

Use and Abuse of Herbicide for Management of Masakwa Sorghum Weed in Vertisol of the Shores of Lake Chad

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Abstract: Masakwa is a transplanted sorghum grown mostly in the vertisols of the shores of Lake Chad under residual moisture. Initial clearing of weed is among the most difficult activities. Introduction of herbicide has tremendously reduced the drudgery aspect and increased area for cultivation and output. This study was conducted to assess the knowledge, use and abuse of herbicides among Masakwa farmers in Mafa Local Government of Borno State, Nigeria. Data was collected in 2021 using structured questionnaire administered to 120 masakwa farmers on socio-economic characteristics, knowledge of handling and usage of herbicides and safety measures applied. Data collected were analysed using simple statistical tool of means and percentage. The result shows majority (70.8%) of masakwa farmers are male, married (76.7%) with more than 50% older than 40 years of age. The educational level is dominated (45%) by Quranic education with only 15% completing secondary school. Household size of 6-10 members is the prevailing (40.8%) and solely (43.3%) rely on masakwa production as source of livelihood. Most (93.3 %) of the respondents use herbicide and most of them (81.7%) are educated on use of herbicides by marketers and retailers as the presence of ADP is zero. Application of herbicide is either by self (16.7%) or family members (38.3%). Introduction of herbicide and guide on usage is mostly (71.7 %) done by marketers/retailers. Farmers violate guide as (93.3%) do not wear protective and 82.5 % apply above recommended rates. They are of the opinion that higher rates give good results without minding the cost and health consequence. However, majority (78%) consider wind direction when spraying. After spray, most (93.3%) farmers wash their bodies only and do not take bath (96.7%) nor change their cloths (84.2%) but display sign (71.7%) as warning after spray. Farmers are ignorant on proper disposal of herbicide as more than half the population either convert it as food (23.3%) or drinking (36.7%) containers. There is therefore the need to massively educate farmers through deployment of extension agents for effective weed control and wellbeing of the farmers and environmental safety.

Keyword: herbicide, safety, masakwa sorghum, Lake Chad Basin

Introduction

In the inundation area - the basin of the former larger Lake Chad - a special type of sorghum is grown on the clay soils (*firgi*). This dry-season guinea corn is also called dwarf sorghum or *masakwa* (Zach *et al.* 1996). *Masakwa* sorghum is dry season sorghum cultivars which are cold, drought tolerant and photoperiod sensitive are commonly grown on heavy clay soils or Vertisols during harmattan period using residual soil moisture stored from the previous seasons' rainfall (Dugje and Odo, 2011; Dugje *et al.* 2014; Jada *et al.* 2017). There are about four million hectares of Vertisols or 'Firgi' heavy clay soils that occur mainly between latitudes 8°30' and 12°30'N and longitudes 10° and 14°E in Nigeria (Klinkenberg and

Higgins, 1968). The post rainy season sorghum is grown on an estimated area of 102,564 km² mainly in the Lake Chad Basin of Borno State, North-Eastern Nigeria (Dugje *et al.* 2014). The cool dry season offers opportunity for growing the *Masakwa* cultivars at a time when it is practically impossible to grow other grain crops without irrigation. The crop contributes immensely to the local economy of the major producing areas that include Dikwa, Bama, Ngala, Gwoza, Mafa, Kala Balge, Monguno and Marte Local Government Areas in Borno State, Nigeria (Dugje *et al.*, 2014; Gworgwor, 2001). *Masakwa* provides supplementary supply of grains and forage during the dry season for both human and livestock consumption.

Weed control in *Masakwa* sorghum is critical during field preparation as the crop is transplanted to receded flood plains and thrives exclusively on the residual moisture. Farmers expend more time and energy to clear weeds before transplanting *Masakwa* sorghum. Weeds also compete with sorghum plants and can reduce the sorghum yield (Tibugari *et al.*, 2020). Yield loss due to weeds depends on the duration of weed infestation, the nature and intensity of weeds, the crop cultivars, and environmental conditions (Barber *et al.*, 2015; Knezevic *et al.* 2002). The introduction of herbicide in *masakwa* production allows farmers to manage larger area with less effort and time. However, behaviours of farmers are diverse and needs to be investigated as reports indicate improper handling practices among users. Farmers interested in *masakwa* sorghum, should have access to scientific information in order to learn how to optimize chemical weed control management and improve the efficacy for safety and economy. The return of Internally Displaced Persons (IDPs) from Maiduguri to Mafa (Anon., 2018) and encouragement by the State Government to farm is encouraging and needs academic backing. The objectives of this study were to assess the socioeconomic status of the farmers and to determine the knowledge of use and handling of herbicide for the management weed among *Masakwa* sorghum farmers in the Shores of Lake Chad Basin of Nigeria.

Methodology

The study was conducted in 2021 in Mafa Local Government, Borno State, in Shores of Lake Chad. One hundred and twenty structured questionnaires were distributed at random to *Masakwa* sorghum producers with the assistance of trained interpreters. Data was collected on the socio-economic characteristics of the respondents, handling and usage of herbicides and safety measures used. Data collected were analysed using simple statistical tool of means and percentage.

Results and Discussion

The socio-economic characteristics of *masakwa* farmers in Mafa Local Government, Borno State, in Shores of Lake Chad is presented in Table 1. The result shows that 70.8% of the respondents were male while 29.2% were female. This shows that the business is male dominant and could be attributed to the culture of the people as the state is Muslim dominated State. The domination of crop production by male in northern Nigeria has been reported by (Sennuga *et al.* 2020a; Okeke-Agulu and Onogwu, 2014). It also shows that 10.9% of the respondents were of age 20-30 years, 23.3% were between 31-40 years, 34.28% were between of 41-50 years, 22.5% were between the ages of 51-60 while only 9.2% have 61 and above. The result indicates that the business is handled by people of older age of between 41-50 years (34.2%). Most youths of 40 years and below are seeking for white collar jobs, this collaborates with the studies of Dahiru (2012). Marital status indicated that (76.7%) of the

respondents were married, 4.2% were single, 8.3% were divorced and 10.83% were widow/er. This shows that majority of the business is done by married men as they are responsible and have to cater for the family. The educational level is dominated (45%) by Quranic education followed by primary, secondary and tertiary education with 22.5, 15 and 8.3, respectively. 9.2% of the respondent did not attend any kind of education. This suggests that the respondents in the study area obtained the basic education required for accepting new technologies. Sennuga *et al.* (2020b) reported that highly educated farmers tend to adopt relevant agricultural technologies better than illiterate ones. The household size shows that 6.7% of the respondents have less than 5 members, 40.8% have 6-10 members, 25% have 11-15, 15.8% have 16-20 while 11.7% have more than 21 household size. This is good as large family size influences adoption of technology to cater for the family as observed by (Okeke-Agulu and Onogwu, 2014; Sennuga *et al.*, 2020a). Majority (46.7%) of masakwa farmers operate in less than 1 ha, 24.2% use 1.1-2 ha and only 7.5% have above 4.1 ha. Farmers in sub-Saharan Africa are mostly subsistent and operate on small farm size which are easily managed (Ncheuveu *et al.*, 2021). Majority Most of respondents (43.3%) do nothing apart from masakwa production, (19.2%) engage in trading as other source of income, 16.7% are civil servants while 7.5 and 13.3 do fishing and livestock, respectively. Nearly half the population feed and sales part of their produce to cater for their other needs.

Table 1: Socio-economic characteristic of Masakwa farmers in Mafa Local Government, Borno State, in Shores of Lake Chad

	Number of respondents (N=120)	Percentage (%)
Sex		
Male	85	70.8
Female	35	29.2
Age		
20-30	13	10.9
31-40	28	23.3
41-50	43	34.2
51-60	27	22.5
61 and above	11	9.2
Marital status		
Single	5	4.2
Married	92	76.7
Divorced	10	8.3
Widow	13	10.8
Education level		
Quranic	54	45
Primary	27	22.5
Secondary	18	15
Tertiary	10	8.3
Others	11	9.2
Household size		
1-5	8	6.7

6-10	49	40.8
11-15	30	25
16-20	19	15.8
21 and above	14	11.7
Farm size		
Less than 1 ha	56	46.7
1.1-2 ha	29	24.2
2.1-3 ha	16	13.3
3.1-4 ha	10	8.3
Above 4.1 ha	9	7.5
Other source of income		
Trading	52	43.3
Civil service	23	19.2
Fishing	9	7.5
Livestock	16	13.3
Nothing	20	16.7

Source: Field survey, 2021

Table 2 shows knowledge and use of herbicide by masakwa farmers in Mafa Local Government, Borno State in Shores of Lake Chad. The result revealed that 93.3 % of the respondents use herbicide and most of them (81.7%) are educated on use of herbicides by marketers and retailers as the presence of ADP is zero. Application of herbicide in masakwa farming is gaining acceptance (Mbaya, 2010). Farmer to extension agent ratio is too wide in Nigeria (Okeke-Agulu and Onogwu, 2014) as such most innovative information reach farmers through other means. The population apply herbicide by themselves (16.7%) or family members (38.3%) while others engage labour (26.7%) or assisted by friends (18.3). The farming system is subsistence hence source of labour is always by self, family or friend and this is very common in northern Nigeria as reported by (Yusuf, 2018; Sennuga *et al.*, 2020a). Masakwa farmers are guided (71.7 %) by marketers/retailers (49.5%) and not by ADP personel. However, most of them violets such guide as (93.3%) do not wear protective and 82.5 % apply above recommended rates. They are of the opinion that higher rates give good results without minding the cost and heath consequence. Nevertheless, majority (78%) consider wind direction when spraying to avoid much inhalation of the chemical as nearly half (43.3%) of the population have experienced or seen someone affected by the chemical. Farmers wash, drink milk or lime orange when side effects such as vomiting or dizziness are observed as they rarely go to hospital.

Table 2: knowledge and use of herbicide by Masakwa farmers in Mafa Local Government, Borno State, in Shores of Lake Chad

	Number of respondents (N=120)	Percentage (%)
Use herbicide		
Yes	93.3	112
No	6.7	8
Source of knowledge		

Friends/neighbours	19	15.8
ADP	0	0
Marketers/retailers	98	81.7
Others	3	2.5
Who sprays herbicide		
Myself	20	16.7
Family	46	38.3
Hire	32	26.7
Friends	22	18.3
Any guide on use of herbicide		
Yes	86	71.7
No	34	28.3
If yes, by who		
Friends/neighbours	20	16.7
ADP	0	0
Marketers/retailers	59	49.2
Others	7	5.8
Do you use protective		
Yes	6.7	8
No	93.3	112
At what rate do you apply		
Recommended dose	5	4.2
Below recommended dose	0	0
Above recommended dose	99	82.5
Based on experience	16	13.3
Do you consider wind direction		
Yes	94	78.3
No	26	21.7
Any experience of side effect		
Yes	68	56.7
No	52	43.3

Source: Field survey, 2021

Masakwa farmer's safety knowledge and practices after spray of herbicide in Mafa Local Government, Borno State, in Shores of Lake Chad is presented in Table 3. Most (93.3%) of masakwa farmers wash their bodies after spray but majority neither immediately take bath (96.7%) nor change their cloths (84.2%). They are of the opinion that toxicity of herbicide is insignificant on body and only effective on weeds. The smell is mild and does not kill insects or animal as such is not lethal to human. This is erroneous notion and farmers need to be educated on hazardous effects of herbicide and appropriate handling (Sule *et al.*, 2020). 60.8% of the respondents do not clean sprayer nozzle after spray. They however clean sprayers when next application is not herbicide to avoid killing destruction by residual herbicide in the sprayer. Farmers usually (71.7%) display signs as warning after spray. This is to avoid animals graze on contaminated grasses. Farmers are ignorant on proper disposal of herbicide as more than half the population either convert it as food (23.3%) or drinking (36.7%) containers. Some (9.2%) store seed which they found to be effective or throw/burly

(6.7%) while others (24.2) sell, use for ablution or keep other liquids. The poor disposal practices observed in the current study was common in most developing countries (Ncheuveu *et al.*, 2021). These poor disposal practices can potentially pose environmental risks in the Chad Basin floodplain because herbicides may leak from the containers to pollute ground and surface waters and this necessitates proper enlightenment for the safety of the farmers.

Table 3: knowledge safety of herbicide after spray by Masakwa farmers in Mafa Local Government, Borno State, in Shores of Lake Chad

	Number of respondents (N=120)	Percentage (%)
Do you wash body after spray		
Yes	112	93.3
No	8	6.7
Do you change clothes after spray		
Yes	19	15.8
No	101	84.2
Do you take bath immediately after spray		
Yes	4	3.3
No	116	96.7
Do you clean sprayer nozzle after spray		
Yes	47	39.2
No	73	60.8
Do you display red flag as warning after spray		
Yes	86	71.7
No	34	28.3
What do you do with empty can after spray		
Drink container	44	36.7
Food container	28	23.3
Store seed	11	9.2
Throw/burrry	8	6.7
Others	29	24.2

Source: Field survey, 2021

Conclusion

Use of herbicide in Masakwa sorghum producers is one of the technologies that has greatly reduce human drudgery and allow for cultivation of larger areas for more production. From the study, it could be concluded that farmers have accepted use of herbicide but do not adhere to recommended practices and safety protocols as most of the introduction and instructions is by marketers/retailers and not scientifically trained extension agents. There is therefore the need to deploy extension agents to fill the gap for wellbeing of the farmers and environment.

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