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DISCOVERY

Assessment the role of village extension worker in North Kordofan Rural Development Project (NKRDP), Sudan

Mekki Abdalla Adam[1], **Sheikh Eldein Farah El Door**[2], **Mohammed AA Hamad**[3]✉

[1]Ministry of Agriculture, North Kordofan State, El Obeid, Sudan
[2,3]Department of Rural Extension and Training, University of Kordofan, Elobeid, Sudan

✉**Corresponding author**
Department of Rural Extension and Training, University of Kordofan, Elobeid,
Sudan
Email: abugitaf2013@gmail.com

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ABSTRACT

This study was conducted in North Kordofan State. The study covers both Um Ruwaba and Bara localities (NKRDP area). The main objective is to investigate the role of village extension worker (VEW) on increasing the awareness of the communities towards IPM techniques that used to improve production and minimize hazard in the environment in the project area. The study based on primary and secondary data. The primary date was collected from field through constructed questionnaires filled with participant

farmers and VEWs by direct interviews. Stratified random sampling technique was used to select 142 participants as sample size. NKRDP was the main sources of the secondary data as well as the institutional sources (MOA and PPD), references and previous studies. The study used SPSS for descriptive statistics and Chi-Squire test was used to test the role of VEWs services. The results showed the allocation and presence of VEW at the project villages. The results have also highlighted the different extension methods used by VEW, such as home and field visits, meetings, FFS, leaflets, and Poster and extension campaign. The results have showed positive role of VEW as sources of pesticides instated of the village traders. Results also indicated the increasing in farmer's awareness towards the importance and use of seed dressing. The study had also shown an increase in the awareness of the farmers in the IPM of the watermelon bugs campaigns by 90% and the participation for the reason to control the pest by 76%. Results of Chi-squire test revealed significant differences between parameters measured. Finally, the study recommended the establishment of an extension system that can be developed for an effective integrated pest management.

Keywords: assessment, role, village extension worker, Sudan

1. INTRODUCTION

In the present years, many developing countries have recognized the need to revive agricultural extension services to improve poor growth, reach poor marginalized small holder farmers and address new challenges on sustainability of agricultural production (Zhou, 2006). Agricultural extension activities in the Sudan took-off in 1958 with support from the United States Agency for International Development (USAID). The first extension unit was established in the same year in Khartoum-North. Between 1958 and 1982, the number of main extension unites rose to 21 in provinces and districts. Branch (village) extension units were added increasing the total number of the main and branch units to 74. A department of agricultural extension and education was established at the Ministry of Agriculture with women section established to cater for the conventional (home economics) activities such as nutrition, child and mother care, sewing and knitting handcrafts….etc. (NKRDP, 2003), therefore it play key role in improving livelihood on the rural area (Berthe, 2015), and this will depend on farmers" willingness and access to new technology. Agricultural extension and advisory services play an important role in addressing this challenge (Directorate of Agricultural Extension Services, 2013), according to (Kassem, 2014) a message is effective if it persuades a particular audience

Although quantitative information is often lacking, it's generally recognized that small scale farmers in the semi-arid tropics suffer seriously from pre and post harvest crops losses due to the pests and diseases (MOA, 2004). Despite its theoretical prominence and sound principles, integrated pest management (IPM) continues to suffer from anemic adoption rates in developing countries (Parsa et al., 2014) In the Sudan, crop protection is largely responsibility of the Plant Protection Department (PPD), which has two major roles: (1) to assist small farmers solving local pests and disease problem, and (2) to provide technical advice. In practice, however, due to the limited resources, PPD in the rural area at least is largely engaged with operation against the so-called National Pests which is usually migratory often breeding in the remote areas away from the crops. In western Sudan (North Kordofan State) these include in addition to tree locust, Dura andat, and birds gadoum ahamar…etc. while the local pest includes grasshopper, water melon bugs, and rats (PPD, 2002).

According to MOA report, agricultural production in North Kordofan is quite unstable mainly due to many factors including, rainfall fluctuation, serious crop pests and disease attacked, soil exhaustion, and poor agricultural extension services. The illegal chemical and pesticides handling and use to control pest and diseases may have hazardous effects in the environment. Despite that, some of the indigenous farmer experiences, methods and techniques for controlling pests and diseases may be of great use if they properly handled and well developed for further integrated pest management tools. A natural consequence of the understandable emphasis on the National Pest Program that the local pest problems early receive the attention they deserve. This weakness in the crop protection services was identified by North Kordofan Rural Development Project (NKRDP). It was decided by the NKRDP that, assisting farmers to control local pest would form an important part of the extension deviations input program to achieve.

North Kordofan Rural Development Project (NKRDP) was financed by the International Fund for Agricultural Development (IFAD) during the period of 2000-2005 with goal to improve the living standard of the communities of the project area, particularly assure their food security and enhance the resilience to the drought and natural disaster in their way of life.

The objectives of this study were to test and evaluate the role of the village extension worker (VEW) in NKRDP area, in increasing the awareness of the rural communities towards effective IPM techniques, handing and use of chemicals and pesticide, and identify different communication skills used to speed up community participation and involvement in the different project activities.

2. METHODOLOGY

Area of the study

North Kordofan State is one of three states forming greater Kordofan. The area is estimated to be about 239.000 km^2 and divided into nine localities, its lays between latitude 12° 10´- 16° 39´ N, and longitude 27° and 32° 25´ E.

North Kordofan Rural Development Project (NKRDP) area covers both Um Ruwaba and Bara localities. Um Ruwaba is in the eastern part of the Sate and has an area of 21.000km^2. Bara locality has a total area of about 20.000km^2, bringing the total area to 41.000km^2 (NKRDP, 1999). The populations of the two localities are estimated to be about 820.000 persons (139.000 households), 523.000 in Um Ruwaba and 297.000 in Bara. About 95% of the population in both localities is settled and 5% are nomadic, ethnically formed from different tribes, Gawama, Shanabla, and Dar Hamid (NKRDP, 1999). Four seasons are recognized; rainy season(Kharif) from May to October, the Harvest season (Darat) follows the early December with low humidity and night temperature, the cold dry season (Shita) from December to mid February, and hot dry season (Seif) with prevalent north –easterly winds, from March to May. Sandy soils cover the most of two localities and support the rain fed arable agriculture, the main crops grown are millet, karkadeh, and watermelon. Gradoud soils cover about 20% of project area. Vertisols are heavy cracking clay soil dominating the Abu Habil basins, west and east Jebel El Dayir extending to south clay plains, they are fertile with good water holding capacity, Nevertheless, the area suffers from acute shortages of fresh water supply for both human and animal consumption(Zeinelabdein & Elsheikh, 2015).The main crops grown are sesame, sorghum and cotton in El Seimeih Scheme, (NKRDP, 1999) and Gum Arabic production and forestay products(Hamad, 2018)

The project area lies within the gum Arabic Belt. The vegetation cover dominantly by number of acacia species mainly Hashab (*Acacia Senegal*), Kitir (*Acacia melifra*), Taleh (*Acacia seyal*), Mikheit (*Boscia senegalensis*) and different types of grosses, Abu asabi (*Dactylactenium aegyptium*), Banu (*Eragrostis aspera*) etc, and wide range of Herbs e.g. Bighail (*Blephanis linarifolia*) and Sena (*Cassia acutifolia*) etc. The central zone of the area is subjected to additional grazing pressure during the rainy season due to presence of the cattle of nomadic baggara tribes and large herbs of camels coming from the north in the early wet season. Farming system include traditional rain fed farming in sandy soils, semi mechanical farming where tractors are used for land preparation for production of sorghum and sesame under condition of ground and vertisols, Flush irrigation is practiced on Abu Habil flood plain, and flood irrigation is concentrated in four areas; Rahad turda, Bara town, El Kheiran and Mulbas. Arable farming, livestock raise, gum tapping and wood collection and off farm activities are economically integrated, and individually make an important contribution to the household food, (NKRDP, 1999).

Data collection

The study based on both primary and secondary data sources. Primary data was collected from the field using constructed questionnaires introduced to rural community (participants) and VEWs. Due to prevalence of illiteracy among rural communities, direct interviewing, both open ended and close ended questions were used. These were focus deeply in the impact of VEWs in rural communities towards IPM. Secondary data was obtained from different sources such as NKRDP reports, scientific journals, and other authenticated sources.

Sampling technique and frame

Due to great homogeneity of the community in socio-economic characteristics in term of resources acquisition farming system and income sources, the study adopted the stratified multistage sampling technique to arrive at appropriate representative sample. A simple sampling technique was also used to select villages from different administrative unites.

Purposively certain administrative units which are characterized by intensive cropping activities were selected. Also the North Kordofan (MOA) strategic policy enhancing agricultural production below latitude 13°N was considered in selecting villages from the localities. Accordingly the sample of the villages was selected based on the year of entering into the project (stratified sampling), with each strata the sample villages were selected using simple random technique. As mentioned above and due to the great homogeneity the community in socio-economic, 30 villages were selected (18 villages from Um Ruwaba and 12 from Bara locality). The participant's farmers (both sex) were selected from each village according to the 'total number of farmers in each village. As result 142 participants were interviewed. In addition to the conventional methods mentioned above, non conventional methods such as, direct field observation, key informant interview and focused group discussion were used.

The sample frame, which contains the Um Ruwaba and Bara localities (the study area), administrative units, villages, year of selection, number of participant farmers and VEWs, was obtained from NKRDP reports. The descriptive statistical analysis methods such as, frequency, tables, cross-tabulation, and Chi-squire Test were used to analyze the data through using SPSS software. The probability of 0.05 determined according to the study was used to accept or reject the null hypothesis e.g. level of significant.

3. RESULTS AND DISCUSSION

Extension tools and methods applied by VEWs

The village extension worker had applied different extension methods and tools that aimed to raise the awareness of the community in the project area and these methods of service delivery offer the opportunity to reach various types of farmers with different needs in various settings (Jafry, Moyo, & Mandaloma, 2014). The results showed that, about 75.4% of VEWs conducted regular monthly field and home visits, while 13.4% were rarely applied visits, also results indicated that, 93% of VEWs intended to conducted meeting, this attributed to the fact that direct contact to the farmers is more effective than any other extension mean particularly among farmers of high illiteracy rate, Table (1). (Rivera & Qamar, 2003) reported that increases in productivity at the farm level, farmer and community group formation and microenterprise development depend mainly on dissemination technique. On other hand only few VEWs were able to disseminate extension leaflets and posters in their village; about 72% did not apply of use such method due to illiteracy rate Table (2). Results extend to depicted that, 90% of the respondents participated in the different IPM extension campaign conducted by VEWs, and 47.2% of FFSs sessions were held in the project villages, where 27.5% in frequent time and 19% in rarely periods, the rest of the participants farmers 52.8% did not attend FFS sessions, Table (3).

Table 1 Distribution of the participants according to visits and meeting conducted by the VEWs during agricultural seasons (%)

Visit schedule	Frequency	%	Cumulative (%)
Monthly	107	75.4	75.4
Rarely	19	13.4	88.8
None	16	11.2	100.0
No. meeting/ session			
Once	41	28.9	28.9
Twice	38	26.8	55.7
More than twice	53	37.3	93
No meeting	10	7.0	100.0
Total	142	100.0	

Source: field survey N=142

Table 2 Frequency of the participants related to extension leaflets and posters distributed by VEWs during agricultural season (%)

Distribution frame	Frequency	%	Cumulative (%)
Regularly	15	10.6	10.6
Rarely	25	17.6	28.2
None	102	71.8	100.0
Total	142	100.0	

Source: field survey N=142

Table 3 Frequency of the participants related to extension campaigns and FFS sessions conducted by VEWs during agricultural seasons (%)

Campaigns	Frequency	%	Cumulative (%)
Regularly	102	71.8	71.8
Frequent	26	18.3	90.1
Never	14	9.9	100.0
FFS sessions			
Regularly	39	27.5	27.5
Frequent	28	19.7	47.2
Never	75	52.8	100.0
Total	142	100.0	

Source: field survey N=142

Community participation awareness and involvement

Different approaches have been developed to facilitate the farmers' participation in the development of technologies to reduce poverty (J.W.M. Kessels, 2005), regarding to participation of the respondents in IPM campaigns 90% were involved and participated IPM campaigns, their level of participation varied from regularly, rarely, and none. As argued by the farmers this was attributed to incidence, danger and attack of the pest. The pests controlled include birds, rats, watermelon bugs, locust and gabora, Figure (1). Also the results showed that, 75.4% of the participant's farmers depend on VEW to get their required pesticide. Traders represent the sources of pesticides for only 10.6 of NKRDP village's communities, 14.1% of the participants received pesticides from both traders and VEW, Figure (2). For the reason of buying pesticide from VEW, the results indicated that, due to effectiveness of the delivery of pesticides and extension packages, 61.3% of the participants purchased their pesticides from VEW, only 6.3% were not yet aware about the VEW role in pesticides, Figure (3). The study results also showed that, some of the participants depend on traders to get their pesticide for the reason of availability, cheap prices and sometime borrowing, Figure (4). To examine the awareness of the participants towards the dose of seed-dressing, the results indicated that 60.6% of them were aware about the right dose which is equivalent to about one ounce (dresser)/3 malwa (seeds), whereas (26.1%) used it in a low dose and others did not know the way of use, Figure (5). Experience has shown that extension services which accommodate farmers' varying interests, needs and capacities help to improve agricultural production(Gerba Leta, Girma Kelboro, 2017).

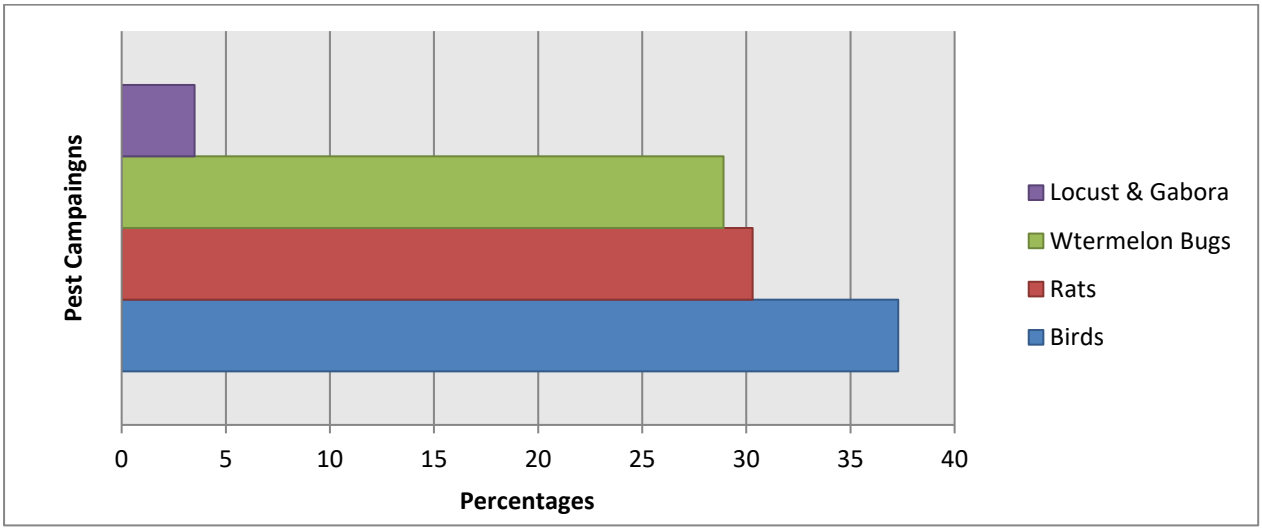

Figure 1 Distribution of the farmer's according to pest campaigns conducted by VEWs during the agricultural seasons

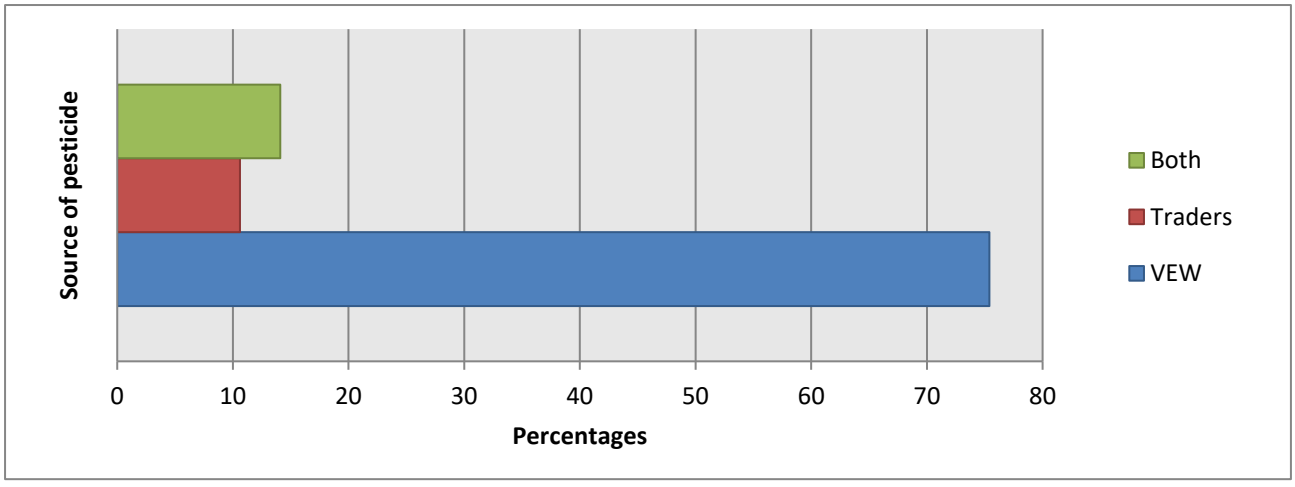

Figure 2 Distribution of the farmer's according to sources of pesticide in villages of NKRDP

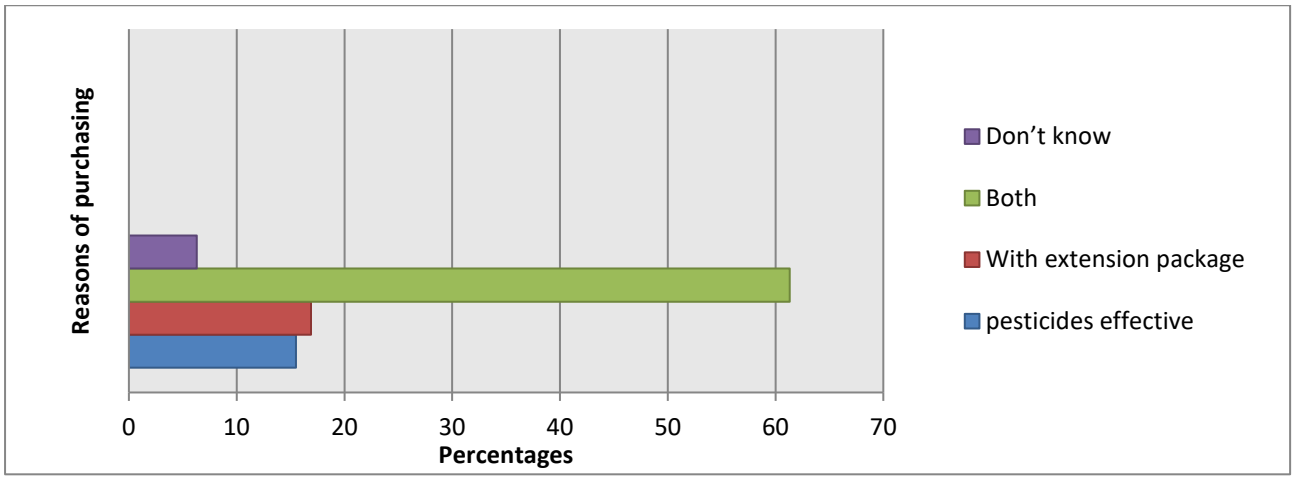

Figure 3 Distribution of the farmer's according to reasons for purchasing pesticide from VEWs

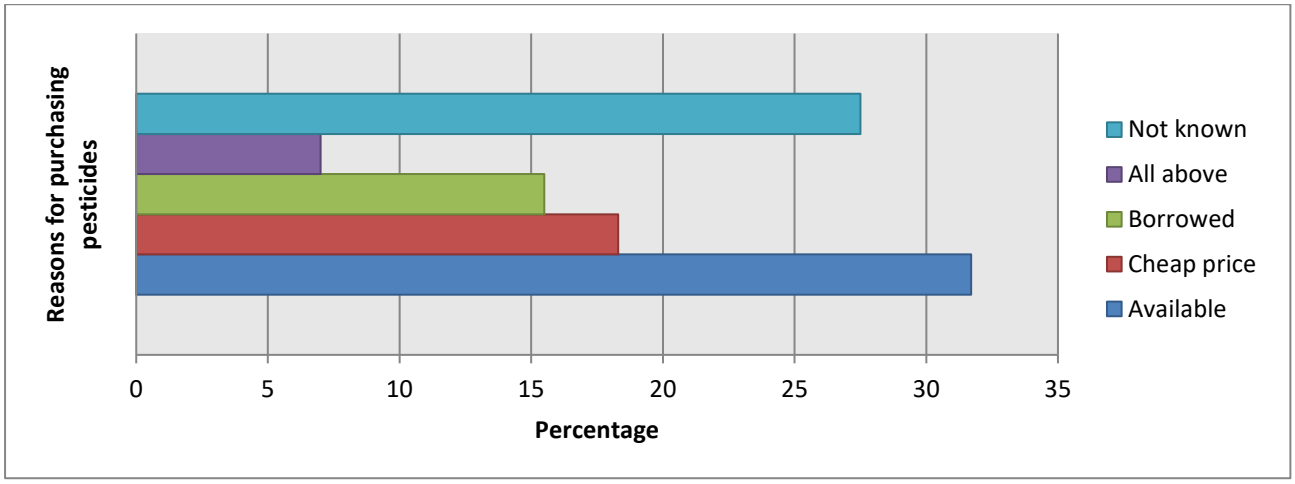

Figure 4 Distribution of the farmer's according to the reasons for purchasing pesticides from village traders

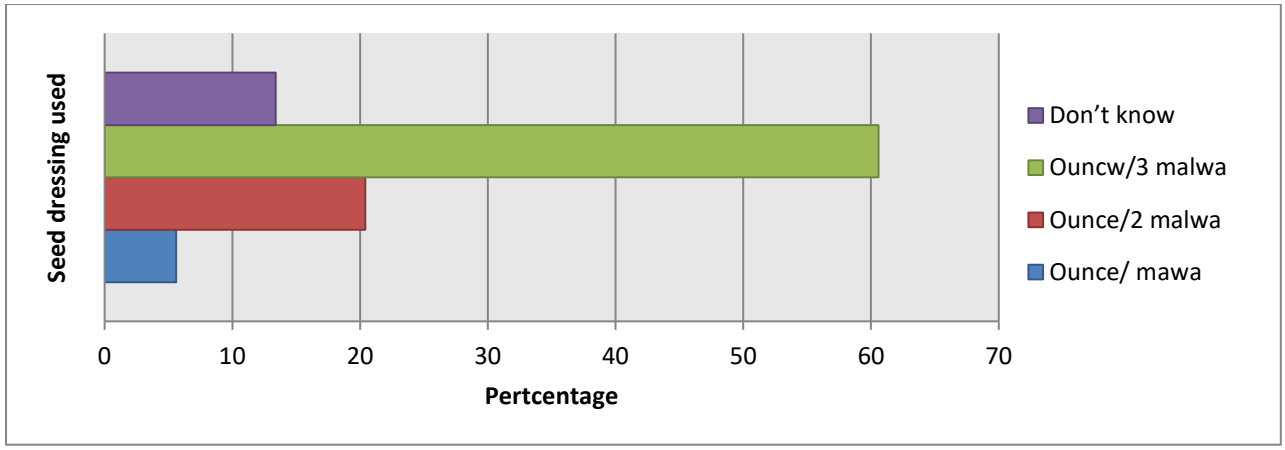

Figure 5 Distribution of the farmer's according to seeds dressing used in NKRDP villages

Participant's involvement in different IPM techniques

During the second half of the twentieth century, most national extension systems focused on transferring agricultural technologies and incentives farmers to adopted IPM that would improve and increase the productivity of major crops (Berthe, 2015). To test the awareness of the participants towards sorghum and millet control, the results recorded that 54.9% of the respondents were

following the appropriate harvest technique where the infected sorghum and millet heads were harvested and collected separately. About 19% of the participants used the seed-dressing in sowing and 6.3% followed a proper crop rotation, these raised the participant's awareness in the area towards sorghum and millet smut to about 97.8%, Table (4). For the best way to control the watermelon bugs, a comparison between mechanical control following different technique (collection and burning, collection and boring) and using pesticides (Benducarb, Sevein,. etc) indicated that 57% of the participants followed mechanical control and only 43% were using chemical control. About 62% of the framers were mobilized towards the summer watermelon bugs control in the area through different extension packages oriented towards mechanical control campaigns, for the reasons of participation in watermelon bugs campaigns 76.2% of the community participated to control and get rid of the pest, 3.8% for gaining incentives, and 20% for both control the pest and incentives, Table (5). To check the awareness of the participant farmers towards the millet (Ashana), 38.7% explained that Ashana millet was early mature than local varieties whereas only 0.7% argued about its resistances to downy mildew and 22.5% of the participants spoke about both early maturing and resistance to diseases . About 38% of the participants were not yet familiar about Ashana millet characteristics. The result revealed that 88% of the participants in the villages where birds accrued used the technique of nest destruction, only 4.2 intended to use mamex to disturb the pest, 0.7% used resistant varieties and 7% practiced all previous means, Table (6). The study also highlighted the technique practiced by the participants to control the grass hopper (Cabora), follow cleaning around the farms represented 33% whereas cleaning the bushes and shrubs inside the farms in a way not to harbor the pest during the day represented 17.6%, some farmers (24% intended to burn the follow where the pest occurs. For controlling store pests, the results indicated that 54.2% of the respondents cleaned their stores from the previous crops residuals as safety precaution major. Some safety means used by 6.3% of the participants were the cleaned bags, other farmers used replant such as Neim, Ushar, and Gudadad in their stores represented by 21.8%, the results also explained that only 16.9% of the respondents were using pesticides (spraying and fumigation) to control the sores pests, Table (7). This result in line with(Organization(FAO), 1993) which reported that this exposure to different extension methods enhance the need for extension and These methods of service delivery offer the opportunity to reach various types of farmers with different needs in various settings (Jafry et al., 2014)

Table 4 Frequency distribution of the participants according to smut disease control methods (%)

Smut control methods	Frequency	%	Cumulative (%)
Harvest technique	78	54.9	54.9
Using seed-dressing	27	19.0	73.9
Following crop rotation	9	6.3	80.2
All above	25	17.6	97.8
Cannot be controlled	3	2.2	100.0
Total	142	100.0	

Source: field survey N=142

Table 5 Frequency distribution of the participants according to control methods of watermelon bugs, source of experience gained for water melon mechanical control, and reasons for participation in watermelon bug campaign (%)

Method of control	Frequency	%	Cumulative (%)
Mechanical	81	57	57.0
Chemical	61	43	100.0
Experience gained			
Indigenous	53	38.4	38.4
Extension packages	85	61.6	100.00
Reasons			
To control bug	99	76.2	76.2
To gain incentives	5	3.8	80.0
Both	26	20	100.0
Total	142	100.0	

Source: field survey N=142

Table 6 Frequency distribution of the participants according to their knowledge of Ashana millet and birds control methods (%)

Ashana millet characteristic	Frequency	%	Cumulative (%)
Early mature	55	38.7	38.7
Resistance to disease	1	0.7	39.4
Both	32	22.6	62.0
Not known	54	38.0	100.0
Birds control methods			
Nest destruction	125	88.0	88.0
Mamex	6	4.3	92.3
Resistance varieties	1	0.7	93.0
All above	10	7.0	100.0
Total	142	100	

Source: field survey N=142

Table 7 Frequency distribution of the participants according to techniques to control Gabora, and methods used to control store pest (%)

Gabora control technique			
Cleaning around field	47	33.1	33.1
Farm cleaning	25	17.6	50.7
Follow burning	34	24.0	74.7
All above	30	21.1	95.8
Can't be	6	4.2	100.0
Means of control			
Store cleaning	77	54.2	54.2
Use cleaning bags	9	6.4	60.6
Use replants	31	21.8	82.4
Use pesticide	24	16.9	99.3
Others	1	0.7	100.0
Total	142	100.0	

Source: field survey N=142

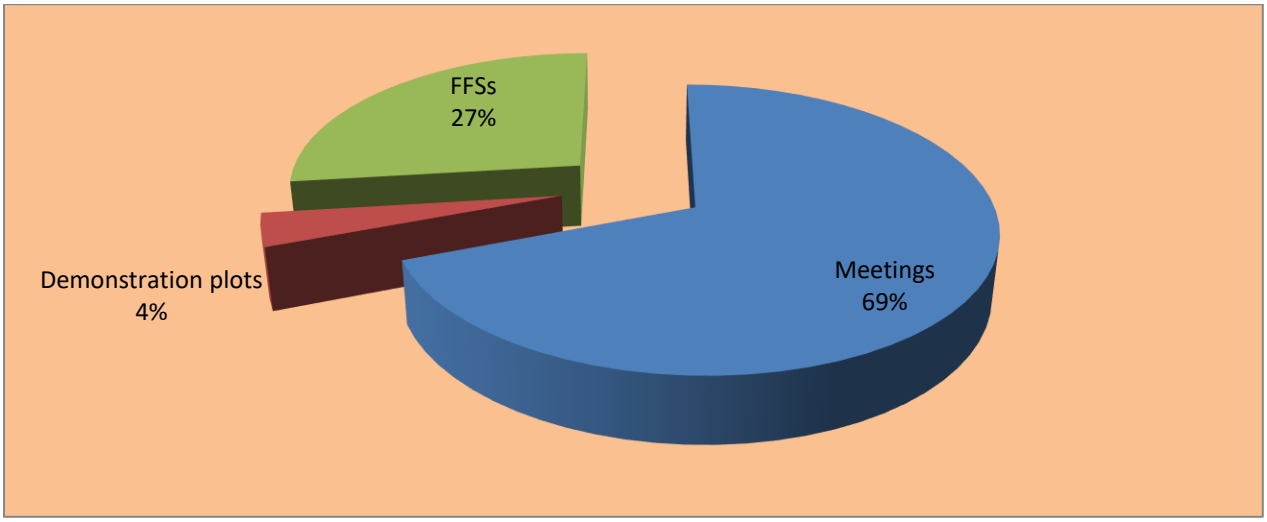

Figure 6 Methods of training implemented by village extension workers

Training methods implemented by VEWs

The training program was conducted in collaboration with Ministry of agriculture/directorate of technology transfer, plant protection and ARC El-Obeid basic and advanced IPM training. Training site (place) and time were preferably accepted by VEWs, training

duration was moderate as prescribed vast of VEWs. The male trained conducted different training sessions to the farmers in their villages, only few of VEWs didn't held any training session for the reasons, farmer's lack of desire to train by female VEW. Different training tool and methods were applied in training the farmers such as meeting, FFS, and demonstration field trails, Figure (6) (Bentley, 2009) suggest that most studies of FFS pilot projects suggest that IPM helps farmers to lower costs or to increase yields. The results explained that the training conducted by VEW was accepted by 80% of the farmers. Figure (7) explained some reasons for weak training as explained by farmers interviewed. To motivate people to produce the desirable changes in their behavior, the message should be relevant, interesting, clear, credible, timely, applicable and beneficial(Project & Strengthening, 2008).Those trained farmers participated in plant protection campaign and expected to form Village Pest Management Unit (VPMU), which will help much in sustainable pest management system in the future. It's expected that every 3-5 trained farmers will form VPMU. More number of VPMU formed more efficient system could be (ENCCP, 1996). The distribution of VEWs who trained farmers is presented in Figure (8).

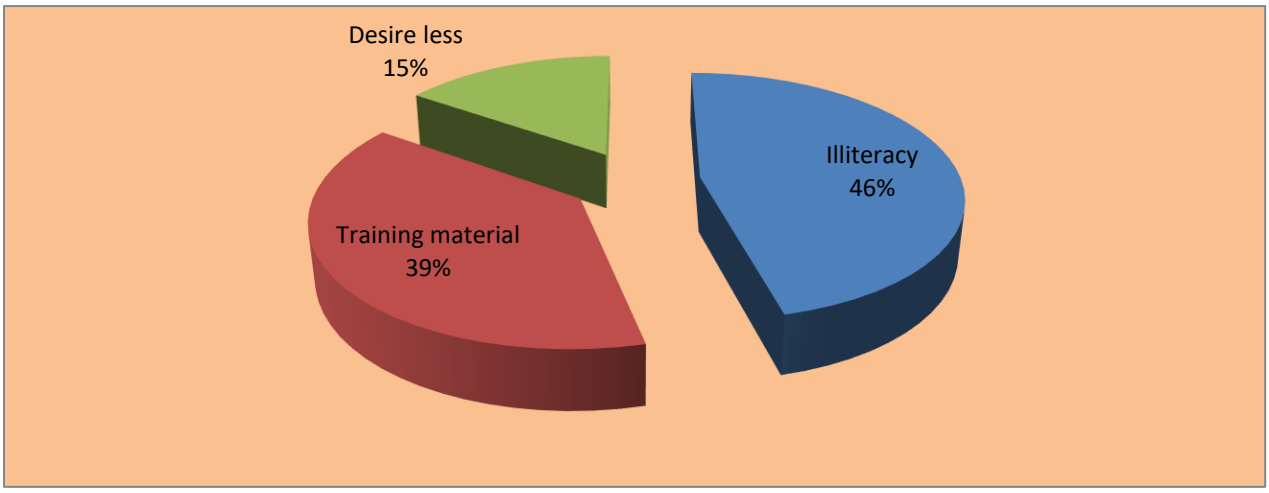

Figure 7 Reasons for weak adoption of farmers to training sessions

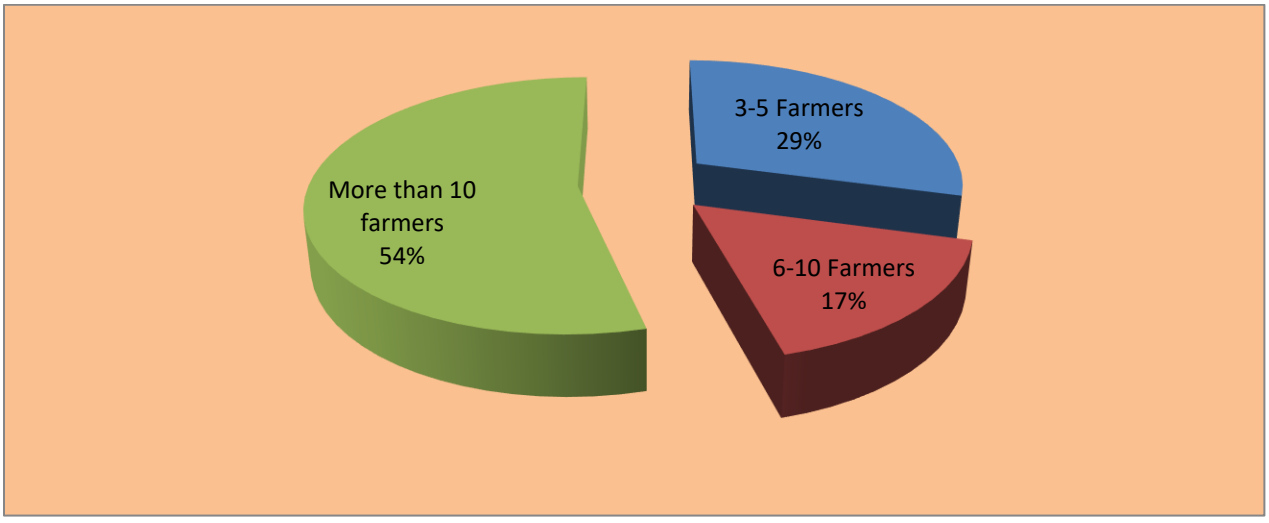

Figure 8 Distribution of VEWs according to the number of farmers trained

Effects of entrance year in the performance of VEWs related some extension methods conducted

Field visits, the study had tested such activities in accordance to the year of entrance into the project, The results explained that during year 2001-2004 the number of field visits conducted monthly were only 35% in the first year and increased in unstable manner from 71% to 91.4% in the year 2003 and 2004 respectively($P<0.05$). This was due to the unavailability of transport means and inadequate trained staff during the first year of the project. This was confirmed by Salih (2002) in T&V extension system (Training and visit system was established by World Bank with the objective of activating the present traditional system) Table (8). Concerning the effect of entrance year in the performance of VEWs related the FFS the result indicated that, NKRDP followed the

method of FFS as an extension tools. A number of 2701 farmers participated in the sessions. The performance of VEW in conducting FFS session ($p< 0.05$) varied between the different years of entrance. Regular sessions represented 4.3%, 31.4%, 14.3% and 57% in the years 2001, 2002, 2003, and 2004 respectively. The significant difference indicated the efficiency of FFS as an extension method that made the project concentrating in training of VEW and farmers in the field of FFS. This result was also confirmed by khisa (2003), he defined FFS as platform and school without walls for improving decision making capacity of farming communities, Table (9).

Table 8 Cross tabulation of field visits by entrance year

No. of village extension meeting		Entrance year				Total
		2001	2002	2003	2004	
Monthly	Observed count	8	32	35	32	107
	Expected count	17.3	26.4	36.9	26.4	107
	%within entrance year	34.%	91.8%	71.4%	91.4%	75.4%
	% of total	5.6%	22.5%	24.6%	22.5%	75.4%
Rarely	Observed count	7	3	6	3	19
	Expected count	3.1	4.7	6.6	4.7	19
	%within entrance year	30.4%	8.6%	12.2%	8.6%	13.4%
	% of total	4.9%	2.1%	4.2%	2.1%	13.4%
None	Observed count	8	0	8	0	16
	Expected count	2.6	3.9	5.5	3.9	16
	%within entrance year	39.8%	0.0%	16.3%	0.0%	11.3%
	% of total	5.6%	0.0%	5.6%	0.0%	11.3%
Total	Observed count	23	35	49	35	142
	Expected count	23	35	49	35	142
	%within entrance year	100%	100%	100%	100%	100%
	% of total	16.2%	24.6%	34.5%	24.6%	100%

Source: survey data

X^2 = 34.069(Calculated) and = 12.59 (Tabulated)

d.f = 6

Significant as $p<0.05$

Table 9 Cross tabulation of FFS sessions conducted by entrance year

FFS sessions conducted		Entrance year				Total
		2001	2002	2003	2004	
Regular	Observed count	1	11	7	20	39
	Expected count	6.3	9.6	13.5	9.6	39.0
	%within entrance year	4.3%	31.4%	14.3%	57.1%	27.5%
	% of total	0.7%	7.7%	4.9%	14.1%	27.5%
Sometimes	Observed count	3	7	10	8	28
	Expected count	4.5	6.9	9.7	6.9	28.0
	%within entrance year	13.0%	20.0%	20.4%	22.9%	19.7%
	% of total	2.1%	4.9%	7.0%	5.6%	19.7%
None	Observed count	19	17	32	7	75
	Expected count	12.1	18.5	25.9	18.5	75.0
	%within entrance year	82.6%	48.6%	65.3%	20.0%	52.8%
	% of total	13.4%	12.0%	22.5%	4.9%	52.8%
Total	Observed count	23	35	49	35	142
	Expected count	23.0	35.0	49.5	35.0	142.0

	%within entrance year	100%	100%	100%	100%	100%
	% of total	16.2%	24.6%	34.5%	24.6%	

Source: survey data

X^2 = 32.274(Calculated) and = 12.59(Tabulated)

d.f = 6

Significant at $p<0.05$

Effects of entrance year in the performance of VEWs related extension campaigns conducted and participation in IPM

The results depicted the performance of VEWs related to the regularity of the extension and orientation extension campaigns conducted during the season. This was due to the annual regular pest management conducted by PPD in North Kordofan State. During years 2002-2004 the regular conducted campaigns represented 88.6% where as in year 2001-2003 was only 52.2% and 57% respectively. The high level of significance ($p<0.05$) was clearly attributed to the regular pattern of pest occurrence in the project area, in particularly the grass hoppers (Gabora), watermelon bugs…etc, Table (10). For the investigation of VEW performance to community awareness and mobilization by entrance year, the result explained the different levels of community participation and involvement in IPM campaigns. Throughout the year 2001-2004, the percentage 71.4% of the participation was recorded in the year 2004 compared to only 56.5% in year 2001 ($p>0.05$). This might be attributed to pest situation which differs from one year to another, Table (11).

Table 10 Cross tabulation of IPM extension orientation campaigns by entrance year

IPM extension orientation campaigns		Entrance year				Total
		2001	2002	2003	2004	
Regular	Observed count	12	31	28	31	102
	Expected count	16.5	25.1	35.2	25.1	102.0
	%within entrance year	52.2%	88.8%	57.1%	88.6%	71.8%
	% of total	8.5%	21.8%	19.7%	21.8%	71.8%
Rarely	Observed count	5	3	16	2	26
	Expected count	4.2	6.4	9	6.4	26.0
	%within entrance year	21.7%	8.6%	32.7%	5.7%	18.3%
	% of total	3.5%	2.1%	11.3%	1.4%	18.3%
None	Observed count	6	1	5	2	14
	Expected count	2.3	3.5	4.8	3.5	14.0
	%within entrance year	26.1%	2.9%	10.2%	5.7%	9.9%
	% of total	4.2%	0.7%	3.5%	1.4%	9.9%
Total	Observed count	23	35	49	35	142
	Expected count	23.0	35.0	49.0	35.0	142.0
	%within entrance year	100%	100%	100%	100%	100%
	% of total	16.2%	24.6%	34.5%	24.6%	

Source: survey data

X^2 = 24.438(Calculated) and = 12.59(Tabulated)

d.f = 6

Significant at $p<0.05$

Table 11 Cross tabulation of community levels of participation in IPM by entrance year

Community participation in IPM		Entrance year				Total
		2001	2002	2003	2004	
High	Observed count	13	31	26	25	95
	Expected count	15.4	23.4	32.8	23.4	95.0
	%within entrance year	56.5%	88.6%	53.1%	71.4%	100%
	% of total	9.2%	21.8%	18.3%	17.6%	66.9%

Medium	Observed count	6	3	13	8	30
	Expected count	4.9	7.4	10.4	7.4	30.0
	%within entrance year	26.1%	8.6%	26.6%	22.9%	21.1%
	% of total	4.2%	2.1%	9.2%	5.6%	21.1%
Poor/weak	Observed count	4	1	9	2	16
	Expected count	2.4	3.9	5.5	3.9	16.0
	%within entrance year	17.4%	2.9%	18.4%	5.7%	11.3%
	% of total	2.8%	0.7%	6.3%	1.4%	11.3%
None	Observed count	0	0	1	0	1
	Expected count	0.2	0.2	0.3	0.2	1.0
	%within entrance year	0.0%	0.0%	2%	0.0%	0.7%
	% of total	0.0%	0.0%	0.7%	0.0%	0.7%
Total	Observed count	23	35	49	35	142
	Expected count	23.0	35.0	49.0	35.0	142.0
	%within entrance year	100%	100%	100%	100%	100%
	% of total	16.2%	24.6%	34.5%	24.6%	100%

Source: survey data

X^2 = 15.954(Calculated) and = 16.92(Tabulated)

d.f = 6

p>0.05

Table 12 Cross tabulation of pesticides sources in NKRDP villages by entrance year

Pesticides sources		Entrance year				Total
		2001	2002	2003	2004	
VEW	Observed count	12	33	30	32	107
	Expected count	17.3	26.4	36.9	26.4	107.0
	%within entrance year	52.2%	94.3%	61.2%	91.4%	75.4%
	% of total	8.5%	23.2%	21.1%	22.5%	75.4%
Traders	Observed count	7	1	6	1	15
	Expected count	2.4	3.7	5.2	3.7	15.0
	%within entrance year	30.4%	2.9%	12.2%	2.9%	10.6%
	% of total	4.9%	0.7%	4.2%	0.7%	10.6%
Both	Observed count	4	1	13	2	20
	Expected count	3.2	4.9	6.9	5.7	20.0
	%within entrance year	17.4%	2.9%	26.5%	5.7%	14.1%
	% of total	2.8%	0.7%	9.2%	1.4%	14.1%
Total	Observed count	23	35	49	35	142
	Expected count	23.0	35.0	49.0	35.0	142.0
	%within entrance year	100%	100%	100%	100%	100%
	% of total	16.2%	24.6%	34.5%	24.6%	100%

Source: survey data

X^2 = 28.909(Calculated) and = 12.59(Tabulated)

d.f = 6

Significant at p<0.05

Effects of entrance year and gender in the performance of VEWs related pesticides handling and use

The study had also investigated the source of pesticides with regard to gender and entrance year, the results showed that almost 60% of the community (males) intended to get the pesticides from VEW, whereas the awareness of women was only 40% towards the VEW. This was due to the decision of inputs provision which always lies among the males in the rural areas. The results obtained

from the study also indicated in years 2002 and 2004 that the farmers interviewed obtained 75.4% their pesticides from the VEW. This was due to advanced training courses oriented from project to VEWs in the felid of pest management during these years. The result exhibited high significance at $p<0.05$ level, Table (12).

4. CONCLUSION AND RECOMMENDATIONS

The study which conducted in NKRDP area indicated that, VEWs who selected and trained by the project and its partners were allocated to the project villages. The results also explained the efforts exerted by the VEWs to conduct and disseminate different extension packages availed by the project and others in away to raise the awareness of the community and upgrade the skills of farmers to improve crop protection.

Findings of the results showed the positive response of the farmers towards pesticides source and use, 75% of them shift and start to get pesticides from the VEWs throughout the entrance year, and 56% of farmers where familiar with importance and the dose of the seed dresser. In the field of IPM the results were clearly identified the increase of awareness, involvement and participation of the community in the campaigns conducted in the project area. Participation for the reason to get rid of the pest through mechanical control methods reached about 76% in the area.

Finally, Presentation of the results of this study recommends that, the VEWs experience can be developed for sustainable IPM grass-root extension services. For the sustainability of the mechanical pest control campaigns, research should be extended to identify the material use and value of crop targeted. More attention should be given to vegetables IPM in North Kordofan State where chemicals are used in inappropriate manner.

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