

INITIATION OF A PESTICIDE ENVIRONMENTAL EXTENSION AND PUBLIC AWARENESS PROGRAM FOR PALESTINIAN COMMUNITY IN GAZA STRIP

By

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ABSTRACT

Significant progress towards the goal of environmental extension and awareness program has been achieved during 1997 and 1998 through the hard work of the environmental extension and awareness staff as well as EPRI executive board. The benefits of the program are distributed in different working sites of the field in Gaza Strip. During the year of 1998, our staff carried out 17110 field visits, conducted 338 concentrated extension days and held 96 workshops in all working sites of Gaza Strip. This work includes awareness to the farmers on their daily life on safe and effective use of pesticides, pesticides toxicity and hazards, environmental protection and pollution control and distribution of leaflets and papers on certain points of interest. This work has also introduced integrated pest management, alternatives to pesticides and training courses to the agricultural engineers and others to the farmers. Exchange of information and training took place in frequent visits, daily personal contacts, workshops, and concentrated extension days.

The initiated Program was successfully completed by the effective work of EPRI and close coordination and cooperation with the Palestinian Institutions working in relatively similar activities (agricultural activities). The enthusiasm of the EPRI staff and administration was demonstrated through mutual visits to the respective agricultural sites. The results of the first as well as the second year are encouraging and we are looking forward to continue the program in order to enhance the environmental pollution management awareness of the Palestinian farmers.

INTRODUCTION

Gaza Strip is a semi-arid region of roughly 365 km² (46 km long and 6-10 km wide) which lies on the Mediterranean Sea, with an estimated population of over one million. Its warm climate favours cultivation of many strategic crops including citrus, olives, almonds, grapes, and other subtropical fruits, vegetables and flowers. Gaza Strip is bound to the industrialized countries for exporting their cash crops and importing all production equipment and materials including pesticides and fertilizers. Gaza suffers from catastrophic environment and degraded infra-structure, water shortage, water pollution with high salinity and micropollutants, lack of sewage and solid waste treatment, maritime pollution, uncontrolled and heavy use of pesticides, overpopulation and overcrowding, poverty and low standards of living, their deficient economy and infrastructure hinder their ability to regulate efficiently the registration of pesticides. (Atkins, 1981; Baker *et al.*, 1978), El-Gamal (1982) and Soliman *et al.*, (1982).

International assistance and support are urgently needed by United Nation Agencies, mainly WHO, UNEP, FAO, ILO, IPCS, IRPTC, and other relevant international organizations (FAO, 1986) and World Bank (1985).

Since 1945, about 1500 individual compounds and more than 35000 different formulations have come into use as pesticides. A number of WHO reports (1985_{a,b}) have expressed concern about the potential risk of the increased production and use of pesticides at a rapid rate all over the world, especially in developing countries. Cases of pesticides intoxications during its formulation or application are increasing progressively, it is a source of public health problem in these countries (Davis *et al.*, 1986). For instance approximately 1300 cases of pesticides poisoning are found in Serilanka annually, which about 100 cases of death. Throughout these countries, workers engaged in pesticides formulations, applications and transportation are among the high risk groups of workers (Levine 1986), EPA, 1984, 1987, 1989 and Johnson *et al.*, (1993).

Chronic effects of pesticides are still less known than the acute toxicity based on case reports or animal data (Hayes, 1982). There are very limited epidemiological data available on the chronic effect of pesticides. The scarcity of this data is due to the limited resources and capabilities to conduct corresponding work, in developing countries. About 99% of the acute poisoning cases occur in the developing countries (Xue Shou Zhen 1987, AL-Ahmady *et al.*, 1985, and Miles 1978). This may suggest the importance of the environmental extension and awareness in prevention of such toxic side effects of pesticides.

Serious concerns with regard to the use of pesticides have been raised (Bottrel and Koeman 1984). It is stated that many pesticides that are considered restricted use in the western nations are being exported to the developing world. About 25% of all pesticides exported from the Western countries are heavily restricted compounds or compounds that have been suspended or prohibited from the use there. A number of WHO reports (e.g. WHO 1985 a) have indicated concern about the potential risk of the increased use of pesticides at a rapid rate in developing countries. El-Mofty *et al.*, 1985 and 1981, El-Sebae, 1985, 1986, 1988, 1989; and El-Sebae *et al.*, (1981).

Because of the heavy pesticides consumption in Gaza Strip (more than 250 metric tons of formulated pesticides in addition to one thousand metric tons of methyl bromide are used annually), it is urgently needed to minimize the magnitude of poisoning and contamination of the environment by these chemicals (Safi *et al.*, 1993; and Safi, 1995 and Safi, 1998 and 1999).

Gaza Strip as well as the developing countries joined the green revolution led by the industrial countries after World War II. The organic and the organometallic pesticides were heavily used to combat vectors of medical diseases such as mosquitoes, houseflies, fleas, lice, and rodents. In addition, the pesticide were heavily recommended and subsidized for the chemical control of pests mainly to protect the agricultural cash crops exported to the industrialized countries.

The short food supply and the ambition to increase the exported cash crops are driving farmers in Gaza Strip as well as the developing countries toward the increased demand for more and new pesticides. More than 250 metric tons of formulated pesticides (about 100 pesticides) in addition to 1000 metric tons of Methyl Bromide are used annually in Gaza Strip. Table 1 illustrates the rate of consumption of pesticides (kg) per Km² of arable and permanent cropland. It is clear that Gaza Strip is the heavy consumer of pesticides and the highest among these countries. Therefore special problems related to the misuse and overuse of pesticides have become widely recognized and documented in recent years.

For example it was found that 19 of these pesticides that have been used, are internationally suspended, cancelled and banned pesticides (Table 2), due to their mutagenicity, carcinogenicity, teratogenicity and delayed neurotoxicity. About 1100 cases of cancer have been registered in Gaza Strip (1979-1983), (Safi, 1999), and WHO (1986).

The distribution of cancer types among those patients is lymphoma and hematological malignancy, breast, head and neck,

gastrointestinal malignancy, reproductive system, urinary system, soft tissue tumors, brain tumors and others. Consequently, the introduction and heavy use of pesticides and other toxic substance in the Gaza Strip environment is suspected to correlate with the growing incidence of cancer and other abnormalities in the nation.

Measures Needed For a Safer Future Use of Pesticides:-

Early notification of adverse health effects regarding acute, subchronic toxicity effects according to the FAO Code of conduct and its appendixes and amendments. Adoption and implementation of both short and long-term integrated pest management (IPM) programs. International technical support is needed on both regional and local levels. To reduce the human health risk, it must be stressed that no threshold or accepted risk is allocable for any cytotoxic compound which is accessible to man in occupational exposure or as a residue in food or water. (Delaney Clause in United State and other countries as well.) This concept is now supported by the molecular irreversible nature of the cytotoxic adverse effects particularly carcinogenicity where one cellular transformation by a single true molecule is capable of inducing the genotoxic episode).

The need to include immune response depression, reproductive and teratogenic adverse effects, delayed neuropathy, other neurological effects, and the environmental impact in the toxicological criteria for registration of pesticides. Providing facilities and experience for disposal of old stocks of pesticides and their containers.

The need for regional and international cooperation to achieve these objectives. The special role of FAO, WHO, UNEP IOL, IPCS, and IRPTC in encouraging, and following up the induction of the pesticide FAO Code of conduct and its relevant supportive services and activities.

The specific objectives of the project are:

To increase the awareness of the public concerning the dangerous effects of the pesticides residues as pollutants.

To increase the public understanding of the dangerous effects of the environmental pollution. And to change the community behaviour (the farmers) towards the environment.

Preparation of the training materials

The main idea behind the suggested materials is to put them in a simple way that each of the agricultural engineers (environmental extension staff) can easily deal with them.

Implementation of the program

The training program for the environmental extension staff has been started since December 1995 and is ongoing up till now. The program has been divided into classroom lectures and field visits and lectures. In the classroom lectures, the staff are taught in the related subjects in theoretical bases, in addition, watching different subjects in TV and Video programs. In the field visits and lectures they learned new application methods for pest control as well as the safe use of pesticides and integrated pest management.

Continuous training course has been established for the agricultural engineers to develop the know-how and to improve their capacities to achieve the work in an acceptable way. This course has involved different environmental topics of great importance to conduct the operations in a proper way and to develop the relationship between the institute (EPRI) and the Palestinian community and farmers in Gaza Strip.

Field working Sites:

In frequent meetings, the EPRI executive board along with the project leader and his deputy have decided to focus the work on eight geographical zones according to the approved work-plan as follows:

Beit-Hanon and Beit Lahia zone

Jabaliala zone

Gaza zone, Shaikh Ejleen and Gaza Valley.

Nusairat, Buraij and Maghazi zone.

Dir El Balah and Gararah zone.

Khan younis zone.

Abasan K. & S , Bani Suhaila and Khuza'aa zone.

Rafah zone.

In each of the above mentioned zones agricultural engineer (environmental extension staff) were appointed to conduct the daily work as mentioned in the work plan.

Survey of the Problems.

During the meetings, the extension staff has found that it is of great benefit to focus their attention on the greenhouses and open fields of vegetables in Gaza Strip. This is because the intensive agriculture and "the green revolution" are the main consumers of pesticides. Also considerable attention were given to the fruits sector in a seasonal bases.

Field visits

Site visits "Daily"

Each of the agricultural engineers after having known the working sites, had divided it into a sub working sites to be visited at least twice a month. The environmental extension program aims to give a hand to the farmers to overcome their problems, in pest within control and to minimize the heavy use of pesticides and the establish an extension service.

Concentrated environmental extension days.

On weakly bases, the agricultural engineers are divided into three groups to conduct a concentrated extension day in different locations in Gaza Strip.

They will make practical training to the farmers on using the right concentration as well as the right method of pesticides applications, machine calibrations, the safe disposal of pesticide containers and the proper handling and storage of pesticides.

Workshops

On monthly bases, 3 workshops are conducted in different places in Gaza Strip. Many farmers were invited to attend this workshop. Three speakers are talking about three different subjects. One is about the identification and objectives of the projects and the source of funds, in some how it is an administrative presentation. The second speaker talks about technical issues such as the safe use of pesticides, the fate of pesticide in the environment, the safe disposal of pesticide in the environment, the use of non toxic means of pest control, the integrated pest management in the greenhouses, and the use of physical means to increase pollination in the greenhouses.

Environmental extension leaflets and papers

On monthly bases or whatever needed, Environmental extension leaflets are distributed to the agricultural community, farmers, and public people about the protection of the environment, public awareness, and pollution control subjects.

Office Work.

On weekly bases all of the agricultural engineers (the environmental extension staff) come to EPRI office on Saturday after a short field visit to the farmers. In this day technical subjects are discussed, preparation of the needed materials such as extension leaflets and papers, workshops, concentrated extension days to the farmers and evaluations of the work. At the end of the month, the meeting concentrated on the preparation of ring the work plan, workshops training course and the needed material for the next month.

Evaluations of the work

On weekly bases the work plan achievements are checked in the different sites of the field by direct and indirect questions to the farmers to evaluate their benefits and remarks. Random samples of farmers were questioned to evaluate the field visits of the extension staff. Site visits along with environmental extension staff are conducted in a randomized way. This randomized method of evaluation gives us real results about

the credibility of conducting the work. Also, specialists (not institutional) committee is kindly requested to evaluate the measures work. Those three of evaluation give us good estimation about the credibility of the work.

Table(1): Comparative Consumption Rate of Pesticides Kg (active ingredients)/ km² of arable land (Safi, 1995)

Country	1980	1985	1988	1990	1991	1994
Canada	-	94	86	81	-	-
U.S.A	204	206	202	199	195	-
Japan	1844	1746	14921	1807	1428	-
Austria	265	346	-	-	277	-
Belgium-	866	-	1157	-	-	-
Luxembourg						
Denmark	186	307	225	186	182	-
Finland	90	82	77	81	68	-
France	407	479	486	451	502	-
Germany	437	403	493	442	-	-
Greece	-	-	172	-	-	-
Ireland	132	-	-	185	203	-
Italy	-	-	842	766	-	-
Netherlands	-	2354	1951	1995	1823	-
Norway	168	178	136	137	-	-
Portugal	786	716	681	-	-	-
Spain	-	-	629	-	-	-
Sweden	168	172	100	83	65	-
Switzerland	416	-	488	412	368	-
Turkey	95	133	1213	122	101	-
U.K	607	-	409	371	417	-
Gaza Strip	1000	1000	1750	2260	2841	6316*

* In addition to the pesticides, this number also one thousand ton of methyl bromide

Table 2: Internationally suspended, cancelled and banned pesticides which are still used in Gaza (Safi et al., & Safi, 1998).

Aldicarb	DDT	Maneb
Benomyl	Endosulfan (Thiodan)	Methadathion
Captan	Ethylene dibromide	Methyl bromide
Chlorobenzilate	Fenamiphos	Nitrofen
DBCP	Methamidophos	Paraquate
2,4-D	Lindane	Trifluralin
2,4,5-T	Parathion	

RESULTS AND DISCUSSION

Table 3 presents number of the concentrated extension days (CED) to the farmers in all working sites in Gaza Strip. The environmental extension staff has conducted 338 concentrated extension days during the last year of the work. In comparison with last year, there is no significant difference among the number.

Table (3): Concentrated extension days (CED) in all sites.

Month	Number of concentrated extension days (CED)							Total
	B.H	Jab	GZ	MZ	Kh YE	Kh YW	Rafh	
Dec. 1996	4	4	4	4	4	4	4	28
Jan. 1997	2	4	3	2	0	0	0	11
Feb.	-	-	-	-	-	-	-	-
March	2	0	3	4	5	5	0	19
April	5	0	4	5	5	5	4	28
May	4	5	4	4	5	5	4	31
June	4	4	4	5	4	5	0	26
July	5	5	4	4	4	4	4	30
August	4	4	0	5	5	5	5	28
Sept.	5	5	3	4	4	4	4	29
Oct.	4	3	4	4	4	4	5	28
Nov.	4	4	4	5	5	4	5	31
Dec.	4	5	4	3	0	4	2	22
Jan. 1998	5	3	3	0	0	0	2	13
Feb.	0	0	4	0	0	3	4	11
March	3	0	0	0	0	0	0	3
Total	55	46	48	49	45	52	43	338

The data of workshops conducted in all working sites in Gaza Strip are presented in Table(4).

Table (4): Number of workshops In Different sites

Month	Location							Total
	B.H	Jab	GZ	MZ	Kh YE	Kh YW	Rafh	
Dec. 1996	1	0	0	0	1	1	1	4
Jan. 1997	1	1	0	0	1	1	1	5
Feb.	-	-	-	-	-	-	-	-
March	3	1	1	1	0	1	1	8
April	2	0	2	0	1	2	2	9
May	1	2	1	1	2	0	1	8
June	1	1	2	0	0	1	2	7
July	1	1	0	1	0	2	2	7
August	2	2	1	0	2	1	0	8
Sept.	2	1	1	1	0	1	0	6
Oct.	2	1	2	2	0	2	1	10
Nov.	1	2	1	1	1	1	1	8
Dec.	1	1	2	0	1	1	1	7
Jan. 1998	1	1	1	1	0	1	1	6
Feb.	1	0	0	0	1	0	0	2
March	1	0	0	9	0	0	0	1
Total	23	14	14	9	9	14	13	96

During this year 96 workshops were conducted in all sites of Gaza Strip. Comparing this data with that of last year, a significant difference was observed. A possible explanation for these data is that there is a continuation of the work of last years, in which the environmental extension staff is better doing the job. The workshops were focussed on different pesticide and environmental subjects. About 4950 farmers and workers were attending these workshops training program.

Most of them are involved in the agricultural process, such as vegetable growers, pesticides sprayers, etc. Most of the farmers were applying pesticides more than the recommended rate and large part of them did not receive the agriculture extension services as well as they did not use protective means during the pesticides spraying.

Table (5), presents the data of comparison study of pesticides application on tomato plants to control white fly. It can be seen that there is a significant reduction of pesticide application in the 1st month, while very slight reduction was observed in the second and third months. At the fourth month the applied rate was not changed.

It is clear Table (5) that the frequency of pesticide application in the second year was relatively reduced to one third. This reduction is due to two reasons: (1) Farmer became more convinced from the frequent visits, which made the environmental extension staff able to reduce pesticide quantities (2) Farmers also have used an alternatives to pesticides such as white net which is not permeable to insects. Similar results were also observed on cucumber and grapes

Table (5): Comparison of pesticide use on Tomato.

Month	Frequency of pesticide application	
	1 st year	2 nd year
1 st	35	27
2 nd	15	12
3 rd	8	6
4 th	4	4

In the second year of the project significant reduction were observed in the applied rate in comparison with the first year. Comparing the reduction in the same year it can be seen that significant reduction

was observed at the first month. A possible explanation of this reduction is that, the farmers responded to the new instructions that they received by the extension program via daily visits, workshops and/ or concentrated extension days, and began to change their attitude according to these new instructions. Thus, they applied pesticides in the right time with the recommended rate. The continuation of this methodology will lead to a real reduction in the applied rate.

In recent survey Table (6), we present the data of analyzing 254 questionnaires (El-Sebae, Suzy, A. (1999). In each questionnaire answers of farmers to different evaluating points are shown. It is clear that farmers have positively responded to the extension staff and real development toward the stated goal of minimizing the use of pesticides in agriculture.

Farmers begin to understand positively the hazards of the pesticides to the environment and to the human health, thus they started to use other means such as natural means of controlling pests. Nevertheless, pesticides are still the fast answer to many of the pest control problems. In such a case, farmers were seeking the service of the environmental extension staff in the selection of the suitable pesticide with less dangerous effects on the environment and the humans. Farmers become more convinced to use alternatives to pesticides such as soil solarization to kill weeds, and nematodes, instead of using methyl bromide, or using electric bee to increase pollination instead of using chemical hormones.

Table(6), also presents some data about the quality of the extension program. It is clear that farmers are depending on the environmental extension staff. Therefore, it is urgently needed that the environmental extension staff will continue working in the field.

Tables (7-9) present the data of development the know-how for management of pesticides among farmers, which is considered a continuation and conclusion of the data of the last year.

Table(6): Analysis of pesticide use on Gaza Strip during the extension program.

Item	Answer of farmer		
	Natural (235)	Integd.(21)	Chem. (150)
What are the Methods of pesticide application	By Eg.(84)	By Exp (33)	ByEPRI St (137)
How do you select the needed pesticide	Manual (84)	Mech. (170)	-
Do you wear protective clothes	Yes (131)	No (123)	-
Do you use of the recommended rate	Yes (218)	No (36)	-
Do you use balance or cylinder to take the needed rate	Yes (228)	No (26)	-
Do you Calibrate the spraying equipment	Yes (156)	No (98)	-
Do you have Information about the toxicity of pesticides	Yes (207)	No (47)	-
Do you knew the list of internationally suspended, banned and canceled pesticides	Yes (193)	No (61)	
How do you store the pesticides	Special store (201)	Hpme (53)	
Do you take an immediate shower after spraying pesticides	Yes (191)	No (63)	
Do you commit yourself to recommended safety period	Yes (171)	No (83)	
Do you use any alternatives to pesticides	Yes (71)	No (183)	
Do you use the solarization instead of methyl bromide	Yes (237)	No (17)	
Do you depend on our extension service	Yes (249)	No (5)	
Do you receive training on pesticide use	Yes (22)	No (232)	
What is your opinion on the quality of our extension	v.good (59)	Good (159)	Acceptable (34)

Table (7) : Progress of the number of farmers who have information about the integrated pest management (IPM).

Month	Farmers have information	Farmers have no information
Dec. 1996	44	256
Jan. 1997	47	253
Feb.	-	-
March	52	248
April	55	245
May	59	241
June	60	240
July	62	238
August	64	236
Sept.	66	234
Oct.	79	221
Nov.	80	220
Dec.	84	216
Jan. 1998	86	214
Feb.	89	211
March	95	205

CONCLUSION

The purpose of this program was to minimize the heavy use of pesticides in Gaza Strip and to alleviate the serious problems caused by pesticides. Significant progress towards the stated goal has been achieved during 1997/1998 through the hard work of the extension staff and EPRI executive board as well. During these years, our staff carried out 17110 field visits, conducted 338 concentrated extension days and held 96 workshops in all working sites of Gaza Strip. The target groups were

farmers, agricultural community, pesticide traders, and agricultural leaders.

Table (8): Progress of the number of farmers who use protective clothes during pesticide application.

Month	Farmers use protective cloths	Farmers do not use protective cloths
Dec.1996	88	212
Jan.1997	98	202
Feb.	-	-
March	98	202
April	95	205
May	93	207
June	97	203
July	100	200
August	118	182
Sept.	125	175
Oct.	132	168
Nov.	141	159
Dec.	149	151
Jan.1998	155	145
Feb.	161	139
March	169	131

The tackled subjects were: (1) safe and effective use of pesticides, (2) pesticides toxicity and hazards (3) integrated pest management,(4)

alternatives to pesticides and (5) training courses to the farmers on practical issues, and (6) environmental protection and pollution control from pesticides. Materials used were: (1) daily visits, weekly concentrated extension days and monthly workshop, in addition to some un-expectable issues, (2) on site lectures and (3) distribution of leaflets and papers on certain points of interest.

Table (9): Progress of the number of farmers who depend on EPRI staff on selecting the needed pesticide.

Month	Selection by EPRI staff	Selection by farmers
Dec.1996	112	188
Jan.1997	124	176
Feb.	-	-
March	125	175
April	133	167
May	145	155
June	168	132
July	179	121
August	188	112
Sept.	197	103
Oct.	200	100
Nov.	200	100
Dec.	212	88
Jan.1998	215	85
Feb.	216	84
March	221	79

The program was successfully completed due to the effective work of EPRI and close coordination and cooperation with the

Directorate of plant protection in the Ministry of Agriculture, PNA, and other Palestinian Institutions working in relatively similar activities (agricultural activities) The enthusiasm of the EPRI staff and administration was demonstrated through mutual visits to the respective agricultural sites. The results of the second year are more encouraging than that of the first year, but it is still beyond our ambition

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الملخص العربي
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انشاء برنامج ارشادى للتوعية البيئية باخطار المبيدات بين
الفلسطينيين فى قطاع غزة

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لقد تم تحقيق الهدف المشترك فى اقامة برنامج الارشاد الزراعى البيئى عن طريق الجهود المكثفة والتي استمرت عامى ١٩٩٧ ، ١٩٩٨ بواسطة التعاون بين فريق الباحثين من معهد بحوث وحماية البيئة فى غزة ووزارة الزراعة. قد انتشرت فعاليات البرنامج لتعطي مواقع النشاط الزراعى فى قطاع غزة حيث تم القيام بعمل ١٧١١٠ زيارة حقلية كما تم عمل ٣٣٨ يوما ارشاديا مكثفا وكذلك عقد ٩٦ حلقة مناقشات لتعطي كافة المواقع الزراعية. وقد ساهمت تلك الجهود وما صاحبها من جمع البيانات وتوزيع النشرات والقضاء المحاضرات وجلسات المناقشات - ساهمت كل تلك الجهود فى تحقيق قاعدة من التوعية العامة باخطار المبيدات على صحة الانسان والبيئة كما ساعدت على بدأ انتشار الوعى لقبول ترشيد استخدام الكيماويات واستخدام بدائل المبيدات فى اطار برنامج للمكافحة المتكاملة.