasize the extent to which the conservation and the restoration of hedges on old territories are required for the rehabilitation of environmental integrity and for enhancing the carrying capacity of the soil. New territories should be considered – especially on soils affected by erosion or not suitable for mechanized agriculture.

Loss of biodiversity

With the loss of hedges around the crops as well as on slopes/hillsides there has been loss of significant numbers of spontaneous vegetation species. At the same time the hedges provide shelters for animals of hunting interest as well as for predators, the natural enemies of the species that damage crops. Some of these species are: birds (Falco tinunculus, F.vesperinus, Perdix sp., Luscinia sp. etc), reptiles (Anguis fragilis etc.), frogs (Pelobates sp., Bufo sp.), mammals (Lepus, micro insectivores etc.) and predatory insects (Coleoptera, Hymenoptera). As well as helping to protect crops many of these species have added economic value as game.

The shrubs represent an eco-tone zone which contributes to the specific biodiversity equilibrium between the monocultures without diversity and the natural vegetation with a very wide range of biodiversity.

Greenhouse effect and air pollution

When signing the Kyoto Protocol, Romania agreed to a greenhouse gases emission reduction of 8% with regard to the 1989 level. At this moment Romania is far below this target. There is no national strategy to reduce greenhouse gas emissions.

As forestry vegetation, the hedges contribute to the retention of particulates from the atmosphere and to CO_2 absorption implicitly mitigating the greenhouse effect. In addition to the 23% forests covered lands in Romania, the hedges recovered from the former lands could contribute to the mitigation with 15% of the CO_2 level.

Pressures for household heating

Farm forestry may hold particular promise in countries like Romania where wood for fuel; construction and other uses are in short supply. The demand for fuel wood is increased as long as it represents the main source of energy for rural households. Trees are becoming more valuable as a renewable cash crop – *biomass* - than a resource to deplete. In the near future after putting seedlings in the ground the trees could be large enough to be used as construction timber in rural houses.

The use of shrub vegetation as renewable biomass meets the CE recommendations comprised in the Fifth Framework Program that the use of biomass is better than using fossil fuels mostly in the poorer areas, such as rural households.

Non-efficient energy use

Hedges retain soil humidity and diminish the energetic costs for irrigation. At the same time they supply a diversity of pest insect-eating predators, diminishing the energetic costs for pesticides' production and spreading.

Institutional problems

Concerning the pilot action included in the practical phase, like any other crop production activity, farm forestry requires know-how, capital investment and quality planting materials. Government agencies can play a role in providing credit, extension advice and

seed for seedling production. Still, promotion of tree farming has no institutional home in some government settings. Trees fall outside the responsibility of agriculture ministries, and forest departments are mandated to protect public forests, not to provide extension and seeds to commercial farmers. At the same time, the suitable qualified institutions to manage the private and public regime in extra forestry vegetation were lacking.

Community interest

Improving the rural tourism facilities and conditions focusing on environmental parameters is required to ensure the development of eco-tourism directly connected with the community interest.

This will also decrease poverty at the rural level in small-developed areas and its contribution of the green house effect in the European region.

The project also assures the transfer of know-how from European Union experts to Romania

Use of pesticides

Due to their mentioned benefits the loss of hedges is one of the factors that interact against the development of a sustainable agriculture. This loss has resulted in the increase of pesticides use in agriculture.

Direct use of pesticides in agriculture raises environmental issues related to: soil contamination, water quality, biodiversity (habitat extend and connectivity, species trends, species richness, flagship species, genetic diversity of agro-ecosystems), landscape diversity

The National Implementation Plan of the Stockholm Convention on POPs has as one of the key objective no. 10: *to strive for sustainable development of ecological agriculture*

This report is based on agricultural environment and hedges importance for biological control as an alternative to POPs utilization

Hedges biodiversity

Hedges are an indirect agro-environmental indicator.

These areas are populated by animals, precious for agriculture, including pollinators and predatory insects, acarids, pest raptors: mammals, birds, reptiles, amphibian, fishes, etc. All of these could be connected with wetlands - ponds, rivers and brooks and water flows (herons, cranes), reptiles, amphibians, and fish etc.

These sorts of hedges can contain the following animal vertebrate species:

Animal Vertebrate species	
mammals	*Lepus, Vulpes, Erinaceus, Talpa, micro insectivores - Sorex, Microtus, Apodemus; Meles, Mustela, Citellus, Cricetus, Mesocricetus, Glis, Dryomis, Crocidura, Capreolus, bats – Barbastella, Plecotus, Nyctalus, Myotis, Pipistrellus*
birds	*Falco, Aquila, Buteo, Accipiter, Milvus, Perdix, Luscinia, Upupa, Ciconia, Grus, Bubulcus, Cuculus, Bubo, Athene, Strix, Asio, Caprimulgus, Phasianus, Picus, Pica, Dendrocopos, Lullula, Galerida, Alauda, Alectoris, Hirundo, Garrulus, Parus, Saxicola, Erithacus, Capreolus, Motacilla, Sylvia, Pastor, Emberiza, Carduelis, Circus, Columba, Corvus, Coturnix, Lanius, Limosa, Otis, Passer, Perdix, Streptopelia, Sturnus, Vanellus*
reptiles	*Salamandra, Lacerta, Anguis, Apodemus, Snakes*
amphibian/ frogs	*Pelobates, Bufo*
fish	*trout, grayling*

A large number of the aforementioned species have economic value as game as well as being natural enemies of crop pests.

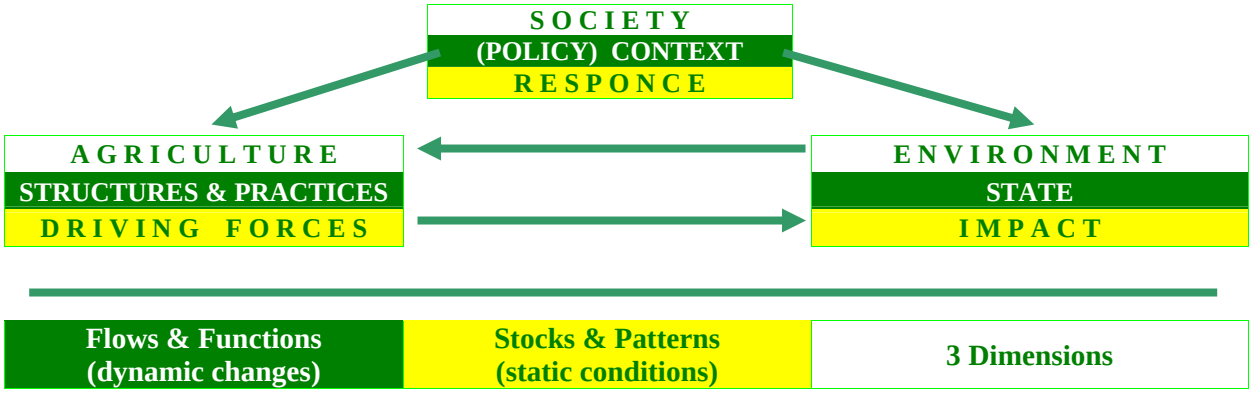
Every hedge shelters three types of auxiliary insects essential in agriculture and acarids, these are showed below:

Table 3		
Type of consumer	**Feed category**	**Species / Importance**
1st Order Consumers or phytophagus	feed on vegetation	i.e. Order Orthoptera - locust, grasshopper These ones and *acarids*, *mollusca*, *worms* and *caterpillars* could be considered agricultural pest
2nd Order Consumers or entomophagus	feed on phytophagus	■ ***predatory insects*** either adult, grub or both belong to the: Ord. Mantodea – *fam. Mantidae*; Ord. Odonata - *Libellula sp.* Ord. Coleoptera – *fam. Carabidae, Coccinellidae, Scarabeidae, Chrysopidae* Ord. Heteroptera – *fam. Pentatomidae, Podisus maculiventris;* Ord. Lepidoptera – *Pyrameis cardui*; ***spiders*** *:* Ord. Araneae – *fam. Araneidae* and ***acarians.*** ■ ***parasite insects*** are living at the expense of one host, where the adult parasite insect deposits one egg inside the host egg or its grub; their development results in the host's death. These insects belong to the: Ord. Hymenoptera – *families Trichogrammatidae, Ichneumonidae, Braconidae, Aphidiidae, Formicidae, Apidae – Apis, Bombus sp.*; Ord. Diptera – *families Syrphidae, Tachinidae, Asilidae.* They are considered auxiliary or useful insects
3rd Order Consumers	feed on charge of phytophagus, entomophagus or both	In their turn, they are interesting for others along the food chain consumers like mammals, birds, reptiles, and frogs

Need for alternative policy

The present report conceptualizes the agro-environmental interrelationship and targets non-POPs strategies for crop protection using biological combat as an ecological alternative, underlining the most important issues that should be taken into account in elaborating non-POPs strategies in agriculture.

The figure below displays a scheme explaining the functional relations between the activities carried out in the agricultural sector, the environmental media, and the response in places that regulate these relations.



The actual Romanian policies in the field of agriculture and environment and related to the present report are the following:

Agricultural policy:

- support for a national program to decrease the effects on soil erosion
- encouragement of agro-tourism and ecological production
- afforestation (commercial forestry) of the degraded lands which are not suitable for agriculture
- achievement of the protective forest belt to protect the plains, communication ways and settlements

Environment policy:

- integration of the environmental policy in elaboration and application of sectoral and regional policies
- improvement of environmental parameters in urban and rural areas
- improvement of environmental policy integration in five important fields with a significant impact on environment: industry, energy, transport, agriculture and tourism, by sustainable use of the natural resources and promotion of a sustainable rural and agricultural development

The alternative policy came as the need to achieve an existing policy in the field of environment and combining at the same time the agricultural priorities.

The present report is offering an alternative policy that combines and supports the actual agricultural and environmental policies.

Policy proposal

The policy proposal underlined by this report in based on the existing Romanian policy in the field of agricututre and environment defined by the Governmental Program and the agro-environmental policies at the European level.

The report proposes a method that could be used in alternative policy or as a support of the existing process: a non-POPs strategy for crop protection, using biological control like and ecological alternative

The alternative policy proposal is based on the EU evaluation that has been put into place and the required evaluation:

1. Agro-environmental measures (Reg 2078/92)
    - combined production with setting environmental goals
    - environmental aid schemes
    - set-aside programme
2. Forestry measures (Reg.2979/82), includes contribution to nature management

Consequences under current and alternative policies

In the case of Romania, (a transition country to the market economy) with a legacy of former years when forestry was not sustainably managed and no private property existed, the present report is underlining a solution successfully used in developed countries. The use of hedges helps manage the existing natural forests, habitats and sustainable agriculture. One of the results of this solution's implementation is the decrease of pesticides or insecticides used in agriculture. Some of these (such as Lindane) are persistent organic pollutants. Lindane itself has been nominated by Mexico to be added to the list of chemicals controlled by Stockholm Convention.

Experience with proposed policy in other countries

These types of polices have been successfully applied in developed countries such as France and Germany.

Creation of hedges – for example in France – is used by communities as a protective mean of rural environment. History shows that the use of hedges is supports the development of agricultural activities and a progress parameter.

See photos below concerning the use of hedges in France.

Conclusions

The idea in this report can be successfully applied in the following sectors having the corresponding benefits as follows:

1. Environment:

Depending on the areas chosen in the early phase of the project (around crops, households and plants, or along roads and railways etc.) and the needs these areas have (wind, sun or cold protection, CO_2 emissions mitigation, agricultural production efficiency etc.), the direct environmental benefits from the projects implementation could be broken down as follows:

Climatic control improvement by:

- Decreasing wind erosion / against wind barriers - belts
- Preventing desertification
- Attenuation of the extreme temperature which are harmful for crops growing
- Mitigation of the greenhouse effect by CO_2 intake
- Supplying oxygen molecules
- Immobilization and neutralization of particulates
-

Hydraulic control improvement and soil conservation

- Considerable diminishing of the surface water flow on slopes in the hedges presence
- Water quality improvement
  - The hedges store nutrients exceeding amounts from conventional and non-conventional fertilizers and implicitly preventing the water loading
- Reclamation of moisture soils in spring
  - The hedgerows, including the trees, are useful in retaining soil humidity and helping drainage. They consume significant amounts of water in spring. The vegetal pumping phenomenon occurs which is useful when soils are warming up, at the moment drainage is difficult or even impossible
- On sandy and open soils wind erosion is limited
  - Improving soil quality
  - The hedges restrict the evapo - transpiration, constituting groundwater reserves and combating water runoff
  - Restoring waterlogged and saline soils
  - Help to rebuild degraded lands or use of abandoned areas

Recovering crops and biodiversity loss

- Provide shelter for many species of game thus leading to biodiversity increase
- Provide shelter for migratory birds

- Hedges supply a diversity of pest insect-eating predators that leads to restricted use of chemicals for crops and more environmentally friendly crop products
- Facilitate spontaneous plants growing that have pharmaceutical and medical value
- Raising the agro-ecosystems' carrying support capacity
- Green couloirs avoid the insulation of particular habitats

Productive function

- Biomass source – provide wood for fuel, construction and other use – is much cheaper and environmental friendly
- Fruits - from some trees species as: nut tree, hazelnut tree, chestnut tree.
- Secondary production - game

2. Agriculture:

- Decrease the dependence on synthetic pesticides / POPs, which is one of the most adverse aspects of intensive agriculture;
- To stop the use of POPs pesticides such as Lindane and/or endosulfan, if they are still in use
- Decrease the quantity of synthetic pesticide / POPs in use and increase the quality of the crops by:
    - mitigation of energetic expenses (less irrigation because hedges retain soil humidity, restricted use of pesticides because hedges supply a diversity of pest insect-eating predators)
    - protection of crops against sun, wind and cold
    - improve the efficiency of vegetable and animal production
    - carbon supply in soil; reducing phytoncides - volatile substances as inhibitive action on some pests and weed killers in adjacent areas.
- The hedges/hedgerows are representing an eco-tone zone, contributing to the specific biodiversity equilibrium between agricultural monocultures and natural vegetation, hosting a wide range of biodiversity.
- Hedges/hedgerows provide a clear land delineation between private properties, stimulating the peasants/farmers' sense of property
- Hedges/hedgerow offer a biological control exerted by animals associated with hedges, and rebuilding hedge ecosystems will reduce the negative effects of POPs.

3. Land planning and use:

The non-arable lands could be changed to plantations.

4. Forestry:

It could provide incentives for sustainable management of forests.

5. Energy:

Provide biomass as a renewable energy source instead of using petroleum and fossil fuels products.

6. Rural development:

Increase the availability of wood resources (as energy resource, for constructions etc.) to rural populations, in terms of larger quantities and lower price; eco-tourism

- **Commercial**
  - Indirect, growing produce value without pesticides, provide a good product trading accessible for the entire Romanian market; eventually future hedge vegetation nurseries could procure seedlings from those nurseries established through our project;
  - Direct growing increasing commercial value of land sales
- **Employment** – nurseries are providing working opportunities, particularly in rural areas

It is also necessary to clean up places polluted by POPs pesticides to prevent further contamination by these substances. This clean up should be done in the way that prevents new POPs releases.

Abbreviations

POPs	Persistent Organic Pollutants
DDT	Benzene, 1, 1' – (2, 2, 2, - Trichloroethylidene) bis (4 – chloro)
HCB	Hexachlorobenzene
PCDD	Poly Chlorinated Dibenzo – p – Dioxins
PCDF	Poly Chlorinated Dibenzo Furans
PCBs	Poly Chlorinated Biphenyls
PAHs	Poly Aromatic Hydrocarbons
NIP	National Implementation Plan
ICIM	National Institute of Research – Development for Environmental Protection
UNIDO	United Nations Industrial Development Organization
UNEP	United Nations Environmental Program
GEF	Global Environment Facility
NGO	Non Governmental Organizations

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