African Scientist Vol. 11, No. 2, June 30, 2010
Printed in Nigeria

1595-6881/2010 $12.00 + 0.00

http://www.klobex.org/afs

AFS 2009156/11210

A study of factors affecting the adoption of integrated weed management practices by cowpea producing farmers in Jere Local Government Area of Borno State, Nigeria

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(Received December 31, 2009)

ABSTRACT: A field survey was conducted at Jere local government area of Borno state (longitude $11^{0}57^{1}$N and Latitude $13^{0}95^{1}$E). The main objective of the study is to investigate the socio-economic factors affecting the adoption of integrated weed management. The cost and return analysis shows high profit that an average of N118.133.50, N25, 725.53 and N92, 406.2 were respectively recorded as total revenue, total variable cost and gross margin by the respondents. The result shows further that respondents that adopted integrated pest management practice earns higher profit (N92, 406.92) that those that did not (N78, 427.74). Majority of the respondents (36%) agreed that the tech is new, 60% said there is inadequate loan 45% lack of extension services and poor masscom. Annual income, farming experience and level of education are very much related with adoption of IPM. Based of the results of the survey, it was suggested that loan, extension in services and, adequate information/ training should be made available to farmer in this area to boost the adoption of IPM in the study area.

Keywords: Weed management; Cowpea; Jere Local Government; Nigeria.

Introduction

Weed as defined by Aldrich (1984) are plants that grows as volunteers where they are not wanted and so interfere with the welfare of cultivates crops. They cause a lot of problems and their control is necessary to ensure increased crop production,

Akobundu (1987) stated that in addition to human values there are ecological consideration that should be noted in discussing weeds. These plants play an important part through out crop production period up to harvest and during the subsequent fallow period

Weeds also "constitute a vital limiting factor to crop production. In the tropics they grow fast and luxuriously during the rainy season. This enhance their competition with the main crop for water sunlight, air space, and soil nutrients, which culminate in significant reduction in the actual quality and yield of crops (Akobundu, 1987). Further more according to Fletcher (1983) weed alone accounted for 10% loss in agricultural production worldwide; and stressed that weed control consumes the greater portion of pre-harvest farm labour and expenditure.

Weed also serves as medium of pest and diseases organisms seasonal carry over or intermediate host). Hampers operation of equipment, and contaminate harvested grain with foreign matter materials such as

weed seeds (Lembi and Ross, 1999).

The problem caused by weeds in Nigerian agriculture is becoming increasingly very difficult to manage. The traditional farming system in the country is depended mostly on hand tools, local crop varieties, and weed is controlled by a combination of manual methods i.e slashing, burning and hoe weeding (Chikoye et al. 2002; and Ogunwolu 2004).

The manual method which is the most easily afforded by traditional farmers are inadequate and have limited effects on the rhizomes of weed. Thus, they do not prevent sprouting of new shoots, thereby increasing the incidence of obnoxious weed such as *Imperator cylindrica* and *Striga* spp. The methods do not provide seasonal long lasting control, and need to be repeated 3 to 5 times to get reasonable control, and yield often occurs despite the control measure (Chikoye, 2004). Weeds are found to thrive in soils of low fertility, a factor which leads to the abandonment of farm lands by farmers. The tragic consequence of the abandonment of farmlands is the decrease in food production.

Integrated weed management involves any of the weed control methods or their combination - cultural plus chemicals, cultural plus biological, Biological plus chemical or combination of three or more of these methods (Akobundu 1987). An integrated weed management approach that combines the use of a low rate of pre-emergence herbicide with hand weeding later in the season will help the farmer to avoid the high cost of labour at peak labour use periods, such as the onset of rains in the tropics. Furthermore, integrated weed management strategy involving chemical and cultural control system has been demonstrated to give better weed control and crop yield than when either cultivation or herbicide was used alone Walker and Buchanan, (1982). It is against this background that this research work is conceptualized to asses the socio-economic factors affecting the adoption of integrated weed, management in Jere local government area of Borno State.

The current weed control method widely practiced are, therefore, grossly inadequate in bringing these weeds under control. They should be effectively controlled for improved yield (Obadoni, and Remsion, 2004). Majority of Nigerian farmers, however, lack the technical know-how for sustained weed management (Ogunwoiu, 2004); It has been reported that a major factor limiting the acreage of land under cultivation in traditional farming system in developing countries is the problem of land clearing and weed control (Chikoye et al 2000). In Nigeria, labour is often scarce and costly, leaving weeds as an intractable problem in the countries agriculture. Weeds have remained the major threat to Nigeria's guest for food self-sufficiency and environmental management.

However no concerted effort have been geared towards evaluating the performance of this package (integrated weed management) with respect to its laid down objectives by any individual organization due to some constrains, these include; Insufficient number of extension staff to guide the farmers throughout their farming activities, poor infrastructural facilities tike rural feeder road, housing for extension staff in the rural area, poor storage facilities as well as poor standard health care delivery, illiteracy and lack of proper knowledge of the package (Integrate weed management) in the area.

There is no existing information in the literature on the research topic to the best knowledge of the researcher in the study area. This study will therefore, serve as a bridge of knowledge on all aspect of weed management research in the study area.

Objective of the Study

The main, objective of the study was to analyze the socio-economic factors affecting the adoption of integrated weed management practice in Jere Local government Area of Borno State, Nigeria.

The specific objectives were to:

i. Examine the socio-economic characteristics of farmers in the study area;
ii. Identify the various methods of integrated weed management used by the farmers;
iii. Determine the relationship between socio-economic factors and the integrated weed management
iv. Estimate and compare the cost and return associated with IWM among adopters and Non-adopters, and
v. Examine the problems associated with the adoption of integrated weed management in the study area,

Methodology

Description of the Study Area

The study area is Jere Local Government Area of Borno State/ Nigeria, It was carried out of Maiduguri Metropolitan, It covers an area of about 160 square kilometer, it is located on latitude 11.57°N and longitude 13.95s°E of the equator.

The climate of the area for most part of the year is hot and dry with short rainfall in the months of June to September, The temperature of the area for the month of March - June record the highest ranging between 28 - 40°c, while December - January .record the lowest temperature of 21 - 25 °C.

Sampling Technique

A total of five (5) wards were purposely selected for the study. These are areas where, cowpea crop consider for the study is predominantly grown. These wards are old Maiduguri, Bale Galtimari, Jere/Zabarmari, Dusuman, and Ngomari ward, in each wards (5) villages were selected. Ten (10) farmers were randomly selected making a total of 50 respondents for the study.

Data Collections

Data for the study were obtained from both secondary and primary sources. The secondary data were obtained through annual reports of the ADPS; internet/ and journals. The primary data were also obtained from the farmers by administering questionnaire which was supplemented by personal interview for farmers who cannot read

Analytical Techniques

The analytical tools employed for the study include, simple percentages/frequency distribution, gross margin, and chi -square analysis.

Gross Margin Technique

Gross margin analysis forms the basis for assessing the profitability of a venture, it was used to achieve specific objective (iv) it is expressed as follows GM = GR-TVC

Where,

GM = Gross Margin N/ha of cowpea using integrated weed management
GR = Gross Revenue N /ha of cowpea using integrated weed management
TVC= Total Variable Cost N /ha of cowpea using integrated weed management

Gross margin analysis will be used under the assumption that fixed cost of production Is negligible (Izge 2002).

Chi-Square

$$X^2 = \frac{(fo - fe)^2}{fe}$$

where

X^2 = chi-square
Fo = observation frequency
Fe = expected frequency

Results and Discussion

The data presented in table 1 show that 18% of the respondents fell in age group between 20 - 30 years, (46%) were between 31 - 40 years, and 24% were between 41 - 50 years while 8% were between 51 - 60 years and 4% were above 61 years.

The result indicates that majority (46%) of the farmers were between 3 1 - 4 0 years and thus, in their middle and productive age category. This might have been the reason for their adoption behaviour, because older farmers are generally slow to change for fear of the unknown and great aversion for risk. They may have many mouths to feed and no alternative employment outside farming. On the other hand, younger farmer are much more receptive to new ideas than older farmer. They may have much wider contact outside farming, alternative employment opportunities and are therefore much more willing to take risk in adopting new practices than older farmers. This supports the view of Wilson and Gallup (1995) that elderly people appear to be less receptive to new ideas and change than younger ones.

Table 1: Socio-Economic Characteristics of Farmers.

Socio economic variable	Frequency	Percentage
Age: (Year)		
20-30	9	18
31-40	23	46
41-50	12'	24
51-60	4	8
61 and above	2	4
Gender:		
Male	29	58
Female	21	42
Household size: (No)		
1-5	16	32
6-10	25	50
11-15	7	14
16-20	2	4
Educational level: (years)		
Primary	17	34
Secondary	11	22
Tertiary	18	36
Others	4	8
Occupation:		
Farming	21	42
Trading	13	26
Civil servant	16	32
Farming experience: (years)		
1 - 1 0	18	36
11 - 20	22	44
21 - 30	6	12
31 - 40	3	6
41 and above	1	2
Annual farm income: (N)		
.N 1,000 -N 100,000	28	56
N 101,000 - N 200,000	11	22
N 201,000 -N 300,000	6	12
N 301,000 -N 400,000	1	2
N 401,000 - N 500,000	1	2
N 501,000 and above	3	6

Source: Field survey , 2007

Gender distribution of the farmers also indicates that the male respondents form greater proportion (58%) of the total, while the female respondents formed the remaining 42%. This shows that majority of the farmers are males in the study area. Men are earlier adopters of new technology than women, probably because males carry out agricultural activities that are more labour demanding than the female.

Household size of the farmers indicates that 32% of the respondent/ had 1 - 5 house hold size, majority (50%) had between 6 -10, 14% had between 11 - *15,* while 4% had between 16 - 20 persons. The implication here is that they spend less to their household, because of less persons and use the remaining to purchase chemicals.

The data also reveal that 34% of the respondents attended primary school, 22% attended secondary majority (36%) attended tertiary institution, while 8% attended Qur'anic school. The findings indicate that majority of the farmers had attended formal education with only a small percentage that attended Quranic school. This might influenced their adoption behaviour positively towards integrated weed management practices for cowpea production. This agrees with the view of Tripathi and Chotelal (1971) that adoption levels were highest for those farmers of high taste and education above primary school.

The results indicate that majority (42%) of the farmers have their major occupation as farming 26% trading, while 32% were civil servants. This implies that majority (42%) of the sampled farmers have spent most of their time in farming which is their major source of income in the study area, this enable them to acquire more information on improve weed management practices for cowpea production.

The data shows that 36% of the respondent had 1-10 years of farming experience, majority, (44%) had 11 - 20 years, 12% had 21 - 30 years, 6% had 31 - 40 years, while 2% had 41 years and above. The result reveals that farmers who had 11-20 years experience constitute the highest proportion of the population. This indicates that the years of farming experience may have an influence on the adoption of the integrated weed management practices by farmers. Thus the longer the numbers of years of farming experience by farmer the more they become aware of the effectiveness of weed control measures.

The results indicate that majority (56%) of the farmers earn between N1, 000-W 00,000, 22% earn between N 101, 000,-N200, 000, 12% earn between N 201,000 N 3000,000, 2% earn between N 301,000-
N 400,000, and N 401,000-N500, 000, while 6% earn N 501,000 and above.

This shows that majority (56%) of the farmers earn N 1,000 N 100,000 annually which indicates a high propensity to adopt as income is a prerequisite for adoption. Income places the farmers in good financial position to buy all necessary inputs and adopt new agricultural practices such as integrated weed control measure.

Table 2: Integrated Weed Management Method Adopted by Farmers

Integrated weed control methods	**Frequency**	**percentage%**
Chemical plus Cultural	23	46
Biological plus Chemical	6	12
Biological plus Cultural	8	16
Others	13	26

Source: field survey data, 2007

The data in table 2 indicates that (46%) of the farmers adopted chemical plus cultural practices, 12% adopted biological plus cultural while 26% practiced other weed control methods, it can be concluded that majority of the farmers in the study area adopted chemical plus cultural practices. This may be because, it saves labour and the output is usually high.

The chi-square result in Table 3 indicates that there is significant relationship between the age of the respondents and adoption of integrated weed management practice. The calculated X^2 of 34.25 is greater than the tabulated X^2 of 9.49. Since the calculated X^2 is greater than the tabulated X^2 at 0.05 level of significance, the null hypothesis is therefore rejected because there is significant relationship between age of the respondent and adoption.

Table 3: Table of Chi-square Value of Selected variables with Adoption.

Socio-Variables	Calculated X2 Economic	Tabulated X2	DF	Remarks
Age	34.25	9.49	4	*
Household size	32.94	7.81	3	*
Educational level	11.55	7.81	3	*
Farming experience	44.25	9.4 9	4	*
Annual farm income	76.54	11.07	5	*

Source: Field Survey, 2007

Key.: * = Significant at P≤ 0.05 confidence level; D.F = Degree of freedom.

This is revealed by the vast majority who are at their active productive age. This might probably be their reason for demonstrating high adoption rate, thus they are at their middle age (Table 1) this may be explained by the fact that younger farmers have the desire, interest and are enthusiastic to adopt integrated weed management practice than elderly farmers who tend to be more conservative in their behaviour, sceptical of risk and therefore do not readily accept new innovations. This support the view of Wilson and Gallup (1995) that elderly people appear less receptive to new idea and change than younger ones.

The results also indicate that there is significant relationship between the house hold size of the respondents and adoption of integrated weed management practice. The calculated X^2 of 32.94 is greater than the tabulated X^2 of 7.8, (at 0.05 level of significance), the null hypothesis is rejected because there is significant ($P \leq 0.05$) relationship between household size of the farmers and adoption. This shows that majority of the farmers who's household size are large adopted the integrated weed management practice (Table 1), This is probably because the out- put is usually high and it saves labour.

There is also significant relationship between educational level of the respondents and adoption of integrated weed management practice. The calculated X^2 is 11.55 while the tabulated X^2 is 7.81. There is therefore a significant relationship between educational level of farmers and their adoption. This means farmers need to be educated to understand better the innovation for effective adoption. This agrees with the findings of Akinbode (1968), who reported that socio economics characteristics such as education use of mass communication, frequency of extension agents contact, participation in cooperative organization are significantly and positively related with adoption of recommended practices.

The result further indicated that calculated X^2 of 44.25 is significant at $P \leq 0.05$, which means that there was a significant relationship between farming experience and adoption of integrated weed management practice. This implies that farming experience is associated with adoption of integrated weed management practices.

The findings also indicates the calculated X^2 of 76.54 is greater than the tabulated X^2 of 11.07 which also means that there is significant relationship between integrated weed management practice and annual farm income. This suggests that higher income is very essential in financing any farm operation and influence farmers to acquire improve farm inputs.

The gross revenue, total variable cost and gross margin per hectare of N118,135.6, N 25,729.53 and N92,406.2 respectively for that practicing integrated weed management on cowpea production the study area. While, N 93,349.56, N13,921,82 and N79,427.74 were the gross revenue,(Table 4) total variable cost and gross margin per hectare respectively for those that did not adopt the integrated weed practices, in the study area.

Table 4: Estimated cost and returns per hectare for adopters and non adopters of integrated weed management practices for cowpea production in Jere Local Government Area of Borno State, Nigeria, 2006.

Variable	Value (N/ha) adopters	Value (N/ha) Non adopters
Gross revenue	118,135.6	93,349.56
Variable input cost:		
Land clearing	3001,75	1557.39
Seed cowpea	1303.42	897.9
Harvesting	3739.13	1760
Chemicals	3929.56	1166,08
Rent on land	1622.60	1113.9
Hired labour	4520	2717.39
.Mechanized labour	7613.04	4709.16
Total variable cost	25,729,53	13,921.82
Gross margin	92,406.02	79,427.74

Source: Field Survey, 2007

The analysis revealed that those that adopted the integrated weed management practices on cowpea received high profit, than those that did not adopt the integrated weed management practice as indicated by the gross margin value of N 92,406.02 compared to gross margin value of N 78,427.74, for non adopters. Thus, the integrated weed management is profitable for cowpea production in the study area.

The results show that majority (86%) of the farmers agrees and 10% strongly agreed, that (Table 5) integrated weed management practice is expensive, while only 4% disagreed. This may be the reason why majority of the farmers the method. Majority (70%) agreed that it requires skills, 18% strongly agreed, 8% disagreed, while only 2% strongly disagreed. This may probably be the reason why most of the farmers use the traditional method, since it requires skills.

Also majority (46%) agreed that there is lack of extension persuasion, 6% strongly agreed, 16% disagreed, 6% strongly disagreed, while 20% did not decide. This may be as a result of lack of financial assistance from the government to persuade extension workers and enable them to perform their duties effectively

The result shows that 32% agreed it is too difficult to understand, 6% strongly agreed, majority (42%) disagreed, 8% strongly disagreed, while 12% did not decide. The result indicates that majority of the farmers 42% disagreed that the technology is difficult to understand this means that the technology is easy and congruent with the farmers existing farming practices, thus influence the adoption of integrated weed management practices.

Majority (60%) agreed that there is inadequate loan, 12% strongly agreed, 8% disagreed, .10% strongly disagreed, while only 6% did not decide. The result shows that most of the farmers were finding it difficult to obtained loan (credits), which makes it difficult for them to adopt integrated weed management practices because they won't be able to buy chemicals, seed, fertilizer and other inputs that were recommended along with the technology.

Majority (36%) agreed that the technology is new, 4% strongly agreed 3% disagreed, 10% strongly disagreed, while 16% were undecided. This may be the reason why majority of the farmers in the study area used both chemical and cultural method. Majority (60%) agreed that there is communication barrier, 4% strongly agreed, 8% disagreed, while 14% strongly disagreed. This may be the reason why some farmers still use only cultural method because they lack guidance from the extension agents.

Table 5: Major Problem Associated with Adoption of Integrated weed Management Practices by Farmers in the study area.

Major Problems	Agreed At	Strongly agreed	Disagreed	Strongly	Undecided
(i) It is expensive	43 (86%)	5 (10%)	2 (4%)	-	-
(li) It requires skills	35 (70%)	9 (8%)	4 (8%)	1 (2%)	-
(iil)'Lack of extension Persuasion	23 (16%)	3 (6%)	8 (16%)	3 (6%)	10 (20%)
(iv) It is too difficult To understand	16 (32%)	3 (6%)	21 (42%)	4 (8%)	6 (12%)
(v) The yield obtained From the method is low	5 (10%)	2 (45%)	26 (52%)	6 (2%)	11 (22%)
(vi) Illiteracy level Is high	33 (66%)	-	6 (12%)	5 (10%)	4 (8%)
(vii) Small farm land	20 (40%)	*2* (4%)	13 (26%)	7 (14%)	5 (10%)
(viii) Inadequate loan	30 (60%)	6 (12%)	4 (8%)	5 (10%)	3 (6%)
(ix) The technology is New	18 (36%)	2 (4%)	15 (30%)	. . 5 (10%)	8 (16%)
(x) Communication Barriers	30 (60%)	2 (4%)	4 (8%)	7 (14%)	14 (28%)

Source: Field Survey 2007

Conclusion

The study re-affirmed the claims that integrated weed management practice is. highly practiced by young, literate and experienced farmers in the study area. It is also profitable in cowpea production the result also found that there was generally high level of adoption of the integrated weed management practice by cowpea farmers in the study area.

It also identified certain problems that hinder the adoption of integrated weed management practice such as lack of extension persuasion, inadequate loan, too difficult to understand, and inadequate knowledge about integrated weed management practice for cowpea production.

Recommendations

Based on the finding of the study, the following recommendations were made:

i. Government and non governmental organizations should designed appropriate policies to ensure adequate supply and efficient distribution of farm inputs such as chemicals and machines for farmers.
ii. Research institutions in-connection, with the extension service should make information and knowledge about integrated weed management practice for cowpea production available to farmers.
iii. Extension -service should be provided with all the necessary facilities required such as working equipment, transportation and incentives to carry out their duty judiciously.
iv. Government should assist small scale farmers to obtain loans in order to purchase the improved inputs.

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