Constraints Faced By the Small-Scale Farmers in the Production of Major Crops Sorghum and Maize in Awdal Region, Somaliland

A B S T R A C T

The study aimed at exploring constraints faced by small-scale farmers in the production of the major crops such as Sorghum and Maize; and finding out their relationship with the selected characteristics of the farmers with the constraints they faced. The small-scale farmers of Baki, Dilla, Sabawanag, and Idhanks under the Borama and Baki districts were the respondents of the study. Data were collected by using a pre-tested structured interview schedule with a randomly selected sample of 92 farmers from a population of 1250 farmers. Results indicated that among ten selected characters of the farmers, education, cosmopoliteness, training received, knowledge of climate change, and extension media contact showed a positive significant relationship with the constraints faced by the small-scale farmers in the production of the major crops like sorghum and maize. On the other hand, farm size, land cultivation area, and annual income showed a negative significant relationship. The rest of the characteristics such as age and farming experience did not show any significant relationship with the constraints faced by the farmers. The results also showed that the highest proportion of the farmers (65.2 percent) faced medium constraints, while 22.8 percent and 12.0 percent of them faced low and high constraints, respectively. Among the 18 selected constraints, the highest constraints facing index (CFI) was found for 'attack of diseases and pests in crop field' which is 276 and the lowest was 'lack of co-operation from family members with a score of 56. The study suggests that these constraints need to be solved to ensure food security and increase agricultural production in Awdal Region, Somaliland.

Key words: Constraints, Small-Scale Farmers, Major Crops, Sorghum and Maize, Somaliland.

1. Introduction

Agriculture remains a significant contributor to the gross domestic product in developing country economies. About 60% of Sub-Saharan Africans are employed in the agricultural industries and

more than 80% of the region's poorest households depend directly or indirectly on farming for their livelihoods [1]. Somaliland has a total area of about 137,600 km2 but only 3% of the total land mass, which is equivalent to about 4,128 km2 is actually in use. Another 7% has the potential for agricultural development. In Somaliland, agricultural production is the second main source of livelihood as well as the main source feeding of livestock. The major agricultural crops cultivated are sorghum and maize which are grown under rainfed and irrigated conditions. Sorghum is the principal crop, utilizing approximately 70% of the rain-fed agricultural land. Another 25% of the land is used for maize. Other crops such as cowpeas, millet, groundnuts, beans, and barley are also grown in scattered marginal lands. The annual harvest in Somaliland normally occurs three times a year. The total annual cereal harvest area of Somaliland has been estimated at a hectare 22945 with a total cereal production of 47,904 tons (81% sorghum and 19% maize) in Somaliland [2].

Climate change, natural hazards and crop diversification are subsequently interlinked to rural poverty and food security [3]. Somaliland is one of the food deficit countries in Africa that is highly dependent on imported food than local production. Before 1990, about 3% of the total land mass of Somalia was cultivated, being made up of 1.5 million ha for crops under rainfed conditions and 250,000 ha of irrigated farming [2]. But today, about less than 1.65% of the total land mass of Somalia is cultivated [4]. Most of these lands are cultivated by small-scale farmers. There is no unique and unambiguous definition of small-scale farmers however; different indicators have been identified in order to define it including land ownership, demographic conditions, economic status, and technological factors [5]. The production of maize and sorghum declined from 25,715 tons to 10,856 tons between 2005 and 2009. This reflects a decline of 14,859 tons in five years period or a 57.78% decline over the same period which was equivalent to an 11.56% annual decline in agricultural production. Several factors caused the food production decline in Africa [6].

The major causes of declining agricultural production are climatic patterns, socio-cultural, socio-economic status, and agricultural technologies [7,8]. On the other hand, Feder et al., [9] considered technology adaptation as main factors influencing declining agricultural production. The main reasons for food insecurity and low income are the poverty, illiteracy, natural disaster vulnerability and lack of unemployment opportunities [10]. According to Abdi-Soojeede [11],

both major and minor constraints are faced by Somali farmers. The major constraints include unstable weather, water scarcity, pests damaging, poor transportation, problems relating to land tenure, and ownership, fear of conflict between rebels and government and also there are some people who are looting crops when it harvested. The minor constraints includes inability to access and use seeds and fertilizers, and lack of capital for inadequate investment in irrigation which makes farmers very vulnerable to drought; lack of knowledge and skills, high postharvest crop losses caused by poor storage structures and inadequate access to pesticides, inadequate market access for both crops and vegetable products and unavailability of crop chemicals. Therefore, this study was undertaken to discover the constraints faced by small-scale farmers in the production of major crops which provides direction to agronomists to be aware of the constraints in Somaliland, particularly small-scale farmers faced, and to develop strategies that may positively influence the future challenges of crop production. The main objectives of the study- a) to explore the relationship between selected characteristics of small-scale farmers, and their constraints faced in the production of major crops Sorghum and Maize, and b) to determine the constraints faced by small-scale farmers in the production of major crops Sorghum and Maize.

2. Methodology

2.1 Locale of the study

The study was conducted in the Awdal region under the Borama and Baki district. Most of the small-scale farmers in this area are directly engaged in Sorghum and Maize production activities. The map of Awdal region under the Borama and Baki districts is presented in Figure 1.

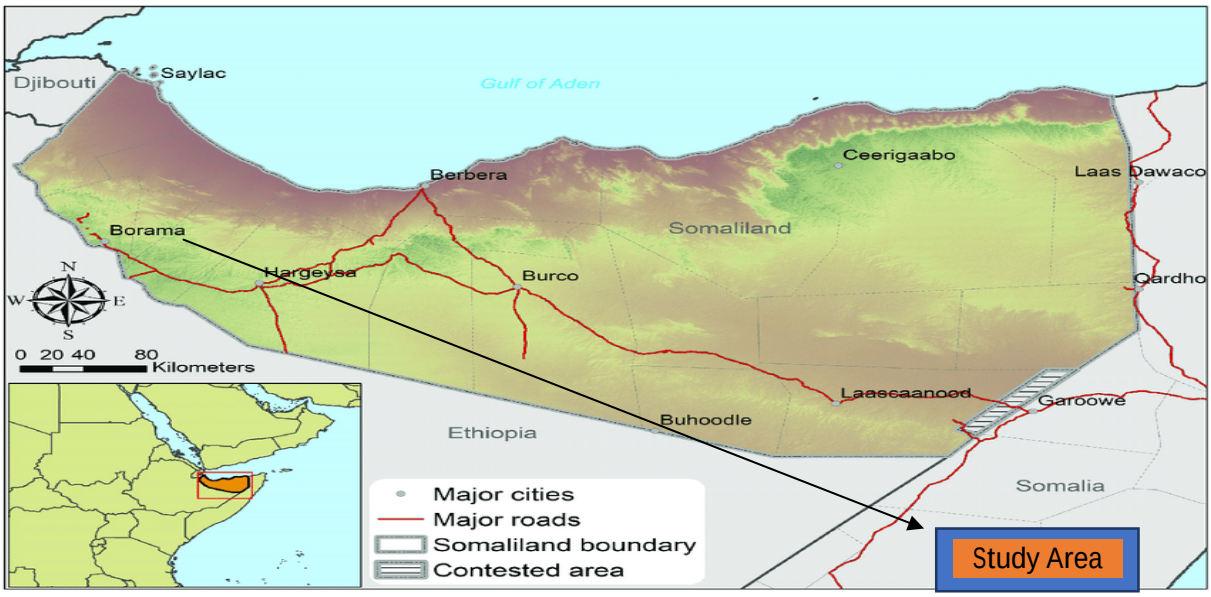

Figure 1. Maps of Somaliland and Awdal region indicating the study area

2.2 Sampling techniques, data collection and analysis

The study was conducted in the Baki and Borama districts of the Awdal region. It was selected purposively among the 15 villages. The villages are well developed and well transport system exists within the districts of the capital city of Awdal region as well as the researcher is well adjusted to the socio-cultural conditions of the villages. That's why it was selected purposively. Among some of the villages of the two districts namely, Sabawanaag, Baki, Tulli, Dilla, and Idhanka were randomly selected for the study. A list of the 920 farmers from 5 villages was prepared with the help of the Ministry of Agricultural Development, Mayors of Baki and Borama districts who are mostly small-scale farmers affected by drought climatic conditions. About 10 percent consisting of 92 farmers were selected by using a simple random sampling procedure as a sample of the study. Data were collected from 1 August to 30 September 2022 by using a structured interview schedule face-to-face interview method. After data collection, data were coded, compiled, tabulated and analyzed in accordance with the objectives of the study. Different descriptive statistical measures such as frequency, number, percentage, mean, standard deviation, and rank order were used for categorization and describing the variables. The analysis was performed using Statistical Package for Social Science (SPSS) computer package.

2.3 Measurement of selected characteristics and focus issue

The selected characteristics of the farmers were age, educational qualification, farm size, land cultivation area, farming experience, annual income, cosmopolites, training received, climate change knowledge, and extension media contact. A constraint-facing scale was constructed to measure the constraints faced by the small-scale in Somaliland which was the focus issue or depended variable. Firstly, twenty-five constraint items of the constraints facing scale were prepared based on [12,13,14,15]. Out of these, the eighteen most important constraints of the small-scale farmers of the study area were finalized in the scale based on pre-test experiences. The farmers were asked to give their opinion on 18 selected constraints which were identified by discussing with the farmers prior to data collection. A four-point rating scale was used for computing the constraint score of a respondent [16]. For each constraint, scores of 3, 2, 1, and 0 were assigned to indicate the extent of constraint faced by the respondents as high, medium, low, and not at all, respectively. The overall constraint-facing score was computed for each of respondent by summing their attained scores. The possible score of the Constraint Facing Index (CFI) for each respondent could range from 0 to 54, where 0 indicates no constraint facing and 54 indicates the highest constraint-facing. Based on the overall constraint-facing scores the respondents were categorized into three groups following the equal distribution of the possible range. Again, the Constraint Facing Index (CFI) was computed using the following formula:

$$CFI = (Ch \times 3) + (Cm \times 2) + (Cl \times 1) + (Cn \times 0)$$

Where CFI = Constraints Facing Index

Ch = Number of respondents mentioned the extent of facing the constraint as high;

Cm =Number of respondents mentioned the extent of facing the constraint as medium;

Cl = Number of respondents mentioned the extent of facing the constraint as low;

Cn= Number of respondents mentioned the extent of facing the constraint as not at all;

The CFI score for each of the constraints could range from 0 to 375, where 0 indicates the lowest extent of constraints and 375 indicates the highest extent of constraints faced by the farmers. Ranking of the constraints was done based on the CFI scores for the constraints. The ranking was done based on the number of citations for each of the suggestions by the respondents.

3. Results and discussion

3.1 Selected Characteristics of the small-scale farmers

The characteristics profile of small-scale farmers such as age, education, farm size, land cultivation area, farming experience, annual income, cosmopoliteness, extension media contact, and training received, and knowledge on climate change were presented in Table 1. The age of the respondents ranged from 20 to 98 years with a mean of 47.34 and a standard deviation of 17.104. Less than half (41.3 percent) of the small-scale farmers were old aged compared to 31.5 percent belonged to the young aged, and only 27.2 percent were middle-aged. The education level of a rural farmer was measured by the number of years of schooling completed in an educational institution. The average of education of the small-scale farmers was 0.51 with a standard deviation of 0.638. Various literatures showed that respondents with higher the educational status increased the access of in agricultural technologies. Education makes people more curious about innovations and literate person always wish to improve the existing condition. Higher educated people are better able to learn and use of new idea and technology [17]. More than half (56.5 percent) of the small-scale farmers where illiterate can't read and write compared to 35.9 percent can read and write only, and only 7.6 percent of the small-scale farmers had a primary education level. Therefore, the majority of small-scale farmers were illiterate can't read and write. The average farm size of the respondents was 1.4953 with a standard deviation of 1.03094. About three-fourths (72.80 percent) of small-scale farmers were under moderately farm size compared to 16.3 percent of small farm size, and only 10.9 percent of very small farm size. So, The Majority of small-scale farmers had small farm size. The land cultivation area of a farmer referred to the total area of land on which his/her family carried out the farming operation, the area being in terms of full benefit to the family. The average land cultivation area of the respondents was 0.7834 with a standard deviation of 0.76263. More than half of 54 percent of small-scale farmers were under moderately small-scale farm size compared to 26 percent of very small farm size, and only 12 percent of small farm size. So, the Majority of the land cultivation area had moderately small farm size. The average farming experience of the fish farmers was 20.62 and a standard deviation of 14.781. Hence, three-fourths 75 percent had medium farming experience compared to 15.2 percent of high farming experience, and only 9.8 percent had low faring experience. The average annual income of the small-scale farmers was 591.41 and the standard deviation of 213.728.

Table 1. Selected profile characteristics of the Small-scale farmers (N=92)

Characteristics (Measurement Unit)	Range		Respondents (n=92)			Mean	SD
	Possible	Observed	Categories	No.	%		
Age (Years)	Unknown	20 - 98	Young (Up to 35)	29	31.5	47.34	17.104
			Middle aged (36-50)	25	27.2		
			Old (above 50)	38	41.3		
Educational Qualification (Years of Schooling)	Unknown	0 – 2	Can't read and write=0	52	56.5	0.51	0.638
			Can read and write =1	33	35.9		
			Primary education=2	7	7.6		
Farm Size (Hectare)	Unknown	.20 – 5	Very small (up to 0.47)	10	10.9	1.4953	1.03094
			Moderately small (0.48 – 2.52)	67	72.8		
			Small farm size (>2.52)	15	16.3		
Land Cultivation area (Hectare)	Unknown	.00 – 3.5	Very small (up to 0.47)	26	28.3	.7834	0.76263
			Moderately small (0.48 – 2.52)	54	58.7		
			Small farm size (>2.52)	12	13.0		
Farming experience (Years)	Unknown	3 – 70	Low (up to 6)	9	9.8	20.62	14.781
			Medium (7-35)	69	75.0		
			High (>35)	14	15.2		
Annual Income (Dollar)	Unknown	300-1430	Low (up to 377)	11	12.0	591.41	213.728
			Medium (378-805)	70	76.1		
			Hight (>805)	11	12.0		
Cosmopoliteness (Score)	0-5	1 – 5	Low (up to 2)	85	92.4	1.33	0.786
			Medium (3-4)	6	6.5		
			High (>4)	1	1.1		
Training received (Days)	0- 12	0 – 12	Low (up to 4)	74	80.4	1.62	2.851
			Medium (5-8)	15	16.3		
			High (>8)	3	3.3		
Knowledge on Climate change (Score)	0 – 32	10 – 32	Low (up to 14)	20	21.7	19.90	6.214
			Medium (15-26)	57	62.0		
			High (>26)	15	16.3		
Extension Media Contact (Score)	0 – 5	0 – 5	Low (up to 1)	66	71.7	1.48	0.908
			Medium (2-3)	20	21.7		
			High (>3)	6	6.5		

Note: SD= Standard Deviation

About three-fourths 76.1 percent of the small-scale farmers had medium income compared to 12.0 percent had low income, and only 12.0 percent of the small-scale farmers had a high income. The average Cosmopoliteness of the small-scale farmers was 1.33 and standard deviation of 0.786. Therefore, the majority of small-scale farmers 92.4 percent had low Cosmopoliteness compared to 6.5 percent had medium Cosmopoliteness, and only 1.1 percent had high cosmopoliteness. The average Training received of the small-scale farmers was 1.62 and a standard deviation of 2.851. It was found that more than the Majority of the respondent's 80.4 percent had law training received compared to 16.3 percent who received medium training short-term duration training, and only 3.3 percent had high duration training in good agricultural practices. The average knowledge score of the respondents on climate change was 19.90 with a standard deviation of 6.214. it was found that more than half of the respondent 62.2 percent had medium knowledge of climate change compared to 21.7 percent had low knowledge of climate change, and only 16.3 percent had high knowledge of climate change issues like drought, and floods. The extension media contact means score of the small-scale farmers was 1.48 and the standard deviation of 0.908. The Majority of the respondent's 71.7 percent had low extension media contact compared to 21.7 percent had medium extension media contact, and only 6.5 percent had high extension media contact.

3.2 Relation between characteristics and constraints faced by the small-scale farmers

Relationship between characteristics and constraints faced by a small-scale farmer in the production of the major crops Sorghum and Maize. The relationships between the selected characteristics and the focus issue were computed by using Pearson's product-moment correlation coefficient (r). The coefficient of correlation (5.00 percent level) was used to test the null hypothesis (Table 3). Five out of the ten selected characters of the farmers namely education, cosmopoliteness, training received, knowledge of climate change, and extension media contact showed a positive significant relationship with the constraints faced by the farmers, in contrast, farm size, land cultivation area, and annual income showed a negative significant relationship. The rest of the characteristics such as age and farming experience did not show any significant relationship with the constraints faced by the farmers.

Table 2. Relation between selected characteristics and constraints faced by the small-scale farmers

Focus issue	Select Characteristics	Pearson correlation coefficient (r)
Constraints faced by the small-scale farmers in Somaliland	Age	-0.172
	Education	0.318**
	Farm size	-0.207*
	Land cultivation area	-0.234*
	Farming experience	-0. 071
	Annual income	-0.221*
	Cosmopoliteness	0.274**
	Training received	0.227*
	Knowledge of climate change	0.205*
	Extension media contact	0.283**

Correlation is significant at 0.01 level (2-tailed);
Correlation is significant at 0.05 level (2-tailed).

3.3 Overall constraints faced by Small-scale farmers in the production of Sorghum and Maize

The computed scores of the constraints faced by the farmers ranged from 28 to 42 with a mean of 36.36 and standard deviation of 2.663. Based on the observed scores, the distribution of the respondents has been presented in Table 1. The results presented in Table 1 reveal that the highest proportion of the farmers (65.2 percent) faced medium constraints, while 22.8 percent and 12.0 percent of them faced low and high constraints, respectively. Majority of the farmers in the selected area faced medium constraints for the production in major crops Sorghum and Maize. This shows that there exist a good number of constraints that could result in food insecurity in the selected area. These findings are more or less similar found by [11, 16].

Table 3. Distribution of farmers according to the extent of constraints (N=92)

Range		Categories	Respondents		Mean	Standard deviation
Possible	Observed		Frequency	Percent		
0 –54	28 – 42	Low (up to 34)	21	22.8	36.36	2.663
		Medium (35-39)	60	65.2		
		Hight (>39)	11	12.0		

3.4 Rank order of the constraints faced by Small-scale farmers in production of Sorghum and Maize

For getting a better understanding of the severity of the selected constraints faced by small-scale farmers in the production of the major crops' sorghum and maize, it is necessary to conduct a comparative analysis of the constraints. For this purpose, the determination of the extent of constraints faced by the small-scale farmers was identified as high, medium, low, and not at all, and based on their responses; then the constraint-facing indices were calculated for 18 selected constraints. The extent of constraints faced by the small-scale farmers considering the Constraint Facing Index (CFI) values along with their rank order has been presented in Table 4.

Results of Table 2 indicated that the 'attack of diseases and pests in crop field' (CFI 276) is found to be the major constraint faced by small-scale farmers in the production of major crops sorghum and maize. Plant pests and diseases affect food crops, causing significant losses to farmers and threatening food security [18]. The spread of plant pests and diseases has increased dramatically in recent years. Globalization, trade, and climate change, as well as reduced resilience in production systems due to decades of agricultural intensification, have all played a part in this. Plant pests and diseases can easily spread to several countries and reach epidemic proportions Outbreaks, and upsurges can cause huge losses to crop and pastures, threatening the livelihoods of vulnerable farmers and the food and nutrition security of millions at a time [19]. Expectedly, similar results and arguments were also presented by [17, 14].

The second top-ranked constraint faced by the farmers is "Crop damage due to natural Calamities such as drought" (CFI 275). Disasters can occur in isolation, in triggered consecutiveness or in simultaneous combination, with mutually magnifying effects. Such emergencies pose serious challenges to agricultural production and food security [20]. The farmers face flood which affects their crops miserably and directly affects their level of food security [18]. The loss of crops and livestock often results in severe household food shortages and psychological stress and insecurity among the affected people. The seasonal rainfall failure (meteorological drought) is largely due to climate variability and its impact results in widespread failure of seasonal crops, pasture, and forage and massive death of livestock in pastoralist areas, and widespread hunger among the affected population. According to [21], recurrent drought shocks, causing severe harvest failure and loss of livestock, have adverse impacts on immediate

consumption as well as long-lasting effects (poverty persistence) on household livelihoods. Third-ranked constraint faced by the farmers was “Declining soil fertility” (CFI 273). The fertility continued to decline due to continuous cropping (abandoning of following), reduced manure application, removal of crop residues and animal dung for fuel wood, and erosion coupled with low inherent fertility of the soils. Soil fertility depletion is the fundamental cause of declining per capita food biomass, especially in developing countries [22]. The fourth-ranked constraint faced by the farmers was “Lack of market access” (CFI 264). Smallholder farmers often lack access to profitable, value-added markets. In the absence of critical supporting functions – such as infrastructure and service provision – farmers struggle to shift from subsistence and barter to more productive forms of exchange. Chowdhury et al., [23] give several reasons for the lack of market information as a barrier to market access, resulting in ineffective market participation by smallholder farmers. Firstly, the reliability of information may vary over time. Information that was once correct may become outdated. Secondly, collecting relevant information for production and marketing may involve costs. Thirdly, smallholder farmers may be unable to process the information gained to suit their situation [23]. In most cases smallholder farmers do not have sufficient knowledge to process the available information correctly [23]. This is due to low literacy levels amongst smallholder farmers in rural areas that inhibit record keeping [24]. The fifth-ranked constraint faced by the farmers was the “Absence of adequate infrastructure” (CFI 254). Access to adequate infrastructures such as roads and transport can contribute positively towards agricultural growth. According to Randela [25], rural communities have access to a poorly maintained road network. In rainy seasons the roads are often impassable, and this has a negative impact on farmers as their products have to be transported from the farm to the consumers. The study also highlights that farmers suffer post-harvest losses due to a lack of storage facilities. Insects have easy access to harvested crops, and this can result in the loss of agricultural produce. This is a setback in efforts aimed at reducing levels of poverty, as income is lost by farmers.

Table 4. Rank order of selected constraints faced by the farmers

Sl. No.	Constraints	Not at all	Low	Medium	High	CFI*	Rank Order
Economic							
1.	Lack of money or necessary fund	6	9	43	34	197	7th
2.	Insufficient credit support	3	9	61	19	188	9th
3.	High cost of production	9	7	44	32	191	8th
4.	High price of food items	3	35	26	28	171	12th
Social							
5.	Lack of co-operation from familymembers	44	40	8	0	56	18th
6.	Rapid population growth	24	53	9	6	89	17th
7.	Lack of employment	3	21	44	24	181	10th
Natural							
8.	Crop damage due to natural Calamities such as drought	0	0	1	91	275	2nd
9.	Attack of diseases and pests in crop field	0	0	0	92	276	1st
10	Declining soil fertility	0	0	3	89	273	3rd
Marketing of produce related							
11.	Lack of market access	0	4	4	84	264	4th
12.	Absence of adequate infrastructure	0	5	12	75	254	5th
Input related							
13.	Inadequate of farm tools and equipment	4	7	75	6	175	11th
14.	Lack of irrigation water in dry Season	12	16	59	5	149	14th
15.	Unavailability of quality seed	3	5	5	79	252	6th
Technological							
16.	Lack of storage/processing facilities	6	78	4	4	98	16th
Information access							
17.	Lack of information related to food and nutrition	10	67	9	6	103	15th
18.	Lack of contact with communication media	10	18	57	7	153	13th

CFI*= Constraint Facing Index

4. Conclusion and Recommendations

The study concludes that the majority of the small-scale farmers had faced medium constraints in the production of major crops sorghum and maize. But there remain a legit percentage of farmers facing high constraints which reduces agricultural production and engraves the food insecurity condition. So, to reduce the constraints faced by small-scale farmers it could be concluded that different agricultural extension organizations should provide the necessary support (like training, providing agricultural inputs, training good agronomic practices, farmer field schools, motivational tours, field days, campaigns, etc.) Five out of the ten selected characters of the farmers namely education, cosmopoliteness, training received, knowledge of climate change, and extension media contact showed a positive significant relationship with the constraints faced by the farmers, Therefore Somaliland government, NGOs and partners working in agricultural should focus on and sustain offering practical training on new technologies and best practices on specific crops contingent on their economic importance to help farmers develop modern production knowledge and skills and thereby reduce crops loss, increase their yield and annual net income per hectare. In addition, findings indicate that more than half of the respondents can't read and write. So, it could be concluded that more non-formal education like mass education is needed in the study area. Moreover, 'attack of diseases and pests in crop field', 'Crop damage due to natural Calamities such as drought", and Declining soil fertility were the top-ranked constraints. The study suggests that these constraints need to be solved to ensure food security and increase agricultural production in Awdal Region, Somaliland. For this purpose, the Ministry of Agricultural Development should consider training small-scale farmers in the highest level of competence for all three areas of pest management practices tested (pest identification, pesticide management, and IPM principles). The government and policymakers should also provide farmers with a drought-resistant crop variety, early maturely seeds, and locally adapted seeds, and increase farmers' capacity and knowledge for better preparing drought coping strategies and reducing the risk of climate vulnerabilities.

5. CONSENT

As per international standards, respondents' opinions have been collected and preserved by the author(s).

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