

Impact of Agricultural Extension Activities & Socioeconomic Factors on Farmers' Adoption of Melon Bug Hand Picking In West Bara Locality North Kordofan State, Sudan

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ABSTRACT

This study was conducted in North Kordofan State, West Bara Locality, to assess the impact of extension activities and socio-economic factors in adoption of melon bug hand picking which was implemented by World Food Programme Organization (WFP) in collaboration with plant protection directorate of North Kordofan State 2002-2006 as programme of food for work (FFW). The main objectives of the study were to examine the effect of personal characteristics, to know the influence of Agricultural extension services and to identify the impact of the socio-economic factors in adoption of melon bug hand picking. Stratified multistage random sampling and purposive techniques were used. From West Bara only one locality was selected from six participant localities and from the selected locality two administrative units were selected and 20 villages were selected randomly to represent the participant farmers according to their population density (158) respondents were selected for both participant and non-participant groups (79 each). Social survey approach, questionnaire was designed for collection of primary data and also secondary data were obtained from different sources. Chi-square test had been used to test the main hypotheses model proposed by the study. The results of chi-square test showed significance on attendance of training sessions, purpose of

cultivating melon, Damage of melon bug, increasing the melon area and productivity of melon crop, bug handpicking and social acceptance of incentive. Chi-square revealed non significance on personal characteristics, extensionist visits, Training topics and social organizations. Based on the findings the study recommended that on both Federal and State levels, the Ministry of Agriculture is advised to declare the melon bug insect as National pest. Federal and State Ministry of Agriculture are advised to give attention to support and strengthen the extension services. The State Farmers union should encourage Farmers to form their own organizations and associations.

Key words: Adoption, Watermelon, Melon Bug, North Kordofan

INTRODUCTION

Integrated pest management (IPM) has been advocated by the Food and Agriculture Organization of the United Nations (FAO) as preferred pest control strategy since 1960s. It is the careful integration of number of available pest control techniques that decrease the development of pest populations and keep pesticides and other interventions to the levels that are economically justified and safe for human health and the+ environment. IPM emphasizes the growth of a healthy crop with least possible disruption of agro-ecosystems there by encouraging natural pest control mechanism, (Vander, 1997).The traditional extension approaches transferring the message and production packages (from researches to extensionist to farmers) dominate the agencies of the ministry of agriculture of the Sudan. Van den Ban, (2003) has defined the extension as the conscious use of communication of information to help people to use sound opinions and make good decisions.The newly established IPM&FFS aim at helping farmers to become experts by gaining up-to date information acquiring positive attitudes towards IPM implementation and improving their skills. These aims are reached through participating by extensionists; in spite of the fact this approach was new in the Sudan. It was fairly easily accepted by the extensionists, researchers and farmers. (Hussein, 1997).North Kordofan state lies between Latitudes $^{\circ}12-^{\circ}40-^{\circ}17-^{\circ}32N$ and Longitude $^{\circ}28-^{\circ}40-^{\circ}32-^{\circ}17E$ with total area of 190840 km^2 , is in the centre of Sudan. Its soil type is sandy loam.The rainfall ranges between 75-250mm in the northern parts of NK and increase gradually southwards and reaching up to 500mm.The state suffers from seasonal food gap and acute water shortage due to recurrent drought in the area.(Care, 1997).The average annual cultivated area in the state is about 8-9 million feddans, grown by dukhon and sorghum as food crops sesame and groundnuts, hibiscus, Arabic gum and watermelon crop as cash crops production are commonly low in yield (Ministry of Agriculture, 2003).The estimated area of 513,000 feddans and

240,000 feddans was grown with watermelon during seasons 1999/2000 and 2000.2001, respectively. Cobley, (1956) reported that watermelon (*Citrullus lanatus*) originated in Africa and has been cultivated more than 4000 years in the drier parts of countries through out India and parts of Asia. It is of Ancient cultivation in the Mediterranean region and was grown in Egypt in early times. It reached America in post – Columbian times. Purseglove et al. (1968) considered Kalaharri desert in Africa to be the original home of the crop. In the Sudan the crop is grown in irrigated schemes in the Blue Nile, Sennar, and Gezerira and Khartoum and Kassla states. Local Watermelon varieties are grown in most parts of North Kordofan but the western and the eastern parts of the state are the most important cultivated areas with this crop. Elnohud and Gubeish localities are considered the leading production areas in Kordofan region. The crop is of great importance in areas hit by drought and in the area of limited water sources. In these areas the crop is a source of water for human and the rind is used as feed for animals. Traditionally the crop is grown in sandy soil (qoz) where its establishment is far better as compared with gardoud type of soils (Elgabri, 2001).

Watermelon is used as dessert dish following the main course of food. Perhaps watermelon *C. lunatus* is one of the fewest crops that give reasonable production under such low rainfall conditions. Due to its suitability in diversification and mixing crops watermelon is playing an important role as integral in the cropping pattern of the area. Furthermore, it plays a vital role as substitute for drinking water and contributes much in solving water shortages. Watermelon seeds are considered as one of most important domestic and export cash crop. In fact the seeds are used as pass time snack in recreation centers and where else some villages produce tar from the seeds. The tar is used against some animal ecto-parasites and as remedy for some dermal diseases. Watermelon crop is facing multitude of production constraints. Most of them are agronomic and of pestiferous nature. However, insects and pests are the main limiting factors of the crop production in the area. The so called *Cordius viduatus* (Fabricius). The melon bug, *C. viduatus* (Fabricius) is found in a number of African and Asian countries. In the Sudan, it has been recorded from northern, western, central and eastern parts of the country. This insect is; generally, found in areas where cucurbits are grown (Schmutterer, 1969), other records of occurrence of this bug as a serious pest of cucurbits, particularly the melon plants, were made by several authors. Furthermore, *C. viduatus* is reported to occur mainly in Kordofan, Darfur, Northern, Kassala, Blue Nile, and Upper Nile states (Guddoura, 1977). The melon bug is common in irrigated areas during the winter months, whereas in rain-fed areas of agriculture it appears on crops during the rainy season (Schmutterer, 1969). It presented itself as the most serious pest of crops in the area. Usually it's found in areas where cucurbits are grown and the bug is common in irrigated areas during the winter months and in the rain fed areas during the rainy season. Melon bug collection or hand picking is an indigenous knowledge practiced by farmers. Plant protection directorate in North Kordofan with

collaboration of Farmer's Union in the state developed the hand picking mechanism to collect the bug during dormancy period and burn it as a mean of control instead of using chemicals. The initiative aimed to encourage most of rural community to participate in the bug hand packing campaign on the basis of food for work, implemented by directorate of plant protection state in collaboration with the world food program Elobid sub office, entered and agreement of mechanical control of watermelon bug collection programme in the drought affected area in North Kordofan state in some localities involved west Bara, UmRwaba, Sodri, Sheikan, Abuzabad and Wad Banda during season 2002-2006 with the following objectives: 1- To control the melon bug mechanically. 2- To increase productivity of watermelon in the area. 3- To provide food indirectly to farmers. (Plant protection administration, 2004). The overall objectives were: To examine the effects of Agricultural extension and socio-economic aspects in adoption of melon bug pest hand picking by the effect of food for work program me (FFW). To know the influence of Agricultural extension exposure in adoption of melon bug hand picking. To identify the socio-economic importance in adoption of handpicking. To determine the impact of melon bug Damage on watermelon farm productivity and production. To confirm the sustainability indicators of melon bug handpicking programme.

MATERIALS AND METHODS

2-1 Site selection:-

The watermelon bug Mechanical control programme was implemented in North Kordofan State from 2002 to 2006, covering the localities of Sheikan, UmRwaba, West Bara, Soudari, Abuzabad and Wad Banda. From the 6 localities one locality, West Bara was selected purposively to undertake this study. The justifications behind this selection were that, the area suffers from seasonal food supply deficit due to low and erratic rainfall (average 75- 150mm/year) and acute shortage of water because it lies on the basement complex rocks region. Watermelon is one of the main crops that are grown traditionally in the area and it serves important functions as food and water for both Human and livestock. The potential expansion of Watermelon production is constrained by the heavy pest infestation particularly Watermelon bug insect. Unlike the other 5 localities west Bara was covered by the programme activities during 2002 to 2006. West Bara locality is composed of 3 administrative units (Um Keridim, Elmuzroub and Tieba), table (2-1).

Umkeridim and Elmuzroub were selected for this study; this purposive selection is based on their active participation in the programme activities. Tieba administrative unit differs from these units because it lies on Bara aquifers where water irrigation is available and farmers practice growing horticultural crops.

2-2 Participant village's selection and duration period:

The total number of villages in the 2 localities was 294 villages (86 in Um Keridim and 208 in Elmuzroub). From the duration period of the programme (2002 to 2006) the study selected purposively 2 seasons (2003 and 2006) on the basis of the high amount of bug collection and family beneficiaries in the programme, table (2-2). The total number of programme participant villages during the season 2003 was 97 villages (71 in Um Keridim + 26 in ElMuzroub). During the season 2006 the total number of programme participant villages was 108 villages (32 in Um Keridim + 76 in ElMuzroub), the average of participant villages in the 2 seasons were $(97+108)/2 = 102$ villages. The 10% from the total of Participant's villages as sample size is 10 villages which were selected randomly as shown in table (3-5).

2-3 Selection of Non participant villages

Ten villages were selected randomly from the average of total villages of non participant in the 2 seasons $(2003+2006) = 116$ villages as shown in table (3-4).

2-4 Sample size:

The sample size of 158 respondents was determined on the basis 10% from total number in programme selected villages.

Table (2- 1): Distribution of West Bara administrative units on 2010 Census:

Administrative units	No of villages	No of households	Total population
Umkeridim	86	10685	51569
Elmuzroub	208	7652	44359
Tieba	148	16245	81604
Total	442	34582	177552

Table (2-2) Sampling techniques of selecting programme participant's villages:

Administrative unit	Participant villages 2003	Participant villages 2006	Total
Umkeirdem	71	32	103
Elmuzroub	26	76	102
Total	97	108	205

Table (2-3) Seasonal Collection of Melon bug from 2002 to2006 with food, area and Beneficiaries:

Season	Bug/m ³	Food/m ³	Area/hectare	Family beneficiaries
2002/2001	120	150	2500	2000
2003/2002	2454	2600	300000	5236
2004/2003	554	620	4500	1000
2005/2004	1343	1472	28550	4500
2006/2005	1141	1414	300000	5800

Table (2-4) Techniques of selecting non participant's villages:

Administrative unit	Total villages	Non Participant villages 2003	Non Participant villages 2006
Umkeirdem	086	014	54
Elmuzroub	148	82	51
Total	232	96	105

The average of non participant villages = 96

$$96+105= 201/2=100$$

Table (2-5) Name of participant villages selected and respondents:

Villages	Administrative unit	No of Household	No of population	Respondents
UmGafala	Ummkridim	105	510	10
Hemair Rashed	Ummkridim	065	325	07
Umm Araba Zarga	Ummkridim	143	715	14
Elgefail	Ummkridim	105	625	10
Elkubra	Ummkridim	043	115	04
Elshegaila	ElMuzroub	084	427	08
EldheilailYousef	ElMuzroub	091	455	09
AbuEleimain	ElMuzroub	058	227	06
AouladMufadel	ElMuzroub	045	209	04
WadEl Khedeir	ElMuzroub	049	207	05
		788	3815	79

Table (2-6) Names of Non participant villages selected and respondents:

villages	Administrative unit	No of Household	No of population	Respondent
DagSudour	Ummkridim	181	905	15
Elsaatashanbol	Ummkridim	142	710	12
UmmNala	Ummkridim	087	522	07
UmmRamad Brah	Ummkridim	108	542	10
Elneil Safi	Ummkridim	047	235	04
AAssarah	ElMuzroub	084	420	07
Eial Saleih	ElMuzroub	056	280	05
Elshawalley	ElMuzroub	059	225	05
Hafeir Elaiadiah	ElMuzroub	138	590	12
Gedairaish	ElMuzroub	023	138	02
		925	4567	79

RESULTS AND DISCUSSION

As shown in the table (3-1) chi-square test for Adoption of respondents group of hand picking by age group, marital status, education level, family size, occupation and income revealed that there were no significance at level (0.188,0.553,0.267, 0.458, 0.580, and 0.707) respectively. This means that adoption of respondents group of hand picking were independent of all personal characteristics above ,this is due to the homogeneity of the personal characterizes and the programme will not cover all the areas, and the chance to participate in the programme was not available for all people which would enhance or delay the adoption rate of innovations. Table (3-2) chi-square test for adoption of respondents group of hand picking by extensionist visits and training topics revealed that there were no significance at level (0.067and 0.193) respectively this means that adoption of respondents group of hand picking were independent of extensionist visits and training topics. While there was significance at level (0.015) and this means that adoption of respondents group of hand picking was dependant on attendance of training sessions.

Table (3-3) shows that chi-square test for adoption of respondents group of hand picking by purpose of cultivating melon, types of pests attacking melon, damage of melon bug, increasing cultivated areas, increasing productivity of melon and hand picking of melon bug was significant at levels (0.050, 0.000, 0.031, 0.009 and 0.022) respectively this means that adoption of respondents group of handpicking were dependent on all economic factors above except the importance of cultivating watermelon crop at level(0.152) and this means that adoption of respondents group of hand picking was independent on importance of cultivating melon. As shown in table (3-4) that chi-square test for Adoption of respondents group of hand picking by

social organizations and women giving birth yearly at times of high production of melon were not significant at levels (0.108 and 0.463), respectively. This means that adoption of respondents group of hand picking were independent on farmer belonging to social organization and women giving birth yearly while for social acceptance of incentives there was significance at level (0.000) and this means that Adoption of respondents is dependent on social acceptance of incentive.

Table (3-1) Chi-square test for adoption of respondents group of hand picking by personal characteristics:

Personal characteristics	Sig	DF	χ^2	Indicative
Age group	0.188	04	6.158	Not significant
Marital Status	0.553	03	2.093	Not significant
Education Level	0.267	04	5.203	Not significant
Family size	0.458	04	3.563	Not significant
Occupation	0.580	04	2.831	Not significant
Income	0.707	02	3.702	Not significant

Source: Field Survey 2012

N: 158

Level of significance 0.05/or less

Table (3-2) Chi- square test for Adoption of respondents group of hand picking by extension activities exposure

<i>Extension Exposure</i>	<i>Sig</i>	<i>DF</i>	χ^2	<i>Indicative</i>
Extension visits	0.067	03	7.145	Not significant
Attendance of training sessions	0.015	03	10.473	Significant
Training topics	0.193	05	7.399	Not significant

Source: Study Analysis, 2012

N: 158

Level of significance 0.05/or less

Table (3-3) Chi- square test for adoption of respondents group of hand picking by economic factors:

Economic factors	Sig	D F	χ^2	Indicative
Purpose of cultivating melon	0.050	06	12.570	Significant
Importance of cultivating melon	0.152	04	6.713	Not significant
Types of pests attacking melon	0.000	05	32.966	Significant
Damage of melon bug	0.0311	02	6.911	Significant
Increasing cultivated melon areas	0.009	03	11.494	Significant
Increasing productivity of cultivated areas	0.022	03	09.653	Significant

Source: Study Survey Data

N: 158

Level of significance 0.05/or less

Table (3-4) chi- square test for adoption for respondents group of hand picking by social factors

Social Factors	Sig	DF	χ^2	Indicative
Social Organizations	0.108	05	9.029	Not significant
Social acceptance of Incentives	0.000	02	158	Significant
Giving birth yearly	0.463	02	1.542	Not significant

Source: Study Survey 2012

N: 158

Level of significance 0.05/or less

CONCLUSION

The plant protection directorate in North Kordofan State with collaboration of World Food Programme (WFP) intervened to initiate the indigenous knowledge practice by encouraging the farmers to participate in the bug hand picking campaign on the basis of Food for Work (FFW). Thus this research found the impact of extension services and socioeconomic of farmers in adoption of melon bug hand picking that, the adoption of respondents group of hand picking were independent on extension visit , importance of cultivating melon on social organization ,giving birth yearly.and training topics, while adoption of respondents group of hand picking was dependent on attendance of training sessions, purpose of cultivating melon types of pest attacking melon, damage of melon bug, increased cultivating area, on social acceptance of incentive of hand picking and increased productivity of watermelon.

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