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Factors Affecting the Use of Pest Control Measures on Sorghum Plant among Small-Scale Farmers in Kweneng South Extension District, Botswana

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Abstract: A survey was conducted to determine the factors affecting use of pest control measures on Sorghum crops among small-scale sorghum farmers in Kweneng South Extension District of Botswana and determine the type of assistance that is required by the farmers to be able to use pesticide efficiently and effectively on sorghum. The target population of the study was 60 arable farmers in the Kweneng South Extension District of Botswana. The formula developed by Krejcie and Morgan was used to arrive at a sample size of 52 farmers that constituted the respondents of the study. An interview schedule developed from literature and experience of the researchers was used to gather data. The validity of the instrument was established by three lecturers in the Department of Agricultural Education and Extension. Reliability test of the instrument was conducted and was found to be 0.71. Results revealed that lack of improved technologies use of pest control measures in sorghum, inadequate facilities for pesticides application and few numbers of extension workers in the farming community to demonstrate to farmers the use of pest control measures constituted the major factors affecting the use of pesticides among the respondents.

Key words: Sorghum, pest control, constraints, small-scale, farmers, Botswana

INTRODUCTION

In Botswana, although livestock accounts for the lion's share of agricultural production, more people are directly engaged in arable agriculture. Common crops grown in Botswana include Sorghum, maize, cowpeas, melons and groundnuts. However, Sorghum remains the most important crop in Botswana as it is the staple food of the general populace. The cultivation of Sorghum has been a thing of concern for the farmers as a result of low yield due to pests such as stem borer and army worm. The word Pest is derived from latin pestis for plague. Pest is a human invention used to describe (plants, vertebrates, insects, mites, pathogens and other organisms) which occur where we do not want them (Norton and Mumford, 1993). Before man, there were no pests. Vast crop monoculture have aggravated the situation by promoting the build-up of huge pest populations. Transeints and vagrant pests reproduce quickly in a sea of succulent food, often in the absence of natural enemies. Insects, in particular can exhibit a dramatic rate of increase if unchecked. One cabbage aphid (*Brevicoryne brassicae* L.) producing a new generation every 2 weeks could annually produce 250 million tonne of offspring, enough to circle the equator. Most contemporary pest outbreaks occur when pest species are accidentally introduced to new habitats and new countries in the absence of their natural enemies. In this way, the European corn borer, *Ostrinia nubitalis* was introduced to the USA in 1909. More rarely a harmless species reaches pest proportion after introduction of new foodstuffs acceptable to that species. Matsaert further urged that although extension services are considered essential for the introduction of new techniques such as Integrated Pest Control Management in African Agriculture, they are in most cases ineffective due to the fact that extension worker are few in numbers and are unable to serve the farmers, their salaries and transport facilities are often poor and there is lack of appropriate technologies that take the resource base of the farmer into considerations and also lack of incentives for extension services (FAO, 1998). Lack of knowledge of pest forecasting is also a problem of pest management. Forecasting is a component of Integrated Pest Management and in Africa it is used on a large scale for the control of locust and armyworm. Illiterate farmers cannot record results and some old farmers are unable to detect small insects (Gibson and Sweetmore, 1992). Labour is also a constraint in pest management under small-scale farming. Most farms are managed by women headed households and elderly people. It is therefore

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important to develop control measures which do not place unrealistic demands on their labour. Lack of funds hinders the exploitation of intensive farming methods. Farmers are generally accustomed to receiving a relatively high level of government support. Farmers are generally reluctant to purchase or apply chemicals themselves but may expect this to be implemented by government personnel. A suitable control measure would therefore be the one which can realistically be implemented by government personnel.

Taboos on killing or touching some insects may also be a constraint. Some people believe that killing or touching some insects will provoke the gods hence resulting in unbearable incidents of such pests perceived as punishment from the gods. The small farm sector has been bypassed by agricultural modernization, mainly because new technologies were not made available to small farmers on favourable terms. Pest management innovations are no exception.

Mengench *et al.* (1995) stated that in most areas where cultural traditions and social organizations have not been changed, farmers have excellent preceptors of their environment and make successful management decisions designed to overcome production constraints. Dent (2000) argued that even when a new technology is both appropriate and feasible, there will still be occasions when a particular pest management strategy will fail to be adopted by farmers. The reasons for this may be caused by a communication gap, social or cultural constraints or it could be that some form of incentive is required.

Norton and Mumford (1993) argued that a problem with implementing improvement in pest management is associated with institutional gaps. Research and extension scientists often operate independently, because of institutional barriers, despite the fact that both have a mutually important role to play in a diagnosing problems and designing recommendations. Leslie and Cuperus (1993) lamented that many third world countries have labour-intensive economics and cannot afford agricultural chemicals.

Scientific infrastructure is sometimes inadequate for the problems encountered. Facilities for virus identification or pesticides residue estimation are not always present. Knowledge of disease epidemiology and pest population dynamics seems poor at growers level and sometimes insufficient at the level of agricultural extension. This is reflected in unnecessary pesticides application and in the various recommendations made for the same diseases in different countries.

Statement of the problem: Despite the free provision of Extension advice by government in Botswana, the problem of Sorghum pests had become more serious under small-scale farming. The fight against pests under this system had remained disputable and open for research. Botswana Sorghum farmers are experiencing pest outbreaks which can result to loss of harvest and further impoverish the small scale farmers. These pests include Stem borers, Army worms, Termites and Weevils. The question that arise is: Why are farmers in Kweneng South District of Botswana failing to use some recommended pest control measures on theses pests.

Purpose and objective of the study: The purpose of the study was to identify the factors affecting the use of pest control measures on Sorghum among farmers in Kweneng South District of Botswana. The following were the specific objectives:

- To determine the personal characteristics of farmers in Kweneng South District of Botswana
- To identify the major factors affecting the use of pest control measures among sorghum farmers in Kweneng South District of Botswana

MATERIALS AND METHODS

Type of research study: A descriptive survey research method using an interview schedule technique was used to collect data in the study.

Subject selection: The list of the 60 arable farmers in Kweneng South Extension District was obtained from the Agricultural Officer in Molepolole to control frame error. Selection error was controlled by checking the list of farmers to avoid any duplication of names. From the target population of the 60 farmers, a simple random sample size of 52 farmers was obtained using the formula developed by Krejcie and Morgan (1970) formula. This helped to control sampling error.

Development of the instrument: The interview schedule instrument was developed based on review of related literature and experience of the researchers. The instrument consisted of a close-ended questions for collecting data on personal characteristics of respondents and a rating scale instrument for collecting data on factors affecting use of pest control measures to control Stem borers, Army worms, termites and weevils. The rating scale statements were anchored on a 6 point likert rating scale of 1 = Strongly Disagree, 2 = Disagree, 3 = Slightly Disagree, 4 = Slightly Agree, 5 = Agree, 6 = Strongly Agree. Also in the instrument for data collection, suggestions were solicited from the respondents on the

assistance required by farmers on pest control usage. The instrument for data collection was bound in a booklet form as advised by Dlamini. Three Lecturers from the Department of Agricultural Extension and Education reviewed the instrument and attested to its validity. The reliability coefficient of the instrument was done and was found to be 0.71 indicating a good degree of reliability.

RESULTS AND DISCUSSION

Data analysis: The data collected in this study was processed using the Statistical Package for Social Science Research (SPSS) at Botswana College of Agriculture. Frequencies and Percentages were used to describe the data collected on personal characteristics of respondents while means, standard deviations and ranks were used to describe the statements relating to factors affecting use of pest control measures on sorghum among the respondents. To interpret the data, a mean of 3.5 and above was used to denote major factors affecting use of pest control measures among the farmers, while a mean below 3.5 was used to denote minor factors affecting use of pest control measures among the Sorghum farmers in Kweneng South Extension District of Botswana.

Personal characteristics of respondents: The personal characteristics examined in this study were gender, age, marital status, educational level and income level of respondents. The respondents were asked to indicate their gender in the interview schedule. Table 1 shows the number of male and female respondents. A total of 31 (60%) of the respondents were males, while 21 (40%) were female. This revealed that most of the respondents were male. The respondents were asked to indicate their ages in the interview schedule. Table 1 shows that 7 (13.46%) of the respondents were aged between 21 and 40 years, 24 (46.15%) were between the ages of 41-60, while 21 (40.38%) were >60 years of age. This showed that most of the respondents were elderly people indicating an uncertain future for arable farming in the country, unless efforts are made to attract younger people into farming. The respondents were also asked to indicate their marital status which indicated that 7 (13.46%) were single, while 45 (86.54%) were married. The respondents were asked to indicate their educational qualifications. Table 1 shows that 35 (67.31%) of the respondents were illiterate, 11 (21.15%) had primary education, 3 (5.77) had junior certificates and 3 (5.77%) had learned in a government illiteracy class. The figures revealed that majority of the respondents were illiterate. Finally, respondents were asked to indicate their level of income. Table 1 shows that all the respondents live on income not exceeding P5000.00 annum^{-1}. This is an indication that majority of the farmers are within the low income category.

Table 1: Frequencies and percentages of personal characteristics of respondents (N = 52)

Parameters	Frequency (F)	Percentage
Gender		
Male	31	59.62
Female	21	40.38
Total	52	100.00
Age		
21-40	7	13.46
41-60	24	46.15
Above 60	21	40.38
Total	52	100.00
Marital status		
Single	7	13.46
Married	45	86.54
Total	52	100.00
Educational level		
Illiterate	35	67.31
Primary education	11	21.15
Junior certificate	3	5.77
Literacy class	3	5.77
Total	52	100.00
Income level		
0-P5000.00	52	100.00
Total	52	100.00

Factors affecting the use of pest control measures on sorghum crops among sorghum farmers in kweneng south disrict of Botswana: In Table 2, the Sorghum farmers were asked to rate in order of severity the statements relating to the major factors affecting the use of pest control measures on sorghum crops in their farms. The Sorghum farmers were asked to rate their level of agreement on a 6 point likert scale. The responses were analysed using means, standard deviations and ranks to describe the data collected. The results revealed that out of 23 statements examined, the sorghum farmers agreed that 16 of them constitute major factors affecting use of pest control measures on sorghum in Kweneng South Extension area of Botswana, while only 7 statements pose minor constraints to them. However, when the statements were ranked, the statement new technologies were not made available to farmers on favourable terms came first as a major factor affecting the use of pest control measures among the respondents, with a mean of 5.5. The following two statements took the 2nd position with a mean of 5.4, respectively; extension staff are few in number compared to the number of farmers they are expected to demonstrate the use of pest control measures to and lack of facilities for use of pest control measures. The least rated factors affecting use of pest control measures included extension staff were under trained in pest management with a mean of 2.6 and a rank of 21st; social or cultural constraints regarding touching or handling certain pest seen as taboos with a mean of 2.5 and a rank of 22nd and low level of government intervention with a mean of 2.3 which took the last rank of 23rd position.

Table 2: Mean, standard deviation and rank of farmers' responses toward factors affecting the use of pest control measures on sorghum

Factors affecting of pest control measures	Mean±SD	Rank
Lack of funds	5.1±1.0	4
Shortage of labour	4.8±1.1	6
Lack of knowledge	4.8±1.1	6
Low level of government intervention	1.9±0.8	23
Little land to facilitate crop rotation	3.1±1.2	19
Social/cultural constraints e.g., taboos	2.5±1.2	22
Negligence	3.5±1.3	15
Lack of farmers participation in research	4.9±0.6	5
Communication gap between farmers and extension services	3.5±1.0	15
Lack of training for farmers	4.7±1.3	8
Lack of infrastructure for pesticides application	5.4±0.8	2
Decreased understanding and appreciation of agricultural researches	3.4±1.1	17
Reception gap between farmers and researchers	4.7±0.9	8
New technologies were not made available to farmers on favourable terms	5.5±0.5	1
Extension staffs are under-trained	2.6±1.1	21
Extension staffs are poorly equipped	4.4±1.7	11
Extension staff are few in number compared to the farming community	5.4±1.2	2
Lack of communication skills (extension staff)	3.3±0.7	18
Poor salaries and lack of incentives for extension services who should sell the idea of pest control usage	3.6	13
Extension services are ineffective	3.0±1.4	20
No feedback from the farmers and extension staff to guide researchers towards development of effective pesticides	3.9±.0.8	12
Lack of on-farm research	4.5±.0.9	5
Institutional gaps between researchers and extension staff	3.6±.0.9	13

CONCLUSION

The major factors affecting use of pest control methods on Sorghum crops include in-availability of new technology on pest control measures to Sorghum farmers in Kwaneng South District of Botswana. This was followed by lack of extension workers to teach the new technology pest control in Sorghum and lack of the facilities required to control sorghum pests such as spraying pumps. This is because farmers believe that the price of a spraying pump is beyond what they can afford.

RECOMMENDATIONS

- Extension workers should work hand in hand with the researchers in Botswana Research Institute to develop pest control measures for Sorghum
- Extension workers should be fully trained and equipped to tackle the problems of pests in Sorghum in Botswana
- The ratio of extension workers to farmers should also be increased

REFERENCES

Dent, D., 2000. Insect Pest Management. 2nd Edn., CABI Publishing, Massachusetts, USA., ISBN: 0-85199-340-0, pp: 366.

FAO, 1998. Training for Agriculture and Rural Development 1997-98. Daya Publishing House, Rome, ISBN: 8170352460, pp: 176.

Gibson, R.W. and A. Sweetmore, 1992. Technical centre for agricultural and rural co-operation (CTA). Proceedings of a Seminar on Crop Protection for Resource-Poor Farmers, Nov. 4-8, Natural Resource Institute, East Sussex, UK., pp: 18-27.

Krejcie, R.V. and D.W. Morgan, 1970. Determining sample size for research activities. Educ. Psychol. Measur., 30: 607-610.

Leslie, A.R. and G.W. Cuperus, 1993. Successful Implementation of Integrated Pest Management for Agricultural Crop Lewis Publishers, Boca Raton, USA., ISBN-10: 0873715020, pp: 174.

Mengench, A.N., N.S. Kailash and H.N.B. Gopalan, 1995. Integrated Pest Management in the Tropics: Current Status and Future Prospects John Wiley and Sons, New York, ISBN: 978-0-471-96076-8, pp: 186.

Norton, G.A. and J.D. Mumford, 1993. Decision Tools for Pest Management. Oxford University Press, Cambridge, UK., ISBN-10: 0851987834, pp: 296.