

ASSESSING THE LONG-TERM IMPACT OF IPM FARMER FIELD SCHOOLS ON FARMERS' KNOWLEDGE, ATTITUDES AND PRACTICES. A CASE STUDY FROM GEZIRA SCHEME, SUDAN¹.

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Abstract

The purpose of a comparative study conducted from June to September 2001 in the Sudan's Gezira Scheme was to assess the long-term impact of Integrated Pest Management (IPM) Farmer Field Schools (FFS) on farmers' self-reported knowledge, attitudes, practices and empowerment. Farmer Field Schools were implemented between 1993 and 1996 in the context of an FAO IPM in Vegetables Project.

The paper is based on a rare opportunity to compare and contrast the results from a 1993 base line study, a 1995 evaluation study and a re-study conducted in 2001. The duration of original FFS project of only three years provided an opportunity to explore the lasting results of an intervention. Although the methodology had a number of flaws, some tentative conclusions which are supported by the time series data are:

The former participants in the FFS training, compared to the non-participants, continued to follow FFS recommendation with respect to:

- Using the recommended quantity of pesticide per *feddan*;
- Using the recommended number of sprayings per season;
- Using protective clothing;
- Observing safety periods.

The study provided evidence also of a degree of empowerment among the participant group when assessed by the following indicators:

- Strengthening friendship and trust among FFS participants;
- Collective activities;
- More self-confidence with respect to Gezira Field Inspectors;
- Incipient organisation;
- Non-compliance with Scheme regulations.

The overall conclusions are:

- FFSs can be considered as a transformational learning process that qualifies farmers with a long-term effect;

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- The changed behaviours of the participants do not seem to have diffused to farmers in non-FFS villages.

1. The Overall Study Design

The aim of the study was threefold: to assess the long-term impact of the IPM FFS training on the Knowledge, Attitudes, and Practices of farmers; to explore the ‘empowering’ effect; and to understand the different roles of the actors involved in the project. The actors involved were FAO, the Agricultural Research Centre, the Extension and Horticulture Departments in the Gezira Scheme, the Farmers’ Union, the Central Ministry of Agriculture, the Gezira State Ministry of Agriculture, the Sennar and Rahad Schemes and Khartoum and Gezira Universities. By looking at the project from these actors’ perspectives, the author attempted to find out the extent to which the project changed the relationships between the different institutions.

The general design of the study included qualitative and quantitative methods (a formal survey and group discussions) in order to collect in-depth information and quantified data from farmers. With respect to the institutional actors, open interviews were conducted with representatives of the main actors involved in the implementation of the project.

Comparisons between the results of three different studies were possible (Fig. 1). A base line survey of farmers’ knowledge, attitudes and practices with respect to pests and pesticides was carried out in 1992/1993 with a sample size of 100, before the start of the IPM FFS project. The report of this study is available, with results reported in terms of percentages, frequency distributions and averages. In 1995, mid-way during the project, samples of 60 FFS participants and 60 non- participants were interviewed. The reported results were comparable to those reported for 1993. The 2001 study was designed to complete the time series.

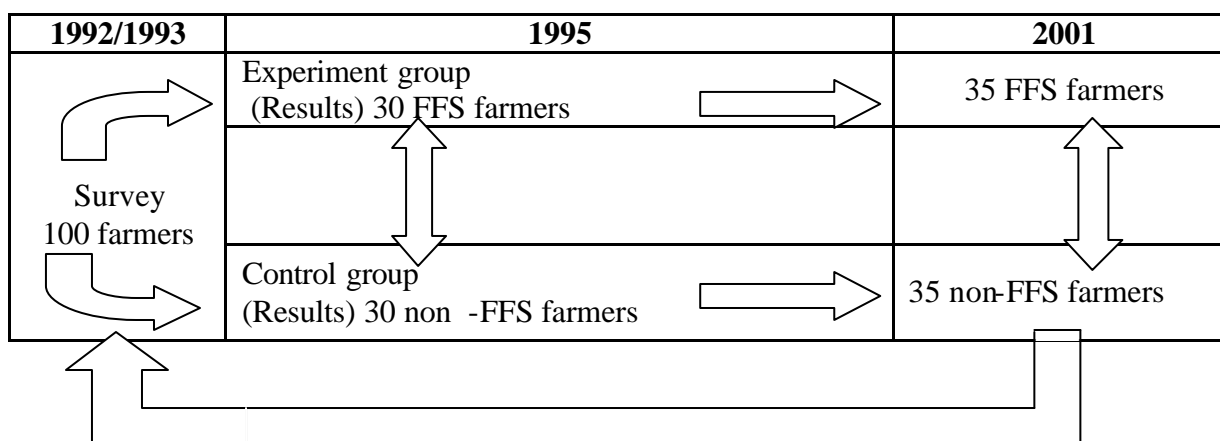


Figure 1. General design of the comparative study

The overall comparative study has a number of flaws. In the first place, the farmers interviewed in the three situations were not the same farmers. The samples were drawn

from different populations using different sampling methods. The original data from the 1993 and the 1995 studies are no longer available, only the results, so that only averages, frequency distributions (some) and percentages (some), as reported, could be compared. The way in which the data were collected (questionnaires, interviews, etc) in 1993 and 1995 is unknown and could not be replicated in the 2001 study. In addition, it should be noted that the farmers trained in the FFS were not randomly selected, introducing a bias that is reported below. Finally, all three studies have relied on self-reporting; no independent observations were made. This opens up the possibility of bias.

2. The 2001 Study

The 2001 study (column 3 in Figure 1) compared the farmers who participated in the FFS to farmers who did not. Both groups were interviewed using a set of questions that addressed the variables used in the 1993 and 1995 studies. In addition some new questions were included. A formal survey, using a pre-coded questionnaire with a few additional open-ended questions, was used to obtain quantified data.

2.1 Respondent selection

The respondents were selected mainly from tomato and onion cultivators. The Gezira Scheme consists of 18 Groups of which the Centre Group was the first in which an FFS was implemented. As shown in Tables 1 and 2, in total two FFS were held in the Centre Group area, drawing members from a total of six villages. The sample of participants in the 2001 study was drawn from the participant list of the two FFS Gezira.

Table 1. Selection of the participants from the first FFS

Group	Villages	No. of farmers listed in each village	No. of farmers interviewed
FFS 1	Wad el-Naeim	14	10
	Hilat Huissin	5	4
	Wad el-Shafi	5	3
	Wad el-Dao	1	1
Total		25	18

Table 2. Selection of the participants from the second FFS

Group	Villages	No. Of farmers listed in each village	No. of farmers interviewed
FFS 2	Wad el-Hindi	33	16
	Wad Hilal	2	1
Total		35	17

It turned out that not all farmers registered as participants actually attended the FFS weekly training sessions on a regular basis. Apparently some landowners were selected although they did not normally engage in agricultural activities. Therefore only those farmers were selected for the 2001 study who, according to the records, had attended four successive training sessions and who were full time farmers.

Originally, the non-FFS farmers were going to be selected from the same villages as the FFS participants. However, the incident reported in Box 1 led to the decision to randomly

select the non-participants from similar but neighbouring villages. In hindsight, this decision made it impossible to assess within-village diffusion of IPM practices.

Box 1: An Encounter with Reality Alters Sampling Procedure

The researcher and an extension worker were driving along the road toward Wad el-Hindi village when we noticed a man in an adjacent field waving and calling for us to stop. We stopped the car and the man approached us directly, asking “Hello, did Sammie come with you?” The man was holding a pale tomato plant in his hand. The extension worker responded: “Hello, sorry, which Sammie is this?” The following conversation then ensued:

Farmer: Sammie, the one from Wad el-Hindi. He promised me to come.

Researcher: No, we have no idea who he is, but what is it you want?

Farmer: I have a problem in my tomato and he has to see it, so when I saw your car I thought he had come, he has the same pick up!

Researcher: what is this Sammie’s job? Is he an extension agent?

Farmer: No, he was in the school and he knows all about tomatoes! He gives us some advice and it works.

Researcher: You mean he is an educated man?

Farmer (rather irritated and in a defensive manner): No, I also went to school and I know how to read and write, but he was in the extension school.

Extensionist: Do you know who I am?

Farmer: Sorry, no.

Extensionist: I used to be the one responsible for that school and I do indeed know Sammie, he was the group leader in Wad el-Hindi FFS”.

He then turned to the farmer and said: Since we are going that way, if we come across him, we will tell him that you are waiting for him.

Farmer: Thanks!

2.2. Socio-economic and demographic differences between respondent groups in the 2001 study.

Following Van der Fliert’s study of FFS in Indonesia (1993), the two groups of farmers were compared on a number of demographic and socio-economic criteria in order to assess whether there were structural differences between the two groups:

1. Age
2. Formal education
3. Farm size
4. Land status (owner, share cropper and tenant)
5. Use of inputs (pesticides and fertilisers)
6. Experiences in vegetable farming.

The mean age of the participants was 43 years and of the non-participants it was 38 years. More than half (51%) of the participants had secondary or higher schooling compared to only about one tenth (12%) in the non-participants group. Moreover the majority of the non-participants had a lower education (86%) compared to only 32% in the participants group.

No major differences between participants and non-participants were found with respect to the size of the vegetable farms. In both groups, more than four fifths of the farmers had less than 5 ha. However, nearly all participants (86 per cent) cultivated their own farms, as compared to about a third of the non-participants (29 per cent), who tended to be sharecroppers. Nearly all farmers in both groups were using pesticide (more than 90 per cent). Four fifths of the participants had ten or more years' experience in vegetable cultivation, compared to 40 per cent of the non-participants.

In all, the selection of the FFS participants had an elite bias, even after the absentee landlords had been removed from the sample. The difference between owners and sharecroppers is an important status difference.

2.3. Evidence for long term impact of FFS

Table 3 indicates that almost half of the farmers (45%) who participated in the FFS training continued to use the recommended amounts of pesticides (200 – 250 ml per *feddan*), as compared to only 11% of the non-participants. Almost all of the non-participants (86%) were applying large amounts of pesticides.

Table 4 shows that more than three-quarters of the participants (76 per cent) sprayed 2-4 times as season, as was recommended by the FFS training. The non-participants showed greater deviation from the recommended number and sprayed an average of 12.5 times compared to 3.3 times by the FFS participants.

Table 5 indicates that almost two-thirds of the participants (6 per cent) pay attention to reading the label on the pesticide container before applying it, compared to 11% of the non-participants.

Table 3. Quantity of pesticides used

Amount in ml / <i>feddan</i>	Participants		Non-participants	
	N	%	N	%
Has no onion	2	6	1	3
200 (recommended)	4	11	-	-
250 (recommended)	12	34	4	11
333	5	14	-	-
400	1	3	-	-
500	10	29	14	40
750	-	-	1	3
1000	1	3	11	31
1500	-	-	1	3
2000	-	-	2	6
3000	-	-	1	3
Total	35	100	35	100
Significance level 0.05 or less			.002*	

Table 4. Number of sprayings per season

Number of sprayings per crop season	Participants		Non-participants	
	N	%	N	%
Has no onion	2	6	1	3
1	4	11	-	-
2	4	11	3	8.5
3	11	31	8	22.8
4	8	23	1	3
5	2	6	3	9
6	1	3	3	8.5
7	1	3	4	11
8	1	3	6	17
9	-	-	1	3
10	1	3	2	6
11	-	-	1	3
12	-	-	1	3
15	-	-	1	3
Total	35	100	35	100
Average	X = 3.3		X = 12.5	
Significance level 0.05 or less		.051*		

Table 5. Information source about pesticide effectiveness

Pesticide effect	Participant		Non-participant	
	N	%	N	%
Read label before use	21	60	4	11
Read label after use	2	6	12	34
Pesticide trader	5	14	12	34
Others	7	20	7	20
Total	35	100	35	100
Significance level 0.05 or less		.000*		

Table 6 shows that a high percentage of participants (80 per cent) have adopted the recommended option for evaluation of pesticide effectiveness after spraying compared to the non-participants (9 per cent).

Table 6. Evaluation of self-reported pesticide effect after use

Pesticide evaluation	Participant		Non-participant	
	N	%	N	%
Insect count (recommended)	21	80	3	9
General view only	14	20	32	91
Total	35	100	35	100
Significance level 0.05 or less		.000*		

All FFS participants claimed to know the difference between pests and their natural enemies as compared to around a tenth of the non-participants. Nearly all participants (91 per cent) claimed to followed the advice to wear protective clothing during pesticide application, as compared to about a quarter of the non-participants. Nearly all FFS participants (94 per cent) reported observing the recommended safety period after spraying pesticides as compared to almost none of the non-FFS participants.

In all, the 2001 study comparing farmers who participated in FFS training between 1993 and 1996 with those who had not clearly showed the lasting impact of the FFS training.

3. Comparison Between the Results of the 2001 and the 1995 Studies

Table 7 shows the differences between 1995 and 2001 on some of the key variables selected for this study. It is very clear

	2001		1995	
	<i>FFS</i>	<i>Non-FFS</i>	<i>FFS</i>	<i>Non-FFS</i>
Recommended quantity of pesticides used	45%	11%	44%	11%
Average number of sprayings	3.3	12.5	4.3	9.6
Use of protective clothing	91%	23%	97%	27%

The main interest of this table is that it shows that the impact of the FFS training seems not to have diminished over the five years that elapsed since the last FFS for vegetable IPM was held in the Gezira. In fact, the FFS participants seem only to have decreased the number of their sprayings, while non-participants seem to have increased their frequency. Of course, some courtesy bias could have crept into the self-reported averages.

4. Comparison between the results obtained from the 2001 study and the baseline survey conducted in 1993.

Only few of the results are shown here for interest sake. The comparisons are limited to the non-participants in 2001. Illiteracy has gone down from 12% in 1993 to 3% in 2001.

Table 8. Reasons for losses in vegetable crops (% of farmers)

Reasons	Non-FFS Participants 2001	Respondents in 1993
	%	%
Low-quality seeds	3	9
Improper practices	3	13
Input shortages	-	4
Theft	-	4
Pests and diseases	51	70
Other	9	
No crop loss	34	-

Table 8 shows that self-reported causes of crop loss changed considerably over the years. Fully one-third (34%) of the non-participants in 2001 reported no crop losses, while about half (51%) reported losses due to pests and diseases as compared to 70% in the 1993 study. The decrease in reported causes such as low quality seed, improper practices, input shortage and theft is remarkable.

Also in 1993 fully 100% of farmers reported using pesticides. However, the sources from which farmers obtained their pesticides seem to have been privatised considerably (Table 9). In 2001, fully four-fifths (83%) of the farmers reported obtaining their pesticides from the market as compared to one-third in the 1993 study (34%). A simple explanation for this change is that in 1993 the Gezira Scheme used to purchase and distribute pesticides but that is no longer the case.

Table 9. Farmers' sources of pesticides (% of farmers)

Pesticide source	Non-FFS Respondents 2001	Respondents in 1993
	%	%
Agricultural bank	6	1
Extension services	-	1
Scheme	11	37
Market/pesticide traders	83	34
1 & 3	-	2
3 & 4	-	25

In 1993, still about one-third of the farmers interviewed used tree branches, brooms and other means to apply pesticides, while nearly all respondents used a knapsack sprayer in 2001.

Table 10 indicates that the percentage of farmers who read the label on the pesticide containers remained more or less the same (resp. 11% and 15% in resp. 2001 and 1993). But in the 2001 study about a third (34%) of the farmers approached traders for information, while no one reported that in the 1993 study. More than four-fifths of the farmers in the 1993 study depended on their own judgement (field observation after use, or smelling and/or tasting), a percentage that had dropped to about half (55%) in 2001.

Table 10. Farmers' opinion on best method of knowing pesticides effectiveness.

Effective before use	Non-FFS Respondents 2001	Respondents in 1993
Read label	11%	15%
Field observations after use	34%	51%
Ask trader	34%	-
Others (smell & taste!)	21%	34%

Self-reported adoption of protective clothing did not change very much over the years (Table 11).

Table 11. Farmers' adoption of use of protective clothing

Type of clothing	Non-FFS Respondents 2001	Respondents in 1993
Protective clothing	23%	28%
None	77%	72%
Other	-	-

5. Indicators of farmers' empowerment

An attempt was made to measure farmer empowerment as an outcome of FFS training in two different ways:

- Open-ended questions were included in the survey instrument used in the 2001 study.
- Group discussions with participants in the two FFS that were included in the 2001 study.

Table 12 shows the result of an attempt to categorise the answers to the open ended questions, and to carry out a simple frequency count of the resulting categories. The table shows that most participants felt that the FFS training had considerable impact in terms of 'empowerment'.

Table 12. Frequency count of response categories from open ended questions addressing the social consequences of FFS Training

<i>Indicators</i>	<i>Frequency</i>	<i>Percentage</i>
Strengthening friendship and trust	30	86
Collective activities	28	80
Incipient organisation	26	74
Evidence of compliance	20	57
Less self-effacing attitude	13	37
Total	35	100

Furthermore I conducted open discussion groups with the participants in the two selected FFSs. The discussions addressed broad questions such as:

- How did the FFS get started?
- What did they think of the idea to start an FFS?
- What was their relationship with the facilitators?
- Did they benefit from the training?
- On the personal level?
- On the village level?
- Did they form or organise anything together after the school stopped?

Here I report only some highlights. "We had been vegetable farmers for long but we never joined in these things before. Perhaps some of us as cotton cultivators did join some meetings organised by the Scheme. When the Farmers' Union approached us to have this farmer field school in our village we liked the idea, we talked about it and we agreed. Then we had a bigger meeting with people from the project and the Scheme, they told us about the project and the idea of the school. Also we told them about our problems. Some of us knew the extensionist (facilitator) and the crop protection officer in the area from before so that was not new. The training started and we selected this place to meet. We did like the training and we were very motivated since we experienced pest problems in the tomato and to some extent with onion and it was a good idea to know more about them".

"Our relation with the Extensionist and the Crop Protection Officer developed into friendship. We still have good contact with the extensionist but unfortunately we fell out

with the Crop Protection Officer. He was appointed to a very high position in the Scheme and when we had a problem with accessing water (the canals needed cleaning) we went to him. He promised to do something about it, but then, instead of starting with our village that lies first along the road, he directed all the machinery to the village of his in-laws. Our onions died due to lack of water. We were very disappointed and angry.”

“We did not know these farmers from other villages before but we really went well together, and till now we have a strong contact with them. The contacts in our own village were always very good. What changed is that, in the past, we did not consult each other on matters related to farming because every one has his own experience, but now we do consult each other for instance on the use of pesticides, especially since some of us became very good”.

“In the 1998/99 season we decided to enter the election for the Farmers’ Union so as to have a voice as vegetable farmers. Traditionally all the members in the Farmers’ Union are cotton farmers. We did not benefit from the Union to solve our problems concerning water, canal cleaning or any other kind of service. We do pay for the water and the land. We mobilised other villages and met with many farmers to talk about the idea and how to win. Many farmers came to meet us here in the village. We rallied a big number of farmers whom we trusted to vote for us. We spent lots of money. We were quite sure we would win. But the results were in contrast with our predictions. That seemed strange. From an informer in the Scheme we learned that we did win but that the results were changed. That was a blow for us and for all the people who supported us. We are very determined to win so we are organising another round. Of course that needs a lot of money that is why we had to wait for some time. We think that they did play with the results because they do not want people with different opinions in the board. You know in the Scheme, you have to agree only”.

Later discussions with members of the Union revealed that there were negative feelings about the vegetable farmers: “Vegetable farmers were looked upon as less important than cotton farmers since they do not contribute to the national economy”.

6. Perceptions of the Institutional Actors

Open discussions with various key informants who had been involved in the project led to the following insights.

6.1 Initiation of the project

Policy makers at the Central Ministry of Agriculture were desperate to overcome the pesticide-induced crisis in cotton. They gave their support for IPM in vegetables after IPM had proved to be a success in cotton. Moreover, the then newly appointed Minister of Agriculture was a former head of the Agricultural Research Council (ARC) and a plant breeder who was highly motivated to introduce IPM in vegetables. IPM was declared a national policy. But there was no general agreement on this. Vested interests in the pesticide industry in the country led to behind-the-scenes activities to protect these interests. The resulting lack of consistency led for example to the continued use of prohibited pesticides such as Tomic in cotton.

ARC acted as the initiator and back-stopper of the FAO IPM in Vegetables Project. The Project's premises were located on the ARC's compound. The national project staff was mainly seconded from the ARC and scientific inputs, in terms of scientists and management team, were provided by the ARC. ARC worked closely, however, with some of the crop protection specialists and extensionists from the Gezira Scheme and Gezira State. The Extension Department that was involved in the IPM in vegetables project was part of the Agricultural Directorate of the Scheme. This led to close and continued collaboration between ARC and the Gezira Scheme's Extension Department.

The Extension Department was directly involved in the IPM in vegetables project through the ARC. The department experienced a shift from its conventional "transfer of technology" model of extension to a participatory approach. Extensionists received FFS facilitator training from 'Trainers of Trainers' (ToT) from the ARC. Some were sent abroad for similar training courses. The resulting changes were very much welcomed by the Extension Department staff. Extension staff began to build a new type of relationships with farmers.

When the project introduced the FFS approach, the project's extension team contacted the Farmers' Union to explain the idea of IPM in vegetables and to organise the communication with the farmers. Researchers from ARC Headquarters and its regional stations took on the supervision of the Project.

6.2 Implementation

An internal unpublished evaluation for the new Director General of the Gezira Board provides some insights into the problems experienced by the extensionists during implementation of the project:

- Field inspectors faced huge problems in keeping the balance between organising FFS activities and maintaining their administrative duties;
- They needed extensive training on new communication practices;
- They requested training materials;
- Farmers were not participating in the structuring of FFS;
- The Extension Department as the backstopping unit faced problems of mobility and funds, which affected the effectiveness of its support.

6.3 Phasing out the Project

The Extension Department gained power within the Scheme structure through its becoming an active partner with the ARC for the purposes of the FAO Project. That position did not fit the earlier realities in the Scheme. Thus, upon completion of the project, staff in the Extension Department were decreased in number and transferred to the headquarters of the Scheme. Moreover the control over FFS training and facilitation was given to the Field Inspectors. These Field Inspectors had been given an introductory training by the ARC in the beginning of the project to explain the IPM concept and principles. They had otherwise not been involved much in the implementation of the Project since their tasks were mostly with the cotton farmers and were more of a regulatory nature.

When FAO's IPM in Vegetable Project came to an end in 1996, the Gezira Scheme adopted FFS as a model for training in all aspects of protection and production for all crops. The objective was to bring about qualitative changes on behaviour, skills and attitudes of farmers. The plan proposed by the Scheme consisted of the following elements:

- The Field Inspectors will take over and handle all FFS activities;
- The Extension Department will supervise, guide, monitor & evaluate, train and technically back up the Inspectors facilitating the FFS;
- The practical part of the FFS training is emphasised;
- Field Inspectors will be trained in FFS methodology and the required technical aspects;
- Within four years, all 113 blocks in the Scheme must establish FFS;
- Administration of the FFS will be the responsibility of the Deputy Group Inspector who will report to the extension director.

During the first year (1996/1997), a total of 113 FFS were reportedly established. In 197/1998 the number reached 249 and in the third year, the number reached 450 FFS. In 2001 when I visited the Scheme, none of these schools had been sustained.

The way in which the Gezira Scheme handled the scaling up of FFS after the termination of the FAO IPM in Vegetable Project could be an indicator of the effectiveness with which the FFS empowered farmers. Giving the task of expanding the FFS to all Blocks in the Scheme to the Field Inspectors was not just a wrong decision but can also be seen as a sure way to stop the FFS movement in its tracks. The way the extension department was restructured and changed completely and the thwarting of the vegetable farmers to be elected to the Farmers' Union seem to support this interpretation.

6.4 Pesticide Companies

Concerning relations with pesticide companies, I came across two contrasting opinions among ARC researchers who worked in the FAO IPM in Vegetable Project. One opinion stated: "There was never a problem from the pesticide companies during the implementation of the project. We as scientists are in a position to test and decide upon which chemical product can be approved scientifically and passed commercially. We have the decision in our hands and the pesticide companies know that".

The second opinion was voiced by some ARC researchers who worked more closely with the project. "There was a war against the project and the researchers who worked in the IPM Project were boycotted and not invited to the annual meetings organised by the pesticide companies. Moreover they were never selected for the training courses sponsored by such companies abroad. It was, therefore, not very inviting for young scientists to join the IPM Project. An incident provides proof of this claim. During the implementation of the project, one pesticide company approached the Project through the Gezira Scheme management to establish a farmer support team dealing with the question which pesticides farmers should use and how. This initiative reached a dead end when the company fell out with the Project because it tried to advertise its products. At a later stage the Project conducted training for the pesticide companies' union about the ideal usage of

chemicals. The Project continued inviting the companies' union to its annual review and planning conferences".

The Scheme continued to use what is called "safe pesticides" in cotton, up to the last season when the management board imported a prohibited pesticide called Tumac for use in cotton. Its use would undo much of what the IPM in cotton programme had earlier achieved. It was directly against internal Gezira Scheme policies and it flew in the face the country's declared national IPM Policy.

7. Conclusion

The case of the impact of FAO's IPM in Vegetables Project in Sudan's Gezira Scheme seems to provide some interesting lessons about the IPM Farmer Field School and the policy conditions required to sustain it.

The data show that the IPM FFS can be seen as a form of agricultural education that qualifies and empowers farmers. It can be considered as a transformational learning process that builds farmers' capacities with a long-term effect. This effect persists unchanged, if not increasingly stronger, 6 years after the termination of the Project.

The changed behaviours of the participants do not seem to have diffused to farmers in non-FFS villages. The study did not look into diffusion effects within villages where FFS were conducted, although indications are that trained farmers played support roles for fellow villagers. The selection of the participants for the FFS seems to have been biased towards farmers with higher status, perhaps undermining the role the FFS alumni could have played in the rural community.

The project's farmer training activities definitely seem to have had an empowering effect, especially in terms of motivating farmers to organise and gain greater countervailing power.

The policy context in which the Project worked seems not to have been very supportive, with a strong negative influence emanating from pesticide companies, cotton farming interests who did not want to give up their privileged position, and a very hierarchical Scheme that did not give space to participatory methods and sharing of power.

In all, the paper presents a case study of a unique situation that perhaps is helpful for understanding the impact of IPM FFS under a wide range of conditions.

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