Egypt

Impact of Macro Policies on Non Point Pesticide Pollution

July 2009

Nile Transboundary Environmental Action Project 2009

Author: Prof. Dr. Mohamed Maamoun Mowafy

and Dr Alaa Saad Marzouk

First published in 2008 by the Nile Transboundary Environmental Action Project (NTEAP)
Al Jamhurya Street
Plot 15 House No. 2
P. O. Box 2891, Khartoum, Sudan
Tel: 00 249 183 784226/29
Fax: 00 249 183 784248

Study coordination and concept development: Gedion Asfaw

Editorial Consultant: Dr. Justin Lupele

Design and Typesetting: Evans Chisamba

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Acknowledgements

The Nile Transboundary Environmental Education Action Project (NTEAP) wishes to acknowledge the many people who contributed to the success of this publication. The production of this report would not have been achieved without the efforts and support of the NTEAP staff and other participants from the Nile Basin countries who participated in a number of workshops. Dr. Abel Atiti's role as a critical reader, at the editing stage, is highly appreciated.

Finally NTEAP is grateful to the Global Environmental Facility (GEF), United Nations Office for Project Services (UNOPS) and United Nations Development Programme (UNDP) for supporting this initiative.

Foreword

The Nile Basin Initiative (NBI) is a partnership between riparian countries of the Nile; namely Burundi, Democratic Republic of Congo, Egypt, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, and Uganda. The NBI's shared vision is to “achieve sustainable socioeconomic development through the equitable utilization of, and benefit from the common Nile Basin water resources”. To translate this shared vision into action, there are two complimentary programmes: the Shared Vision Program (SVP) which creates a basin wide enabling environment for sustainable development; and the Subsidiary Action Programmes (SAPs) engaged in concrete activities for long term sustainable development, economic growth and regional integration of the Nile Basin countries.
The Nile Transboundary Environmental Action Project (NTEAP), one of the seven projects under the Nile Basin Initiative's (NBI) Shared Vision Programme, is mandated to provide a strategic environmental framework for the management of the trans-boundary waters and environmental challenges in the Nile River Basin.

As part of a broader plan of raising environmental awareness, NTEAP seeks to enhance the understanding of common and high priority policy issues that affect the environment of the Nile Basin. This will be done through policy studies of the patterns of economic development and priority transboundary environmental issues. The Nile Transboundary Environmental Analysis which was developed by the riparian countries in collaboration with the World Bank, UNDP and GEF identified priority environmental issues and threats in the Nile Basin. Better understanding of how these environmental threats are influenced by macro and sectoral policies and identifying the root causes is essential to explore possibilities of jointly addressing the threats.

In August 2006 the NTEAP held a planning workshop in Tanzania on the impact of macro-sectoral policies on the Nile Basin environment. The workshop discussed the concept note on macro policies prepared by NTEAP, reviewed country papers and decided on the kind of studies that could be carried out in line with macro and sectoral policies. Topics were selected on the basis of their relevance to the Nile Basin, significance of trans-boundary aspect and where policy intervention/policy reforms will be required. Four research themes/topics emerged. These focused on the macro/sectoral policies: on soil erosion; Non point pollution/pesticide pollution; exploration and development of oil projects; and deforestation in the Nile Basin.

This report examines the impact of macro and sectoral policies on non point pollution/pesticide pollution. The report examines the severity and extent of pesticide pollution. It also discusses the required policy interventions and /or policy reforms in Egypt. It is hoped that the content of this report will permeate the government system to form part of the basis for decision making process.

Gedion Asfaw
Regional Project Manager
Nile Transboundary Environmental Action Project

Pesticides have contributed to the increase in crop production to meet the need for food. However, use of pesticides has also caused environmental degradation. Pesticides have also caused negative health problems. Many pesticides have been known to cause carcinogenicity, teratogenicity, reproductive toxicity, neuro toxicity and immunosuppressant in humans. As a result of hazardous effects of pesticides on the environment, most international organisations have banned the use of such chemicals.

Pesticide Impact:

Water pollution: River Nile like most rivers of the world is mainly contaminated with chlorinated hydrocarbon insecticides (OCI). Globally banned pesticides such as DDT and its metabolites DDD, or DDE, and endrin, dieldrin, aldrin, endosulfan, heptachlor, and hexachlorohexane are still used in Egypt. This is due to poor macro / sectoral policies of the government. Organophosphates, carbamates, synthetic pyrethrins and other group of pesticides cause serious health hazards. The most common widespread effects include spontaneous abortions, and problems associated with birth, neurological, reproductive organs and cancer.

Effects of pesticides

- The intensive use of pesticides during 1950- 1990 periods.
- Aerial application of pesticides caused more pollution to the environment which was prohibited during 1990s.
- Catching fish using toxic insecticides.
- Pesticide trafficking where banned or restricted pesticides are smuggled through Sues Canal and the borders of Egypt .
- The widespread of fake pesticides of unknown sources (indoor manufactured pesticides).
- Some Nile upstream countries are still using persistent organochlorine pesticides (POPs), which contaminate the River Nile.
- The discharge of pesticide factory wastes and many agricultural drains spread into the Nile River.
- Throwing of waste pesticide containers into the water canals and drainage.
- The burning of domestic wastes along the river banks.
- Heavy navigation increases dioxane pollution when it is released from the paints in the submerged ship causing high pollution to the water and marine organisms.

Macro/ Sectoral Policy for Pesticide Management in Egypt:

Before 1982, Egypt used high quantities of all pesticides in crop production. Chlorinated hydrocarbons, organophosphates, carbamates and pyrethroids were the commonly used pesticides. The Ministry of Agriculture adapted the integrated pest management to mitigate the effect of toxic pesticides. As a result of this policy pesticides usage were significantly reduced from 16 thousand metric tons in 1988 to 7.5 thousand metric tons in 2001 and 3714 tons in 1995 / 1996 growing seasons.

The policy of the government to reduce the impact of pesticide hazards include measures such as the compliance to international standards, banning of aerial spraying of pesticides, banning the use of herbicides in the control of aquatic weeds; and establishing of training programmes.

Recommendations

- Stringent control measures on pesticide market should be put in place to control illegal pesticides;
- More effective biological control measures should be carried out;
- The government should supply the laboratories with adequate facilities for pesticide investigation;
- The government should stop the discharge of the agricultural drains along the river to reduce Nile water contamination with pesticides and fertilizers.
- More accurate pesticide residue analysis and monitoring should be put in place.
- Participation of farmers in the IPM programme is necessary.
- Campaign against the excessive use of pesticides through media is urgently required; and
- Control of waste pesticide containers disposal methods is needed.

Pesticides have contributed to a dramatic increase in crop production and food supply catering for the increase in population. High population in Africa and other third world countries require more crop production to cover the increased food consumption. Pesticide application is one important factor to increase crop production by decreasing pest infestation. During the past 6 decades thousands of pesticides have been extensively used in developed and developing countries to minimize the losses of crop production that are attacked by several pests. The losses of crop production resulting from pest attack are estimated to be 10 30 % in the developed countries and higher in the developing countries (Edwards, 1986).

The River Nile Basin is still contaminated mainly with chlorinated hydrocarbon insecticides (CHI) although they were banned in 1972 and officially stopped at the beginning of 1980s. DDT, and its metabolites DDD, or DDE, and the other CHI such as aldrin, dieldrin, HCH, toxaphene and others are still detected in River Nile Basin. Pesticide pollution has adverse effects on human health in the region.

- Two kinds of toxicity are associated with pesticide pollution **acute** toxicity and **chronic** toxicity. A**cute toxicity** appears after short time exposure to a pesticide. Its effects are skin irritation, vomiting, headache or death immediately or after several hours of exposure to pesticides. On the other hand
- Chronic toxicity symptoms appear after month (s) or several years from the exposure. The effects of chronic toxicity on humans include cancer (carcinogenesis), non carcinogenic tumours (onogenesis), birth defects (teratogenesis), infertility due to reproductive toxicity, immune suppression and brain damage due to neurotoxicity.

Environmental issue description

There are several reports from EPA and other organizations accounting for the severe hazardous toxicity of pesticides. The impact of pesticides on human is often recorded in international organisation publications. These toxicological studies are expensive and need advanced infrastructure, technology and financial investment. Thus international reports are only used as reference materials when investigating pesticide pollution in countries such as Egypt.

According to Windham (2002), it is not only organo-chlorines or organo-phosphate insecticides that have hazardous effects, but also synthetic pyrethrines which, were considered safe insecticides a few years ago and used for domestic purposes. The most common widespread effects of these insecticides include; spontaneous abortions, birth defects, neurological effects, cognitive and behavioural effects, reproductive effects and cancer. In the new cancer hospital in Egypt, the number of children suffering from cancer is increasing.

A World Health Report entitled Organic Farming Worldwide A 100% Pesticide Risk Reduction (2000) indicates that as many as 25 million agricultural workers in the developing world may suffer at least one incident of pesticide poisoning each year. Chemically synthesized pesticides caused tremendous hazardous effect (over 40000 reported cases of pesticide poisoning in 1980, EPA, 1980).

Children cancer incidences have been increasing at the rate of 0.8 % since 1973. Acute lymphocytic leukemia stands at 62%; brain cancer at 50%, and bone cancer at 40%. The main cause of these types of cancer is paternal and maternal exposure to toxic substances (Committee on pesticides in the Diets in Infants and Children, 1993). Known causes of brain cancer include pesticides and nitrate treated hot dogs and lindane. Organochlorine pesticide exposure caused neurological damage in wading birds that fed from lake Aporka in 1993 (Guilette, and others, 1994). Tests showed toxaphene and DDT in food chain in the birds. Pesticides (POPs) are also known to cause failure in reproductive organs of fish and birds. From studies on pesticide pollution in Florida Lakes and Rivers, Dioxanes and organochlorine insecticides are found to increase the breast and testicular cancer. Sperm count, mutation and malformation result from exposure to organochlorine insecticides dioxin and PCBs. The last two decades have witnessed an increased estrogenic effect and reproductive abnormalities in the USA and other industrialized countries (Windham, 1994). Various organochlorine, organophosphate, carbamate, and metal- based pesticides are known to suppress the immune system of mammals.

In a series of the articles entitled Home and Lawn Pesticides More Dangerous than Previously Believed Bell (2001) mentions that 19,000 fetal deaths (stillborn) occur each year in the United States. According to Bell (2001), a mother who lived within one mile from an agricultural area that used pesticides stood two - fold greater risk of having a stillbirth. Primary defects which contribute to the death of the child were urinary system and multiple congenital anomalies. The data are of high importance as it was first to determine risk if limiting exposure to the 3 - 8 week gestational period. It demonstrates the true risk to pregnant mother in school, homes, offices and neighbourhood mosquito control projects. Pyrethroids are still used for controlling mosquito in truck applications. This raises concerns regarding exposure to pregnant women living in mosquito spray areas.

Water Pollution with Pesticides, and Other Pollutants

In an article written by Salah Hassanein entitled The River Nile, the Life of Egypt he stated that the picturesque of the River Nile, the life of Egypt is becoming a serious hazard to people. Its water contains a chemical stew of heavy metals, dioxins, PCBs, DDT and other pesticides, untreated animal and human wastes and diseases carrying bacteria. These pollutants come from different sites and discharge into Nile Basin canals, lakes, and ground water.

The level of pollutants varies from location to other. The permissible limit as set by the Ministry of Public Health for the hazardous pesticides in drinking water in 2007 is illustrated in Table 1 below:

Aquatic Weeds

One of the problems faced in the River Nile riparian countries is the rapid growth of water hyacinth. This has led to the growth of water snails, losses of water and hinders water flow in the Nile Basin. Snails are the intermediate host of the parasite Schistomes schistosomiasis which causes bilharzia or schistosomiasis in humans. Schistosomiasis is a waterborne disease that is the main cause of liver and kidney diseases in Egypt. In an attempt to control snails in waterways, a lot of pesticides such as copper sulphate and baymscide are used.

However the use of these chemicals does not only kill the snails but fish and other aquatic life as well. The use of these chemicals has since been banned.

Before 1990, Egypt depended completely on chemical treatments to control water hyacinth which was stopped because of environmental concerns. Since then, Egypt controls water hyacinth by physical means. Mechanical harvesting and obstructions such as floating boom in canals has proved a great success. Sometimes farmers collect water hyacinth and other aquatic weeds from canals manually. Nevertheless the problem still exists and nuisance. Most eastern and southern African countries are currently implementing biological control programmes. Water hyacinth weevil N. eichhorniae and N. bruchi are being reared and released in most water bodies.

The extensive release of weevils which began in 1980s and 1990s in Kenya, Malawi, Tanzania and Uganda, and proved successfulness.

Table 1: Guideline value (mg/litre) for drinking water according to the Ministry of Public Health decree No. 458/2007

Pollutants	Permissible limit (ppm)
II- Organic pollutant	
Alachlor	0.02
Aldicarb	0.01
Aldrin and dieldrin	0.00003
Atrazine	0.002
Bentazone	0.03
Carbofuran	0.007
Chlordane	0.0001
Chlorotoluron	0.03
DDT	0.001
DBCP	0.001
2,4 D	0.03
1,2-DCP	0.02
1,3-DCP	0.02
HCB	0.001
Isoproturon	0.009
Lindane	0.002
MCPA	0.002
Methoxychlor	0.02
Metolachlor	0.01
Molinate	0.006
Pendimethalin	0.02
PCP_s	0.009
Permithrin	0.02
Propanil	0.02
Pyriproxyfen	0.3
Simazine	0.002
Trifluraline	0.02

Pollution of Nile water with Pesticides

There is little data available on the existence of POPs in drinking water. Tarek and Osasma from the National Research Centre, Cairo (2007) monitored the chlorinated insecticides in Ismailia canal which is considered the main source of drinking water plant in the Great Cairo. The canal is 130 km long and is a branch of the River Nile which goes east to El- Sharkia Governorate and then to Ismailia. The canal is susceptible to industrial wastes discharges from many industries, paper, petroleum, and petroleum derivatives. Table 2 presents the extent of pollution in the canal since it is the main source of drinking water for Mostorod and Ameria areas.

Food contamination Cotton, sunflower, soybean, butter oil, vegetable oil, milk cream and fish were found to be contaminated with OCI (Ayoub, 2000). The results of analysis showed that the percentage of fatty food samples contaminated with OCI residues reached 53, 50, 46, 46, 54, 61,50 ,97 and 55% in corn oil, sunflower oil, soybean oil, cotton seed oil, vegetable oil, butter oil, butter, milk cream and fish respectively. DDT was the prevailing contaminant with 100% frequency followed by hexachlorohexane (HCH), lindane, heptachlor, hexachlorobenzene, and dieldrin. The local oils were slightly more contaminated with OCI residues than imported oils.

The Level of OCI in fat tissues taken from human bodies after surgical operation in Behara governorate where the largest agricultural activities take place ranged from 0.44 3.19 ppm in 1987. Mother's milk and infant's blood and fatty tissues found with traces of DDT, DDE and other OCI as an impact of MOA policy which depended on these pesticide chemicals before 1982.

EXTENT AND SEVERITY OF PESTCIDE

Due to intensive use of pesticides during 1950s 1990s in Egypt, many farmers and agricultural workers were exposed to serious health problems. The policy of MOA at that time depended completely on chemical pesticides in the controlling program. According to the report entitled Cancer Risk of Pesticides in Agricultural Workers by the JAMA (1988) it was reported that 10 out of every 14 Egyptians farmers who between 1980 and 1984 had been diagnosed with having hepatic ongiosarcoma, had been repeatedly exposed to organophosphorous, organochlorine and arsenical pesticides for an average of 14 years. Agricultural workers have higher death rates

Table 2: Determination of chlorinated hydrocarbons in Ismailia Canal water (ppb), 2007

Organic compounds	Site (1)*	Site (2)**	Site (3)***
á-HCH	126.62	81.96	47.6
ß-HCH	96.1	14.86	3.78
ä-HCH	612.13	211.48	79.75
gamma-HCH	242.46	158.92	71.23
Heptachlor	91.81	51.4	19.58
Aldin	13.88	7.7	3.04
H. epoxide	115.7	33.52	16.54
endosulfane I	303.46	24.19	7.58
Dialdrin	105.4	14.68	5
p,p-DDE	20.08	16.33	7.18
Endrin	9.66	7.75	2.66
endosulfane II	7.25	5.51	2
p,p-DDD	71.52	17.57	3.21
endrin aldehyde	32.06	16.62	3.13
endosulfane sulfate	26.13	23.2	6.49
p,p-DDT	38.15	14.34	6.21
endrin ketone	14.38	10.37	7.39
Total	1926.79	710.4	292.37

* 8km from the beginning of Ismailia Canal (Mostord Drinking Water Treatment Plant)
* *10km from the beginning of Ismailia Canal (after oil companies)
*** 65 km from the beginning of Ismailia Canal (Middle of the Canal)

from malignant brain tumors (Grufferman, 1985).

Pesticides including insecticides, herbicides, and nematicides, especially those bearing chloro-, fluro-, or bromo-, in their structure are highly persistent and can last over 50 years in soil, water, or sediments. These pesticides could cause significant hazard to human or animals.

In the early 1980"s DDT and other halogenated pesticides as ethylene di-bromide aroused great concern as potential carcinogen (cancer causing substances). It is estimated that about 1% of the applied pesticide reaches the target pest and the other 99% ends up in water, soil and air. These amounts go directly to human and animals bodies. The aquatic system is liable to heavy contamination, where fish is caught from the heavily polluted drains, causing serious health problems to the farmers.

During the summer (from June to September) cotton and rice receive the biggest amount of pesticides in Egypt as the cultivated areas of the two crops reaches about 3 million feddans (feddan = around acre). Cotton farming consumes the highest amount of insecticides while rice consumes the highest amount of herbicides. The polluted water from fields of the two crops goes directly to the drains after short time of pesticide application supporting the proliferation of aquatic weeds.

Trafficking in Obsolete Pesticides

Trafficking in the obsolete banned and restricted pesticides from the developed countries to the third world countries has significantly contributed to pesticide pollution. According to the FASE Research Report 1996_b, 4th custom records for shipments from the USA showed that at least 108,000 metric tons of banned and restricted pesticides were shipped the USA and dumped in the third world market.

Table 3 shows the trafficking of banned and restricted pesticides in the developed countries which are dumped in the developing countries market.

In Egypt, EEAA began a project in 2004/2005 to collect obsolete pesticides and kept them in a store in Giza governorate (Al-saff district). They collected more than 1000 tons of obsolete pesticides among them were 8 tons OCI. In the Suez custom there are 220 tons of OCI which were about to enter the Egyptian market. As a result of lack of money and effective approach to the disposal of these chemicals, impounded obsolete pesticides are stored in different parts of the country and could illegally leak to the market and cause serious negative impact to the environment.

Mansour (2004) in an article entitled Pesticide Exposure Egyptian Science confirms that a number of long persisted organochlorines and highly toxic organophosphates which have been banned or severely restricted are still marketed and used in many developing countries. The misuse of pesticides by concerned individuals, in addition to lack of or weak national controlling policies is the causes of pesticide pollution.

Although banned in 1980s DDT and other chlorinated hydrocarbons such as lindane, chlordane, toxaphene, etc. their residues still exist in the environment. The existence of POPs residues are known to persist in the environment for over 50 years. Egypt still faces risks of pesticide pollution as some of the Nile Basin countries still use DDT and other chlorinated insecticides to control mosquitoes and other human vectors. These pesticides leak directly to the water body of the River Nile.

Sallam et al (2006) found more chlorinated hydrocarbons in the River Nile sediments in Upper regions of Egypt from Aswan to El-Aiat than in the North regions. Organophosphorous insecticides (OPI) concentrations, on the other hand, were higher in the North Egypt than in Upper Egypt. The most common OPI detected in the surface sediments in the River Nile in North Egypt were chlopyrifos, ethion, fenitrothion, Prothiophos, chlorpyrifos-methyl, primiphos methyl and Phenthioate. The authors attributed the existence of OPI residues in this area to the intense agricultural activities (cotton, maize, rice and potatoes) and Kafr El- ziat pesticide company that discharge its wastes to the Nile. However, these chemicals have a short life span in the environment. The source of pollutants is closely related to human activities, such as domestic and industrial discharge, agricultural chemical application and soil erosion.

Table 3: Banned and restricted pesticides spilled in the third world market, (ton/year)

Category Banned or	1992	1993	1994	1995
suspended	2.036	1.708	3.008	6.779
Severely restricted	3.361	4.136	2.612	10.109
Restricted	26.096	32.066	32.732	90.894
Total	31.520	17.910	38.352	107.782

The following factors associated with poor use of pesticides by farmers, poor regulations on pesticide application and a lack of market control policy have contributed to an increase in pesticide pollution in Egypt.

Causes of Pollution from Pesticides

The following are some of the causes of pollution from pesticides and health hazards:

- Farmers in Egypt like those in the other third world countries do not wear protective clothing or safety glasses when spraying pesticides. Direct exposure to the pesticide is known to increase risk for testicular cancer in agricultural workers (Wiklund and Holm, 1986).
- Poor disposal of empty pesticide bottle Some farmers use the pesticide waste bottles for domestic purposes, e.g. as water containers. This poses a health hazard to the users. Others throw pesticide waste bottles in the drains or rice fields where fish is caught leading to pesticide pollution.
- Overuse of pesticides Farmers sometimes use over dose of pesticide to control the target pests believing that it is the most excellent way for achieving good effects. This results into high levels of pollution and pest resistance.
- Failure to follow instructions on pesticide application Farmers who often do not read application instructions found on the labels well expose themselves to risks of pesticide pollution. One such instruction is the Pre-Harvest Interval (PHI) the safe time to harvest a crop after application and occasionally harvest the crop few days after pesticides treatment. For instance, tomatoes are treated over 20 times with fungicides and insecticides as the crop is vulnerable to pest attack. Harvesting the crop a short time after pesticide application might cause high contamination levels of pesticide residues which can result into health hazards to the consumers.
- Lack of a proper market policy This has led to an increase in the number of both registered and unregistered pesticide products into the local market from different sources. Sometimes the contents and source of pesticide products are not clear. This affects the credibility of agricultural production for foreign markets.
- Poor controls on pesticides use There are limited controls on pesticides shops, storage and formulators located in small villages and farms. Furthermore, there is poor coordination, cooperation and information exchange amongst stakeholders in pesticide industry

MACRO SECTORAL POLICY FOR PESTICIDES MANAGEMENT

Before 1982, Egypt consumed high quantities of all pesticide categories in the pest control programme, insecticides in particular. Highly toxic chemicals were used to control cotton leaf worm as cotton was the main cash crop at that time. The intensive use of chlorinated hydrocarbon, organophosphate, carbamate and pyrethriod led to serious environment risks whose effects are still being felt in the country. The introduction of macro sectoral policy for pesticides management in 1982 sought to mitigate environmental risks resulting from pesticide pollution. The policy of the Ministry of Agriculture and Land Reclamation (MOA) was to start integrated pest management program (IPM) by applying pesticides when necessary and using other alternatives. Following this policy, pesticide quantities reduced from about 16 thousands metric tons in 1988 to about 7.5 thousands metric tons in 2001 as shown in Tables 4 and 5.

From the above Tables it is evident that the highest amount of pesticide consumption was during 1953 1982 when the pest control programmes depended entirely on the use of pesticides. The highest amount of 35,000 tons was recorded in 1972 at a time when the cotton leaf worm had acquired resistance to the chlorinated insecticides. Since cotton was the main economic crop, the Ministry of Agriculture and Land Reclamation began to explore the use of other insecticides. In 1972 organophosphate insecticides replaced the chlorinated insecticides DDT, endrin, dieldrin, toxaphene and others. High quantities of orgaonophosphate insecticides such as chlopyriphos, (dursban), Leptophos (Phosphyl), Phosfalon (Cyolane), and Mephosfalon (Cytrolane) were introduced in 1972.

The use of pesticides began to decrease gradually from 1982 following protests from many environmental organisations against the use of hazardous pesticides. There was a marked decrease in pesticide use (from 15830 tons in 1989/1990 to 11750 tons in 1990/1991 growing season) when the Ministry of Agriculture and Land Reclamation started applying sex attractants (pheromones) to replace insecticides as insect control in cotton fields. Pesticides consumption reached its minimum of 3,714 tons in the 1995 /1996 growing season reaching. However, the application of pheromones as a pest control tool was stopped due to a significant reduction of cotton yield in the 1996/1997 growing season. The use of insecticides resumed and this explains the rise in the consumption of pesticides since the 1997 growing season.

According to the international organisations such as EPA, WHO and IARC, some pesticides were known to cause serious health problems that range from tumors carcinoma, kurtosis, adenomas, and teratogenicity. As a result, the Minister of Agriculture on July 31 1996, banned 28 pesticides (common names) which included 8 fungicides, 2 acaricides, 12

Table 4: Development of pesticide consumption in Egyptian agriculture sector during 1953-1984

Year	Quantities	Year	Quantities
1953	2143	1969	25668
1954	1627	1970	24664
1955	8871	1971	20851
1956	9188	1972	35259
1957	10489	1973	26344
1958	8075	1974	20910
1959	15078	1975	26910
1960	11062	1976	27056
1961	23398	1977	25593
1962	7447	1978	28340
1963	12550	1979	26074
1964	20916	1980	22715
1965	21958	1981	19046
1966	28636	1982	18778
1967	30699	1983	12789
1968	28914	1984	15462

Table 5: Quantities of imported pesticides (ton) for Egyptian agricultural sector during 1988-2006

Year	Herbicides	Fungicides	Insecticides	Total
1988/1989	1723	4163	9944	15830
1989/1990	1584	4734	9512	15830
1990/1991	969	3437	7345	11750
1991/1992	583	2841	4948	8372
1992/1993	315	1919	3852	6086
1993/1994	200	1929	3627	5756
1994/1995	726	1948	1334	4008
1995/1996	543	1599	1572	3714
1996/1997	1235	1912	3639	6786
1997/1998	1813	755	4469	7057
1998/1999	1120	2719	4821	8660
1999/2000	775	1946	2406	5127
2000/2001	1388	2611	3513	7512
2001/2002	905	1263	2072	4242
2002/2003	1345	2226	4178	7749
2003/2004	1680	1951	3528	7160
2004/2005	1123	1204	1863	4190
2005/2006	2578	3874	4921	11373

Notes:
1.The values were taken from Pest Control Strategy in Egypt, 2006.
2.Pesticide usage data in the developing countries are sometimes misleading.
3.Sketchy figures for quantities consumed are not related to values used in the field level.
4.The consumed amount fluctuated from year to year depending on changes in the Government Such changes are usually reflected in the policies of agriculture in place.

herbicides and 6. This ban which was hurriedly implemented had far reaching impacts on the pesticide market due to the:

- lack of alternatives pesticide to replace the banned ones.
- existence of large amounts of banned pesticides in the market with no way of disposing them except to utilize pesticides in the pest control program. This doubled or tripled the prices of the banned pesticides on the black market.
- entry of large amounts of banned and counterfeit pesticides in the Egyptian market through the borders.
- issuance of many decrees that created more confusion in the pesticide market rather than correcting the situation.

Through Decree No 719 of 2005 47 obsolete pesticides were banned following recommendations from a new Pesticide Committee. This ban included all the pesticides banned in 1996 plus 19 others. The ban explains the reduction in the amount of pesticides imported in the 2004 /2005 growing seasons as shown in Table 6. The high jump in the use of pesticide amounts in 2006 is attributed to the total sum of the remaining amounts of pesticides in the market after the 2005 ban.

Table shows the banned pesticides 1ist in 1996 and 2005.
Through Decree No. 630 of 2007 a new Minister of Agriculture unbanned 14 pesticides that had been banned in 1996 and 2005 (see Table 7 for details)

The 1996, 2005 and 2007 Decrees which were issued by three different ministers indicate that the registration and regulation of pesticides in Egypt was influenced by the vision of the minister and his advisors and not the long term policy or strategy of the Ministry of Agriculture.

IPM Policy in Egypt

Integrated Pest Management (IPM) is a system which combines all suitable techniques that include environmental manipulation, use of biological control products, host plant resistance and pesticides to keep pest populations at level below those causing economic injury. One of the basic tenants of IPM is that optimal pest control systems are specific and dependent on extensive knowledge of the ecology of an area. While pesticides are potential tools in any IPM programme they are only used where and when field monitoring of pest levels indicates that other techniques have failed. Within an IMP program system it is important for farmers have at their disposal safe, effective and efficient methods of applying pesticides which allow them to respond to pest outbreaks.
Inefficient and time consuming pesticide application methods may lead to an inability to respond to pest infestation in time and often results in a regime of unnecessary prevention treatments. The implementation of this strategy could avoid the impact of pesticide pollution. Environmental risks associated with pesticide pollution include human health hazards,

Table 6: Pesticides banned according to the Ministerial decrees of MOA, Egypt

Decree No. 874/1996		Decree No. 719/2005	
Pesticide	Class	Pesticide	Class
Propargite	AC	Propargite	AC
Mancozeb	F	Mancozeb	F
Maneb	F	Maneb	F
Chlorothalonil	F	Chlorothalonil	F
Folpet	F	Folpet	F
Procymidone	F	Procymidone	F
Iprodione	F	Iprodione	F
Captan	F	Captan	F
Cyproconazole	F	Cyproconazole	F
Alachlor	H	Alachlor	H
Propoxur	I	Propoxur	I
Dimethoate	I	Dimethoate	I
Cypermethrin	I	Cypermethrin	I
Permethrin	I	Permethrin	I
Carbaryl	I	Carbaryl	I
Tetrachlorovinphos	I	Tetrachlorovinphos	I
Etofenprox	I	Etofenprox	I
Dicofol	AC	Dicofol	AC
Clofentezine	AC	Clofentezine	AC
Fosetyl-Aluminium	F	Fosetyl-Aluminium	F
Propiconazole	F	Propiconazole	F
Triadimenol	F	Triadimenol	F
Benomyl	F	Benomyl	F
Hexaconazole	F	Hexaconazole	F
Oxadixyl	F	Oxadixyl	F
Tebuconazole	F	Tebuconazole	F
Triadimefon	F	Triadimefon	F
Terbutryn	H	Terbutryn	H
Atrazine	H	Atrazine	H
Trifluoralin	H	Trifluoralin	H
Bromacil	H	Bromacil	H
Metolachlor	H	Metolachlor	H
Oxyfluorfen	H	Oxyfluorfen	H
Oxadiazon	H	Oxadiazon	H
Bromoxynil	H	Bromoxynil	H
Linuron	H	Linuron	H
Simazine	H	Simazine	H
Pendimethalin	H	Pendimethalin	H
Dichlobenil	H	Dichlobenil	H
		Aldicarb	N
		Tetraconazole	F
		Thiophanate methyl	F
		Butachlor	H
		Thiamethoxam	
		Pymetrozine	I
		Thiabendazole	F
		Propargite	Ac

Table 7: Fourteen banned pesticides in the decree No., 719/2005 were resurged according to the new list of the new decree No., 630/2007

The unbanned pesticides are:
Decree No. 630/2007

Pesticide	Class
Bromoxynil	H
Captan	F
Chlorothalonil	F
Folpet	F
Fosetyl-Aluminium	F
Iprodione	F
Linuron	H
Mancozeb	F
Maneb	F
Pendimethalin	H
Pymetrozine	I
Thiabendazole	F
Thiamethoxam	I
Thiophanate methyl	F

NB. I= insecticides F= fungicide H= herbicide N= nematicide AC= acaricide

environmental contamination, destruction and reduction of biological pest controls, pesticide resistance and food contamination.

The IPM policy of MOA was introduced in 1980s to reduce pesticide application and included the following approaches:

The use of more efficient application methods to improving spraying machines

For most spray applications there are droplet sizes which are most effective in reaching the biological target and achieving the desired results. Overlarge droplets are inefficient as they fracture and split on reaching the foliage ending up on the ground. Very small droplets are liable to drift and settle outside the target area. The effect of both is the same; the pesticide does not reach the target and contribute to environmental contamination rather than crop protection. Many farmers in Egypt suffer from the effects of using improper sprayers with overlarge droplets. Such sprayers leak pesticide solution and contaminate their bodies resulting to environmental risks associated with pesticide pollution. machines

The improvement of spraying equipment is important in reducing pesticide pollution, especially in irrigation canals that have fish the main source of protein for Egyptian farmers. When applied as part of a cotton IPM programme, the introduction of improved ground spray application methods such as the use of micron Ultra Low Volume (ULV) has halved pesticide dosage rates. The availability of effective ground treatment methods has phased out aerial application. Cotton is now treated on small block basis that depends on pest levels determined by scouting .This has resulted in an overall delay in the start of pesticide treatment, giving beneficial insects better chance to get established. This has had an overall reduction in number of treatments carried out and an increase in cotton yields. Under a GTZ project Egypt improved pesticides spray equipment. This drastically reduced the losses and drift of sprayed pesticide solutions. The sprayers are now available in the pest control units in all cotton growing regions. The sprayers should be made available to the other crops as well.

Use of resistant crop strains

This approach involves the genetic manipulation or selection of plant varieties which have pest resistant qualities. Resistance may be due to physiological factors such as toxic compounds produced by a plant or morphological factors where cuticles thicken to increase pest tolerance. The Seed Breeding Department of Agriculture Research Centre (ARC) has successfully produced many resistant crop varieties of wheat, maize and cotton. Many vegetable varieties (e.g. tomatoes, cucumber, and water melon) resistant to diseases and viruses are imported from Netherlands or USA. The increase in the use of such strategies will reduce pesticide application and consequently, minimise pesticide pollution in the Nile Basin.

The use of biological pest controls

In the Plant Protection Institute, a project was started in the mid 1990s to rear a big mass of Trichograma predator for the purpose of controlling insects. The predator has been successfully used in the control of bollworms that used to cause 20 – 40 % losses in cotton yields. Different breeding laboratories for Trichograma exist with the biggest ones in Monofia and Kafr El- Shaikh regions. There is need to find biological pest controls for other crops (especially vegetable crops) to reduce the impact of pesticide pollution.

The role of natural enemies in pest control is well known. Biological pest control is generally cheap, effective permanent, and non disruptive. Unfortunately, this strategy is opposed by pesticide companies.

Cultural pest control measures

Cultural control measures include the timing of planting and harvesting, tillage, trap crops, and crop rotation. Such measures involve modification of management practices and make the environment more unfavorable for pest survival, movement, or reproduction.

The use of microbial pesticides

Microbial pesticides are formulated from microorganisms or their by-products. They are generally specific and selective and therefore, control pests with little or no impact on non target organisms. Bacillus thuringiensis or BT is the most widely used microbial insecticide.

Different BT formulations (e.g. Agreen, Protecto and Dipel) are used in the pest control program in Egypt. Many tons of Agreen, usually produced by the Genetic Engineering Institute of Agriculture Research Centre are used annually in controlling cotton and vegetable crops pests. The active ingredients in BT formulations are crystal toxins produced by the bacterium. When ingested, these crystals bind the gut of certain larvae, causing them to stop feeding and die. Protecto which is produced by the Plant Protection Institute of Agriculture Research Centre produces the same effect. Dipel that is imported into the country is another BT formulation used to control insect pests. The use of microbial pesticides needs to be spread all over the country.

The use of natural toxins produced from fungus (Spinosad)

Spinosad group of fungi was introduced in the pest control program in Egypt as well as in different countries as an alternative to many hazardous pesticides. The fermentation toxin products are from the fungus Saccharpolyspora. The Spinosad group showed high efficiency in controlling cotton leaf worm and cotton boll worm in the 2006 and 2007 growing seasons. It was traded under the name Spentor or Tracer and used in very low doses of about 50 gram / acre. It should be mentioned that spinosad group is highly effective against the control of mosquitoes. This new group of pesticides should replace the use of chlorinated insecticides such as DDT which is still used in many Nile Basin countries.

Oils

Mineral oil, essential plant oil, vegetable seed oil and fatty acids are effective in controlling sucking insects and many plant pathogens. They are efficient, cheap and safe. Petroleum oil is being used intensively in citrus and horticulture. Vegetable oil sprays used for cooking and salad are more readily available than most other oils. They are biodegradable and thus less disruptive to the environment.

Fatty acids extracted from oil are highly efficient against many sucking insects, aphids, and termites which destroy many crops. The insects transmit viruses in tomato and almost all vegetable crops. Fatty acids also control many plant pathogens such as early and late blight in potatoes and tomatoes and powdery mildew in grapes, apricot, mango, cucumber and other crops. The product Anti stress is marketed in Egypt for these purposes.

Organic farming development strategy

Organic farming system is now becoming a popular form of farming as the pesticide risks increase. Lady Eve Balfour, a pioneer in the organic movement defined agriculture sustainability as Permanence. This was during the first IFOAM International Scientific Conference held in Switzerland in 1977. Permanence means adopting techniques that maintain soil fertility, utilize only renewable resources, do not pollute the environment, and foster life energy within the soil and all food chain cycles.

Pesticides are completely not used in organic farming. There are many steps to naturally intensify the regulating power of nature. The first step is to establish a system as closed as possible with cycles which allow nature to work. Strategies include seven or nine year crop rotation, using the disease suppressive potential of compost , planting hedge rows, integrating forestry into agriculture, mulching and other necessary steps for establishing healthy soil for healthy plants and animals. Domestic birds are used in the organic farm tactics, where ducks have successfully controlled weeds in rice fields in Japan and geese control couch grass in potato fields. This potentially eliminates pesticide pollution and earns the farmer extra income.

For insect control, organic farmers use pheromones and colour traps to attract insects in the greenhouses or the open field. Pheromones are used to attract male insects which are then trapped to reduce mating with females. There are many small scattered organic farms in Egypt. Most of them are dedicated for exportation purposes and few for local market. Majority of these farms are hired to investors from Germany or Italy. Inspectors from the mother countries check the rule of the farming processes periodically to ensure the product quality complies with international standards.

Other efforts to reduce health and environmental risks of pesticides

More efforts are being made by researchers, APC and executives from MOA as a policy to reduce health and environmental risk of pesticides. These include the followings:

- Aerial and ULV applications were stopped in 1990.
- Development of conventional application to reduce spray volume.
- Promotion of anti-drift nozzle and/ or special equipment for herbicide on horticulture and field crops treatment.
- Minimizing the use of powder or dust formulations.
- Promotion of less hazardous formulations suitable for the hot climate.
- The use of soluble sachets for highly toxic WP (wetable powder) materials.
- Promoting the use of appropriate protective clothing (overall, gloves, glasses, masks and head covers) during pesticide application.
- Introduction of suitable packages (bottles / sachets) or small area with clear instruction for not being reused.
- Using of spot treatment technique in area of infestation or strip treatment for some crops (horticulture / sugarcane).
- Instruction not to wash pesticides equipment in irrigation canals or pour the left-over solution in current water or to bury empty containers near water canals.
- Co-operation between MOA, pesticide industry and NGO's to follow FAO and Croplife International regulations and standards. This has led to the distribution of publications and pamphlets on the safe handling, storage, transportation and use of pesticide to end users.
- Establishment of periodical training programme between MOA and Pesticide industry and NGOs on the safe handling, storage, transportation and use of pesticides.
- All instructions for poisoning accidents and treatment are clearly labelled on the pesticide.
- Four major poison medical centers have been opened in key cities, with specialized medical poisons clinics in University Hospitals. However, there is a lack of information system or networks for records of pesticide poisoning in Egypt.

Pesticide legislation and regulations

Pesticide legislation and regulations in Egypt are governed by adequate laws and ministerial decrees which comply with international organizations' regulations (i.e. EPA, EU, FAO etc.). However, assistance from FAO, in reviewing and updating local regulations to conform to the provisions of the Code of Conduct, is required.

The registration and regulation of pesticides is controlled by the Agricultural Pesticide Committee (APC). According to the law, the Minister of Agriculture is responsible for the selection of the members in consultation with his advisors. He can re-formulate or add some members if there is need in order to implement the policy of the Ministry of Agriculture according to his vision. Sometimes the misuse of a pesticide by farmers or applicators leads to deregistering for use in Egypt though it may be registered and used in other countries.

A strong registration scheme is applied in Egypt and will be continued with full governmental control in the future. However, it needs more explanation and stability in order to be fully understood and observed by pesticide dealers and manufacturers.

Data required for registration are in accordance with FAO recommended list; and local pesticide experts are capable of evaluating such scientific data before product registration and release in the country.

Adequate infrastructure and analytical facilities are available to support the registration process in Egypt. However, updating of technological knowledge and upgrading of laboratory facilities is needed.

Pesticide label compliant with FAO guidelines on good labelling practices and with WHO on recommended classification of pesticide by hazard. A colour coding system and the use of pictograms are incorporated in pesticide labels, and will be continued in the future better handling and safety measures.

Monitoring the quality of pesticides at the point of importation or manufacture and in local markets is done. However, pesticide residues in food, water and soil, label compliance and poisoning cases need to be monitored on regular basis, with a neat record keeping system.

Training In collaboration with relevant NGO's (i.e. CropLife Egypt) and pesticide manufacturers and dealers, several training courses on safe and efficient use of pesticides for retail shop workers are being offered. However, assistance is required in organizing multilevel training of trainer's courses for extension workers, farmers and commercial/professional pesticide users. Training of medical staff on diagnosis and treatment of pesticide poisoning is required. There is also more need for training of pesticide registration, evaluation and analysis staff through FAO assistance.

Pesticide Legislation and regulations This is governed by adequate laws and ministerial decrees that comply with international regulations and standards (e.g.. EPA, EU, FAO etc.). However, regular review and updating of local regulations to conform to the provisions of the Code of Conduct is required.

Disposal of obsolete pesticides Advice on current methods of the disposal of obsolete pesticides is from FAO or other international organizations. Transfer of new technologies and upgrading disposal facilities as well as training are needed.

Poisoning information centres

These are available in hospitals of major cities. Redistribution of these centres to cover main agricultural areas with intensive pesticide usage is required. Communication between these centres and regulatory authorities is essential, to provide the centres with current information, on registered pesticides and corresponding symptoms and treatment, on a regular basis.

Record keeping by regulatory authority on all aspects related to pesticide registration and control started only recently. No record keeping system was adopted for various registration activities, only individual efforts. A new computerized information system is under development. Help is needed in this area to adopt an advanced computerized record keeping system to facilitate national, regional and international information exchange.

Monitoring the quality of pesticides

This is done at the point of importation or manufacture and in local markets. However, pesticide residues in food, water and soil, label compliance and poisoning cases need to be monitored on regular basis, with a neat record keeping system.

Weakness in legislation & regulations

Although there are many positive and strong areas in the registration and regulation policies of pesticides in Egypt, there some weak areas that need to be improved:

- Technical explanatory documentations of registration scheme are lacking, thus producing confusion in the understanding of implementation steps
- Increase in the number of registered plant protection products from less developed countries and unrecognized sources.
- Low investment in local industry. The interest of the local industry is only in formulation and re-packaging.
- Support for research and development is at its lowest.
- Shortage in equipment, technical facilities and regulations to carry out pesticide quality control or assurance tests.
- No official local specifications for exportable or domestic crops to meet the European or USA requirements.
- Limited control on pesticide shops, storage, and formulators located in small village and farms.
- Limited control on food and fresh crops for domestic use.
- Limited co-ordination, cooperation, and information exchange between various stakeholders.
- Invasion of various unknown products into the local market where their sources or contents are not clear.

Pesticide use and control

- Egypt should be divided into different agro-ecological zones or areas. Each area should have its own pest control programme.
- In the past few years PHI have been done in CAPL in order to match the Egyptian requirements. Equipped laboratories and well-trained personals are a must and should be considered.
- Since unidentified pesticides have invaded the Egyptian market from china and other Asian countries, Pesticide Inspectors should be provided with incentives, transportation and clear and effective law.
- Government should support the local pesticide industry, whose interest is in formulation or re-packing with minimum research and development initiatives.
- Government should set up a local guideline for food quality (pesticide residue limit, for example). The guideline should be established in order to encourage the food exportation to Europe or the USA.
- Increase budget for research and development.
- Establish a training programme in pesticide handling and regulations.
- Work with NGOs in pesticide regulations and control.
- Enforce policies that make pesticide traders and manufacturers cooperate and take part in the formulation of regulations and policies.

Training

Short term training programmes on pesticide is required for small scale farmers who are the most affected by pesticide hazards. For example, in Fyuom governorate where Netherlands funded a training programme on pesticide handling, pesticide usage and the level of pollution were significantly reduced. So the programme should spread out in the other governorates as well.

Integrated Pest Management

Dialogue among stakeholders should be encouraged in the implementation of IPM programmes. Participation of farmers in the IPM programs generally shifts to less toxic and less persistent pesticides and greater reliance on other biological control measures. Non Governmental Organizations, big agricultural investors and dealers of bio-pesticide companies should pool their resources to support IPM programmes.

Training programmes should be developed for agricultural engineers and extension officers in the governorates in order to update their skill and information.

Guide reprints and brochures should be available. The need for training materials and experienced trainers is of significant importance.

Strengthen cooperation and institutional linkages among various, donor's agencies, NGOs, civil society and government departments in the implementation of programmes such as IPM.

Table 8 Steps for implementation process for the proposed reforms.

STEP	Y1	Y2	Y3	Y4	Y5
1- Formation of the working group					
2- Planning for training and awareness campaigns among public, agriculture engineers, extension experts in the news papers, TV, and others.					
3- Lobbying for banning highly toxic pesticides whose LD 50 is less than 200 mg/kg					
4- Selection of small plot areas (5-10 feddans) for the implementation of all IPM measures for demonstration at the rate of one pilot / command area. 5- The IPM program is applied in an increased area in not less than 100 feddan including all crops.					
6- The IPM program is applied in all areas. The final report highlighting success and constrains of the project implementation, should be submitted to the stakeholders. The link between the MOA and ministries and interested organizations must continue.					

Storage and disposal of pesticides

One of the concerns of environmentalists is the disposal of the invalid pesticides and their waste containers. Farmers sometimes use the pesticide containers in households for drinking cups. Sometimes used pesticide containers are thrown in waterways. A proper waste management policy should be put in place.

Validation of the proposed reforms

In order to validate the proposal mentioned, virgin area such as Toshki or North Sinai, where no pesticides have been used should be selected. The Integrated Pest Management programme with all components mentioned in this report should be implemented in this area where there are many big investors.

Implementation process

The following steps (as shown in table 8) should be taken:

Formalisation of the proposals

In order to formalize the proposals, the root and causes of the problem should be identified first. The major reasons for high pollutions in the waterways are the bad behaviour of the individuals. Without correcting the manner of our performance nothing will change and the case will be worse. Therefore, it is indispensable to go along different measures to accomplish legal policy reforms:

- Policy makers should play a part in the problem solving because their positions.
- Non Governmental Organizations universities, research institutes should play respectable role in the pollution problems.

- The national organizations, FAO, WHO, and others should help in solving the pollution problem as it is one of their interests.
- The pesticide companies contribute to pollution and so should contribute to problem solving such as provision of incinerators and technical assistance.
- Call for the cooperation between extensions and researchers on one hand and the farmers on the other hand in order to ensure the flow of information both ways and compliance of laws and regulations by all stakeholders.
- Reconstructing the policy for capacity building to analyze variables and consequently raise the ability to advice and support to farmers.
- Decentralize decision making process elevate flexibility and allocation of authorities to speed decision making, on condition that no contradiction to the general policy exists.
- Place the farmer at the centre of decision making process, research and agriculture development.
- Overall, stringent acts, decrees and laws should be issued through MOA, EEAA, and Public Assembly to fill the gaps and constrains mentioned before. Laws by on their own may not be fair enough to mitigate the problem but how to implement the law is one of the best ways to solve the situation.

Monitoring and evaluation processes

In order to evaluate any proposal, program or strategy, accurate and correct information should be accessible. Reliable data is not easily obtained in Egypt due to the following reasons:

- Officials keep data behind closed doors and cannot offer them easily.
- People usually suspect the questioners.
- People sometimes do not tell the truth
- Questionnaires are often not simple and straightforward.
- Data does not capture that from universities and other research institutions.
- To optimize the evaluation processes an information centre with qualified persons in data analysis and assessment should be established for this purpose.
- Policy makers and stakeholders should be acquainted with what is going on to assist in taking the right decision.

Acronyms

AI Active Ingredient,
APC Agricultural Pesticide Committee
ARC Agriculture Research Centre
CAPL Central of Agricultural and Pesticide Laboratory
CHC Chlorinated Hydrocarbons
CHI Chlorinated Hydrocarbon Insecticides
EAPC Estimated Annual Percent Change
EEAA Egyptian Environmental Affair Agency
EPA Environmental Protection Agency
EU European Union
FAO Food and Agriculture Organization
FASE Foundation for Advancements in Science and Education,
IARC International Agency for Research on Cancer
IPM Integrated Pest Management
JMPR Join Meeting Pesticide Reform
MOA Ministry of Agriculture and Land Reclamation
NGOs Non Governmental Organization
OPI Organophosphrous Insecticides
PCBs Poly-Chlorinated Bi-Phenols
PHI Pre- Harvest Interval
POPs Persisted Organochlorine Pesticides
ULV Ultra Low Volume
WHO World Health OrganizationReferences

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Nile Basin Initiative
Entebbe, Uganda
P.O.Box192
Telephone: +256 41 321424 / 321329
Fax: +256 41 320971

Burundi D. R. Congo Egypt Ethiopia Kenya Sudan Rwanda Tanzania Uganda

NILE BASIN INITIATIVE

NBI Vision: ***to achieve sustainable socioeconomic development through the equitable utilization of, and benefit from the common Nile basin water resources.***