

Contact Details

Tel office: +264 61 379 500
Fax office: +264 61 22 5371
E-mail: nabdesk@nab.com.na
Website: www.nab.com.na

Physical address:

Agricultural Boards' Building
30 David Hosea Merero
Road
Windhoek
Namibia

Postal address:

PO Box 5096
Ausspannplatz
Windhoek
Namibia

A world-class regulator of a vibrant, diversified and sustainable crop industry

AN OVERVIEW OF THE SORGHUM VALUE CHAIN IN NAMIBIA

ABSTRACT

It is expedient to analyse and understand the current status quo of sorghum crop production and marketing activities in Namibia to develop a sustainable and functional sorghum value chain in Namibia. Thus, the Namibian Agronomic Board conducted a value chain analysis study aimed at defining the production area and quantifying the current status quo of sorghum crop production, storage, value addition, and marketing in Namibia; and identifying sorghum value chain actors and their respective functions. The study deployed a quantitative research questionnaire survey method coupled with qualitative questionnaires to collect data from sorghum producers, traders, and other value chain actors. A total of 70 respondents comprised of producers (57), traders (6), and input suppliers (7). This sorghum study comprehensively covered five (5) Namibian Agronomy and Horticulture production zones namely: Central, Karst, Kavango, Zambezi, and North Central. Out of these five (5) production zones, the study included producers, traders, and input suppliers from nine (9) crop-growing regions of Namibia; Omusati, Oshana, Ohangwena, Kavango West, Kavango East, Zambezi, Oshikoto, Otjozondjupa and part of Kunene Region. At least 8 respondents from each of the selected crop-growing regions were interviewed as a representative sample. Collected data were analysed using the descriptive statistical analysis method in Microsoft Excel and the value chain mapping model was applied to present the overall results of the study. The study results revealed that the Namibian sorghum sector is faced with various challenges which include low production volumes, less area under sorghum cultivation, and lack of improved varieties, a lack of value addition and, poor market accessibility. Therefore, the study recommends the Namibian Agronomic Board facilitate the national identification and consequent registration of all sorghum producers, traders/processors, and input suppliers nationwide, and related production and marketing data should be collected to establish accurate baseline information for necessary socio-economic development purposes.

Keywords: Sorghum, Value Chain, Production, Market, and Development

1. INTRODUCTION

Sorghum (*Sorghum bicolor* /L./ Moench) is well adapted to the Namibian weather conditions due to its tolerance ability to drought and high temperatures and its successful cultivation in climates that are too dry for maize production. Although sorghum is not formally marketed at a satisfactory scale in Namibia mainly due to low production, the crop is well adopted under the Namibian soil and climatic environments. It is believed that given the ability of sorghum crops to withstand drought, harsh weather conditions, and varieties of end-use diversified food products (Srinivasa *et al*, 2014), sorghum genetically possesses the right traits to be introduced into the Namibian harsh environment and eventually into the Namibian formal crop market (as a controlled crop). Sorghum is an important cereal food with tolerance and resilience to climate change and responsiveness to climate variability. Therefore, it may be important for food security in the Namibian dry climate and has the potential to be a staple cereal crop in Namibia. Table 1 shows the annual average local production, local consumption, import, and export of sorghum from 2015 to 2019.

Table 1: Namibia Sorghum production, consumption, import and export – average tonnage, 2015 - 2019

Quantity in tonnage	Years					Average
	2015	2016	2017	2018	2019	
Local production (grains)	1,700	1,500	2,800	4,000	400	2,080
Local consumption (grains)	3,124	6,133	4,011	5,794	4,729	4,758
Import (products)	1,424	4,633	1,211	1,794	4,329	2,678
Export (products)	2.4	0.2	1.8	0	0.3	1

Source: NSA, 2019

Despite the good adaptability of the sorghum crop on the Namibian soil, there has been a decline in overall local production during 2015 – 2019, recording an average production of 2,080 tons/annum (Table 1). However, there has been a high demand for sorghum in the Namibian market with an average annual consumption of about 4,758 tons/annum. Table 1 further shows that there has been a very high reliance on the importation of sorghum products, averaging 2,678 tons/annum with a minute of sorghum product exports, averaging 1 ton/annum.

Therefore, the Namibian Agronomic Board conducted a study to analyse the sorghum value chain in Namibia aiming at promoting local production and marketing.

2. METHODOLOGY

A total of 70 respondents comprised producers (57), traders (6), and input suppliers (7) with at least 8 representatives from each of the selected crop-growing regions were interviewed. The data was analysed using Microsoft Excel and Word, to formulate descriptive analysis.

3. RESULTS AND DISCUSSIONS

3.1. Demographic

Sorghum production is predominantly operated by women and the elderly group. The results show that 70% of sorghum producers are female. Moreover, the majority of sorghum producers in Namibia are above 60 years of age which accounts for 33%, while youth under the age of 30 represent 7% only.

3.2. Sorghum production and output information

3.2.1. Land under sorghum cultivation

Overall farmers allocate a total area size ranging from 0.5 ha to 1500 ha for crop production, averaging 33 ha per producer. However, on average farmers allocate land ranging from 1 to 2.5 ha for sorghum cultivation. Figure 1 shows the average area size (ha) allocated for sorghum cultivation per farmer per production zone in Namibia. Results depict that on average producers in the KARST production zone, allocate the highest area size of 2.5 ha per farmer for sorghum production followed by Zambezi and North Central with 2.1 ha each while Kavango recorded the lowest land allocation for sorghum cultivation with 1. ha per farmer.

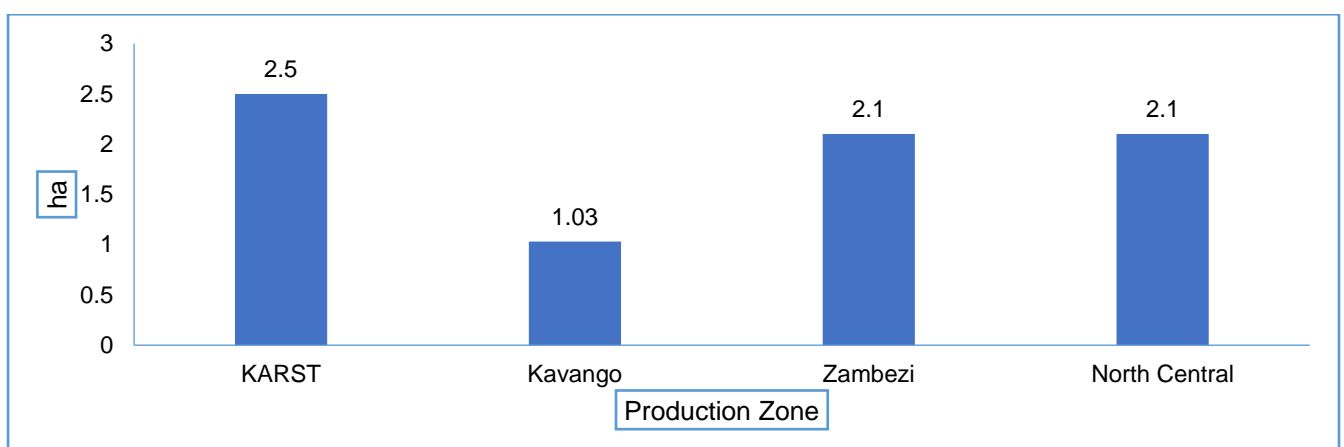


Figure 1: Average area size (ha) under sorghum cultivation per producer in each production zone

3.2.2. Seed production and supply system

The study reveals that the Namibian sorghum seed production and supply system is underdeveloped with few ha of land devoted to sorghum seed production and low supply output of improved quality sorghum seeds. There are only a few seeds or input suppliers who are accredited and supply certified sorghum seeds. The majority of source seeds are locally dominated by landraces varieties.

3.2.2.1. Land size under seed production

On average, seed growers devote land size of 2 ha per producer for sorghum seed production with average productivity ranging from 0.5t/ha to 1t/ha. On estimate, a total harvest of 2 tonnes per seed producer can be attained per season. On average estimation, 6 tonnes of seeds are sold per retailer or input distributor per annum.

The only present sorghum seed growers are registered through the Ministry of Agriculture, Water and Land Reform (MAWLR), Northern Namibia *Farmers Seed Growers* (NNSGC), and Namibia Agricultural Mechanisation and Seed System Improvement Project (NAMSIP) thus, financing mechanisms are through a government subsidy scheme and most of the sorghum seed growers are located in the North Central production zone of Namibia. North Central dominates seed production with an average of 8,000 kg yield per annum as the majority of sorghum seed growers are located in that production zone. It is worth noting that the high production of sorghum seeds comes from government research stations such as Okashana and Omahenene in North Central and Bagani in Kavango.

3.2.2.2. Seed sources and varieties

The present study results reveal that sorghum seed producers (mainly registered seed growers) source foundation seeds from either the MAWLR, NAMSIP, or NNFSG for sorghum planting. The results demonstrate that there is a need for improvement in sorghum seed production in Namibia as compared to other cereal crops where farmers can easily find numerous improved seed varieties available for cultivation.

Red sorghum and Macia and local landraces are the most common sorghum varieties planted by local producers at an average seeding rate of 9.6kg/ha, although some producers use few quantities of 2kg/ha while others use more seeds of up to 40kg/ha. Red sorghum is commonly used in traditional beer and beverages. Macia, the white sorghum is mainly popular in flour making at the household level using traditional milling methods.

3.2.2.3. Improved seeds and seed sources

Figure 2 shows sorghum farmers' utilisation of certified seeds in comparison with traditional seed varieties in Namibia. Results depict that 58% of grain producers use uncertified seeds from the informal market or previous harvest for planting. While, 42% use certified seeds and these are registered sorghum seed growers who source improved seeds from government suppliers such as MAWLR, NAMSIP, and NNFSGC. Sorghum production in Namibia is currently limited to household use only, cultivated under rainfed farming.

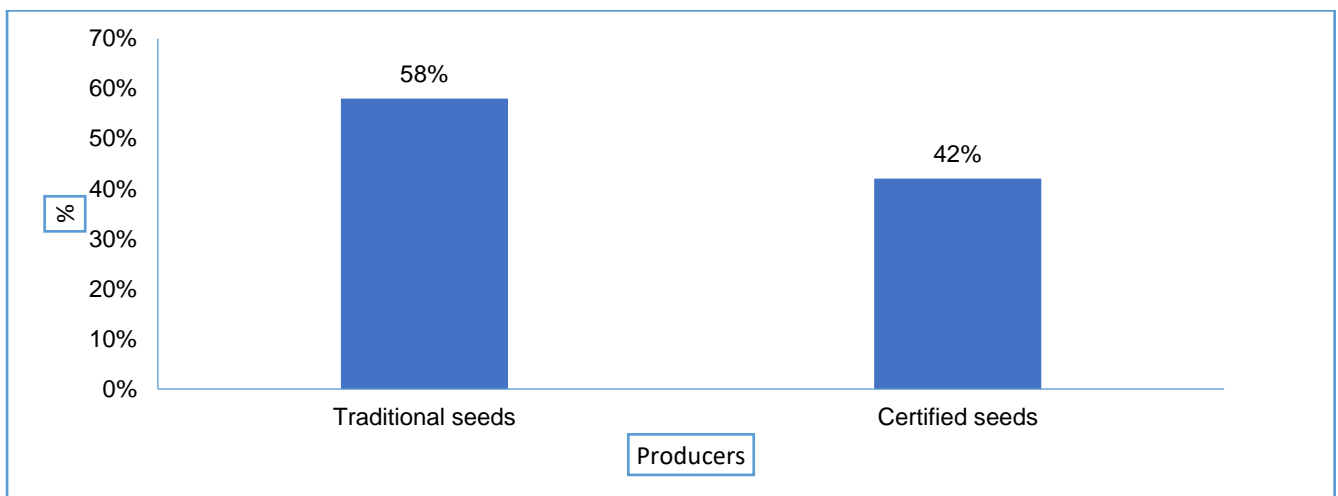


Figure 2: Farmers' proportion on utilisation of certified seeds versus traditional seeds

It can be deduced that there are limited options (varieties) through which sorghum smallholders acquire improved sorghum varieties of assured quality. Currently, farmers buy seeds from unaccredited suppliers such as informal markets and vendors, this is a common practice with most 'orphan crops' such as cowpea (Gerrano et al., 2022).

3.2.2.4. Input suppliers on seed production

The study results reveal that seeds and inputs are sourced locally of which seeds are sold at an average price of N\$10.25 per kilogram. Few registered seed growers are affiliated with MAWLR/NNSSGC and NAMSIP. The registered seed growers receive foundation seeds from accredited sorghum breeders and multiply these seeds to produce certified seeds which are then sold to the public, all sorghum producers. However, due to high demand these certified seeds are always not enough for the majority of sorghum producers.

3.2.3. Sorghum grain production in Namibia

3.2.3.1. Land size under sorghum production

Small-scale producers in communal area set-ups allocate a small portion of land for crop cultivation averaging only 3.5 ha per producer in comparison to large-scale producers in commercial set-ups who on average devote up to 33 ha for crop cultivation per producer. Out of this cropland allocation, sorghum occupies less than 40% of the total cropland per producer. Whereby most crop producers intercrop sorghum with staple crops such as maize or pearl millet. Very few farmers allocate up to 100% of cropland to sorghum cultivation. Table 2 shows land allocated for crop activities and proportion allocation for sorghum cultivation purposes as per production zone.

Table 2: Average cropland under sorghum cultivation in each production zone

	Total average area (ha) planted	Average cropland (ha) under sorghum cultivation	Land allocation percentage for sorghum (%)
Kavango	4	1	25
Zambezi	9	3	33
North Central	7	2	29
Central	758	7	1
KARST	2	0.6	30

Results show that less than 33% of cropland is allocated to sorghum cultivation. The Zambezi production zone recorded high percentages of cropland allocated to sorghum production while the Central production zone recorded the lowest land allocated for sorghum production.

In absence of a well-established market that is accessible by local sorghum producers has negatively attributed to small land size allocation for sorghum cultivation. According to Wanga *et al.*, (2018), numerous issues have been attributed to the declining area under sorghum in the past two decades in Namibia; lack of market for sorghum grain as compared with maize, pearl millet, and wheat (controlled crops).

3.2.3.2. Production tonnage volume and productivity

Present study results established that sorghum productivity per unit area in Namibia is approximately 400 kg per ha, these findings are in line with the study by Deb *et al.*, (2004). However, the lowest sorghum yield of 63 kg per ha and the highest yield of 1000 kg per ha were recorded by the present study respondents. According to Deb *et al.*, (2004), the global sorghum's average yield ranges from 2000 kg to 12 000 kg per ha. Figure 3 shows the sorghum's average yield per ha per production zone in Namibia.

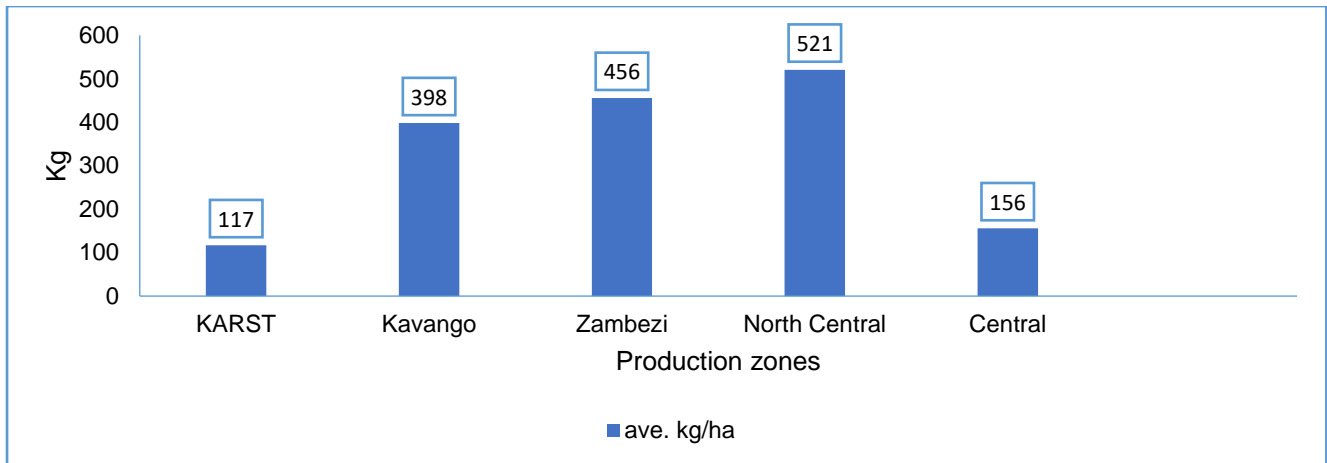


Figure 1: Average sorghum productivity, yield per ha produced per production zone, current study.

The results show that North Central has high average productivity of 521 kg/ha followed by Zambezi with 456 kg/ha while Karst recorded the lowest yield with only 117 kg/ha. A total yield of 970 kg to 2000 kg per farmer per season has been reported.

Table 3 shows national sorghum production and productivity (yield per ha) over 3 years period from 2017/18 to 2021/22.

Table 3. National sorghum productivity average over 5 year period

Year	2021/22	2020/21	2019/20	2018/19	2017/18	Average
Production (t)	6 100	8 200	7 100	400	4 000	5 160
Area (ha)	29 402	36 800	22 004	29 000	36 000	30 641.2
Yield (t/ha)	0.207	0.222	0.322	0.013	0.111	0.175

(Source: Wanga et al., 2018; Crop Prospects and Food Security Situation Report-MAWLR, 2022)

According to the study by Wanga et al., (2018), as displayed in Table 3, an average sorghum grain production of 0.175 t/ha is attained, which is slightly lower than the established average yield of 0.329 t/ha as per the present study. According to Knnoema, 2022 over 1 tonne per ha of sorghum grains can be attained in Namibia.

Figure 4 shows the average total sorghum production produced per farmer per season in each production zone.

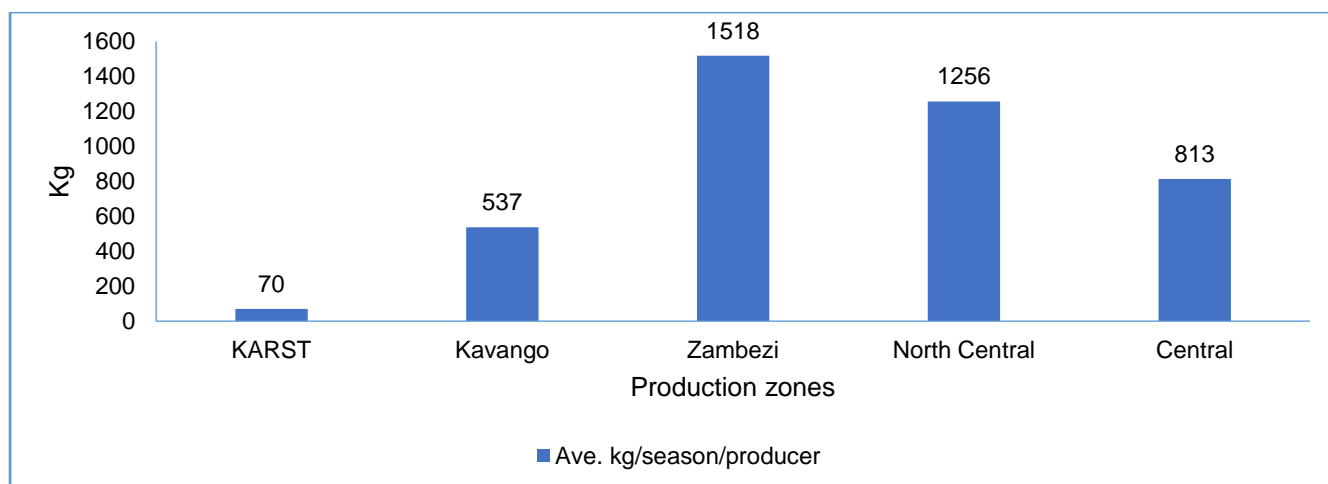


Figure 2: Average total sorghum production produced per season by a single farmer in each production zone

Zambezi recorded the highest total production per season per farmer with 1 518 kg/ha while Karst recorded the lowest average total production of 70 kg/ha. There are no technological practices currently carried out in Namibian sorghum cultivation as the majority of producers practice traditional cultivation methods. Sorghum is currently produced under rainfed in Namibia.

3.2.3.3. Fertiliser application and input supply

Table 4 shows the application of different types of fertilisers by sorghum producers per production zone. Overall fertiliser application rate among Namibian sorghum producers is very low. Organic fertiliser is the most commonly applied fertiliser by the majority of farmers who constitute 73% of the producers' population (Table 4).

Table 4: Application of different types of fertilisers by sorghum producers per production zone

Production Zone	Type of fertiliser		
	Organic	Inorganic	Mixed
North Central	67%	25%	8%
Kavango	69%	19%	12%
Zambezi	91%	9%	0%
Karst	67%	33%	0%
Central	50%	0%	50%

Table 4 shows that inorganic fertiliser is among the least applied types of fertilisers. Only a few local sorghum producers apply inorganic fertilisers in their sorghum crop fields representing 19% of the total sample population. While over 74% of sorghum producers use organic fertiliser mainly kraal manure, and about 7% of sorghum producers apply mixed, both organic and inorganic fertilisers. It is worth noting that overall fertiliser is applied at a very low quantity of insignificant rate. There is limited

access to input markets by smallholder, sorghum farmers. The main input suppliers are located in urban setups far from farmers hence, transport expenses with a significant impact on production costs are incurred.

Furthermore, the types of fertiliser applied differ amongst production zones. In Zambezi, Kavango, North Central and Karst production zones organic fertiliser is the most popular applied type of fertiliser with high representation of 91%, 69%, 67%, and 67% respectively while in the Central production zone, only 50% of sampled farmers apply organic fertiliser while the remaining 50% apply mixed fertilisers. Low application of chemical (inorganic) fertiliser could be linked with high fertiliser cost on affordability by farmers while organic fertiliser is readily available and accessible.

3.2.3.4. Cost of Production

In this study production costs were established in terms of the economic compensation required by the farmer to grow sorghum crops and therefore include not only the cost of cultivation but also the transport costs to the nearest market which are often omitted in production cost calculations. However, it was also observed that most of the local sorghum producers do not have proper or updated economics records, thus, the obtained information is per farmers' responses on the cost estimates (including; seed cost, land preparation, fertilizers and application, weeding, harvesting, storage and transport cost).

Table 5 shows farmers' perception of sorghum production affordability while figure 5 shows the estimated average sorghum production cost per hectare per production zone in Namibia.

Table 5: Farmers' response to the perception of sorghum production affordability

AFFORDABLE	EXPENSIVE
87.8%	12.2%

Results depict that the majority of farmers (87.8%) believe that sorghum production is affordable. However, 42.8% of sorghum producers don't have production cost records which makes it difficult to determine the exact sorghum production cost.

Figure 5 shows the average production cost per ha in each production zone.

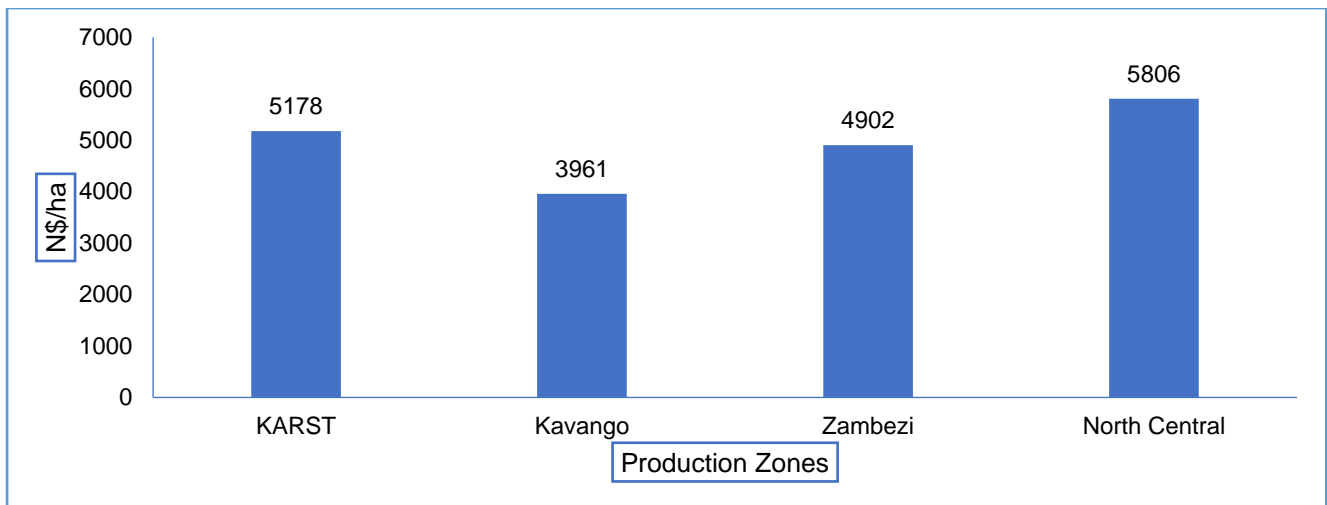


Figure 3: Sorghum average production cost per ha of each production zone

Figure 5 results indicate that the average sorghum production cost per ha ranges from N\$3 961/ha to N\$5 806/ha, as per the findings on average sorghum production cost is estimated roughly at N\$5 046 per ha across all production zones. Kavango production zone recorded the lowest average production cost of N\$3 961/ha while North Central recorded the highest average production cost of N\$5 806/ha.

3.3. Regulatory compliance and government protection

3.3.1. Registration and usage of certified seeds

Figure 6 shows Farmers' Awareness of Namibia's Seed and Seed Varieties Act No. 23 of 2018.

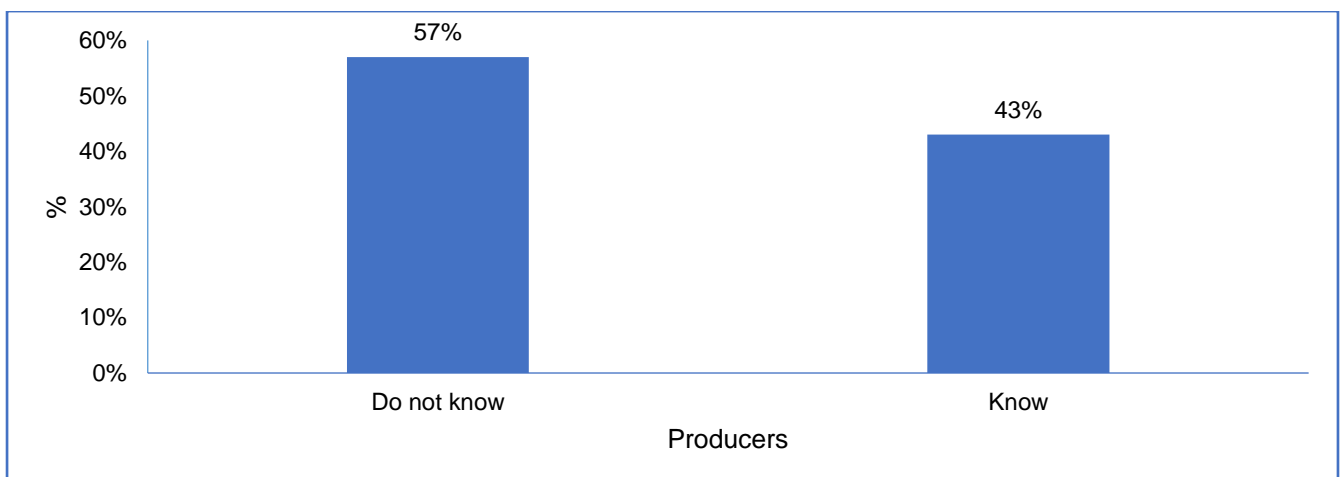


Figure 4: Farmers' Awareness of Namibia's Seed and Seed Varieties Act No. 23 of 2018

Figure 6 reveals that the majority of sorghum seed producers are not aware of Namibia's Seed and Seed Varieties Act No. 23 of 2018. Results show that 57% of sorghum producers are not aware of Namibia's Seed and Seed Varieties Act and only 43% are aware of the Act. Most input suppliers are

agent distributors. Only the Ministry of Agriculture, Water, and Land Reform through the Crop Research Stations namely Omahenene, Okashana, Mannheim, and Bagani with a few participating seed growers who are currently producing certified sorghum seeds and selling to the local farmers through seed cooperatives. Figure 7 shows the Seeds/inputs suppliers' registration status as per the production zone.

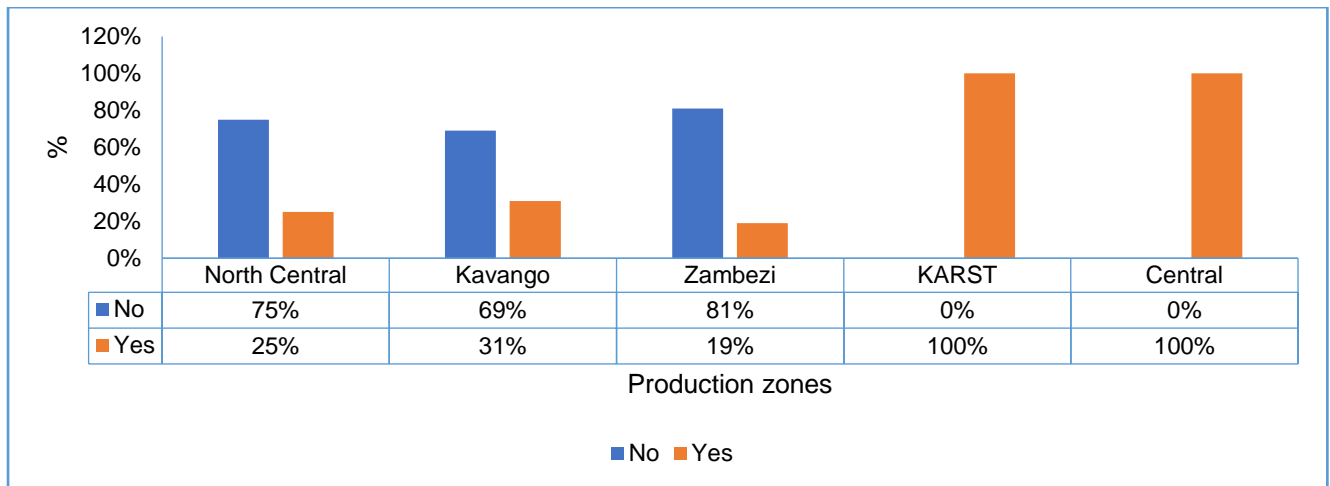


Figure 5: Seeds/inputs suppliers registration status as per production zone

Results indicate that in the Zambezi production zone inputs/seeds suppliers are not registered sorghum seed suppliers accounting for 81% of the total sampled farmers in that production zone followed by North Central and Kavango with 75% and 69%, respectively. However, 100% of sorghum seed growers in Karst and Central production zones are registered with NAMSIP, these are the sorghum seed growers under NAMSIP programs through the Ministry of Agriculture, Water and Land Reform. Figure 8 below shows a certified sorghum system as per the production zone.

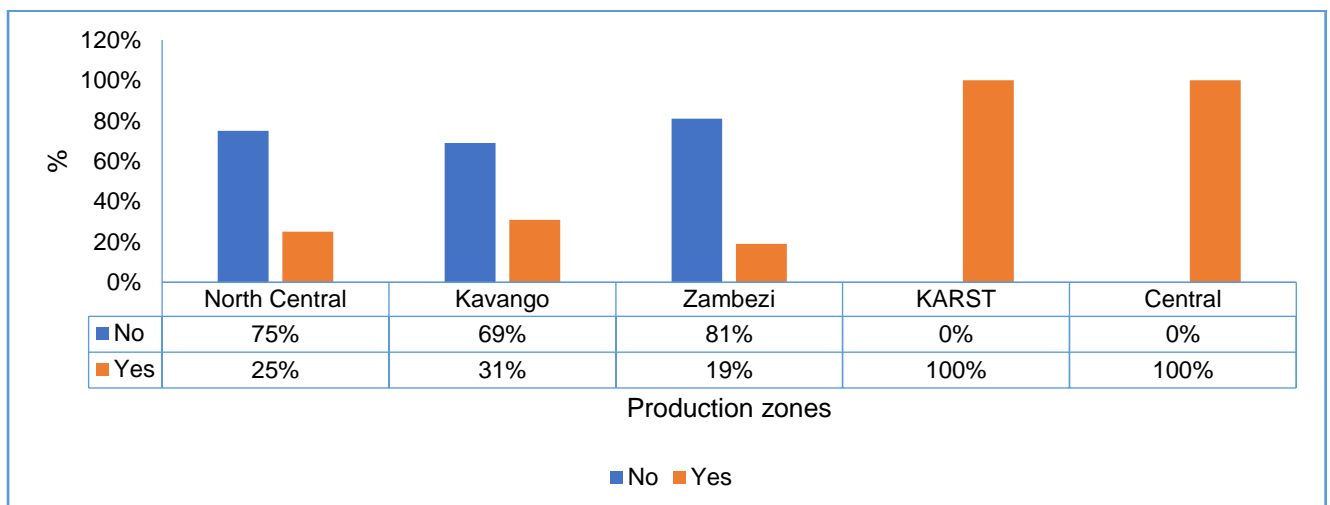


Figure 6: Certified sorghum system as per production zone

Figure 8 indicates that in the Zambezi production zone sorghum producers do not use certified sorghum seed accounting for 81% of the total sampled farmers in that production zone followed by North Central and Kavango with 75% and 69%, respectively. However, 100% of sorghum producers in the Karst and Central production zones use certified seeds from NAMSIP programs through the Ministry of Agriculture, Water, and Land Reform.

3.3.2. Grain food safety system

Figure 9 below shows Sorghum grain safety practices by input suppliers and producers

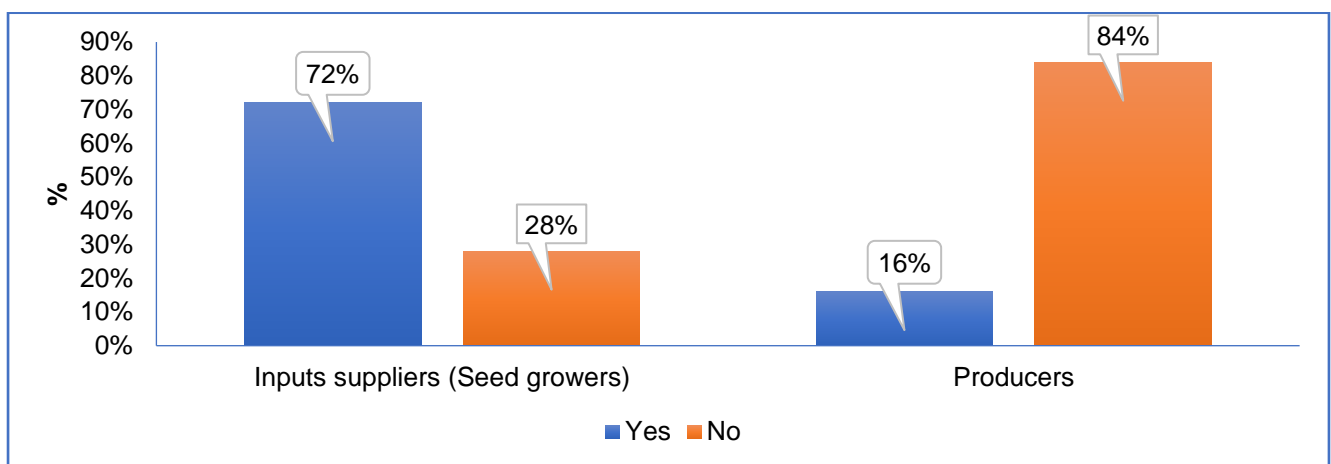


Figure 7: Sorghum grains safety practices by inputs suppliers and producers

Figure 9 shows that the majority of seed suppliers follow certification processes such as Good Agricultural Practices (GAP), phytosanitary and traceability as well as other quality aspects such as screening and grading. Present study results reveal that 72% of seeds/inputs suppliers (seed growers) follow the food safety certification process and only 28% of input suppliers do not practice the food safety certification process. On the other end, the majority of sorghum producers do not practice food safety processes in their production systems, there is no quality standards procedure currently in place. Over 84% of sorghum producers do not have any food safety system, and only 16% are confirmed to have a food safety system in place. Figure 10 shows results on food safety and certification systems as per production zone.

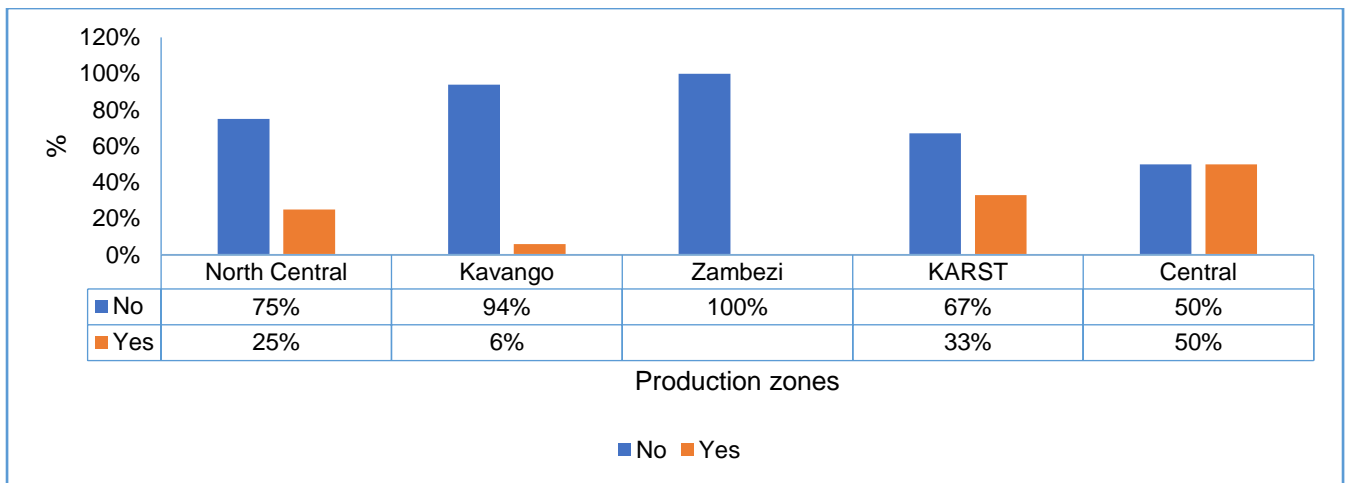


Figure 8: Food safety and certification system as per production zone

Results depict that in the Zambezi production zone, all (100%) of the sampled sorghum grain producers do not practice food safety systems or use certified seeds followed by Kavango and North Central with 94% and 75%, respectively. This demonstrates that the food safety and certification process is poorly practised among local sorghum producers in Namibia.

3.3.3. Government sorghum industry protection

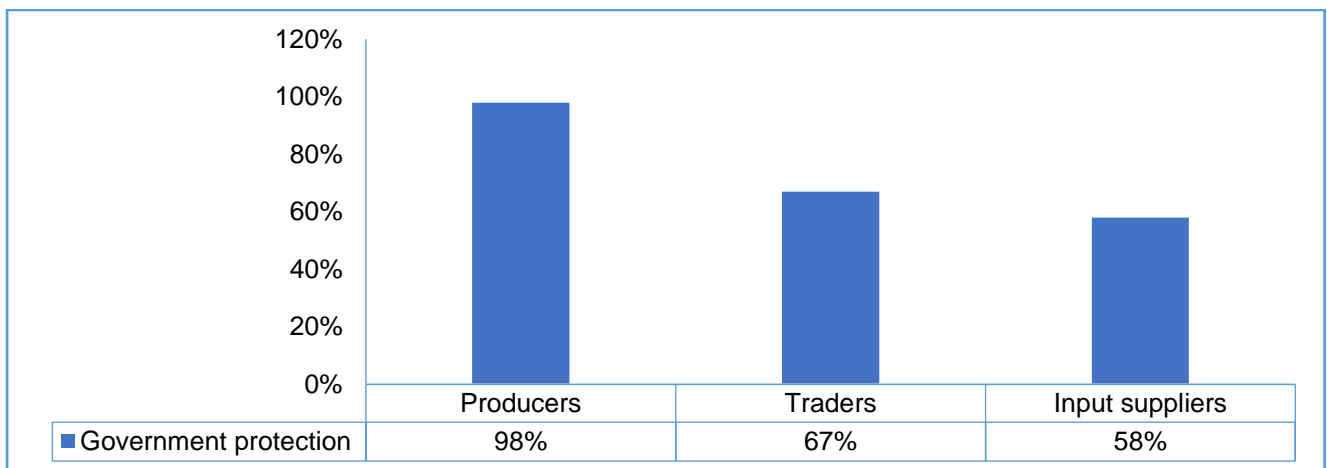


Figure 9: Number of different value chain actor's plea for government sorghum industry protection

Figure 11 reveals that almost at every sorghum value chain stage various actors plea for government sorghum industry protection. Whereby over 98% of the sorghum producers plead to the government for market protection and price regulation mechanisms and over 67% of traders/processors plead for government protection on minimising imports and promoting an organised farming system among local sorghum producers to ensure a consistent and quality supply of sorghum commodities as well as regulation of price within the sorghum value chain stages. On the other hand, 58% of input

suppliers plead for government protection on the market, import restriction, and promotion of local farmers' participation in the seed supply chain (Figure 11).

3.4. Marketing and price information

3.4.1. Market Share

Figure 12 below shows the number of sorghum producers trading in different markets

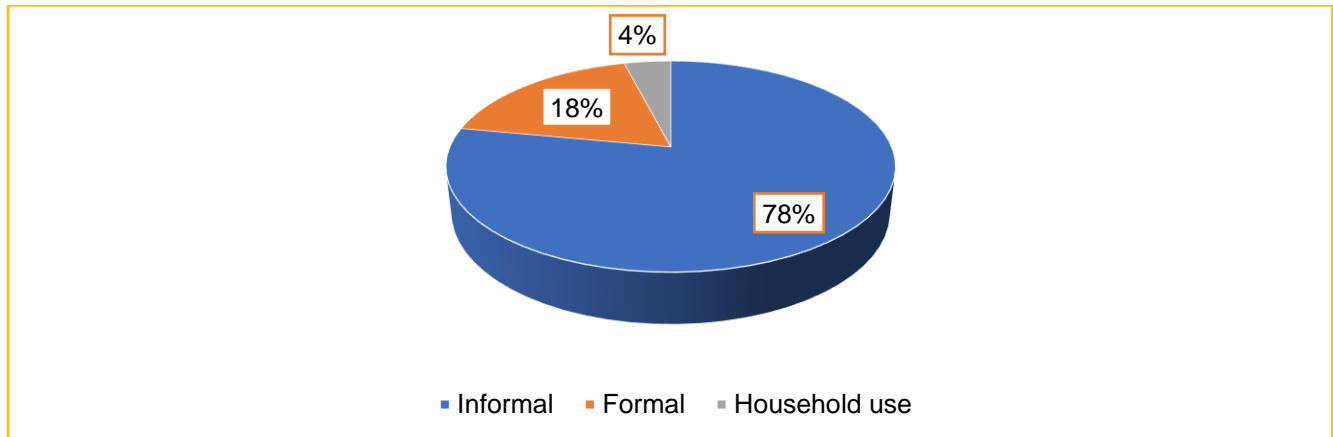


Figure 10: Number of sorghum producers trading in different markets

Results show that 78% of sorghum producers market through the informal market while 18% are marketed through formal such as local supermarkets like Spar and Choppies and only 4% of sorghum producers use sorghum for household purposes. Farmers showed a willingness to produce and market sorghum and sorghum products in bulk. However, the lack of a formal market deprives these farmers of partaking in the formal main economy stream. Consequently, producers opt to sell through informal markets. Sometimes smallholder farmers store and sell sorghum grains back to farmers during peak planting season at high prices as seeds.

Table 6 shows sorghum grain market share distribution by tonnage.

Table 6: Sorghum grain market share distribution by tonnage

Market type	Tonnage sold	Market share %
Informal	47 331	89%
Formal	5 850	11%
Total	53 181	100%

Out of the sampled size population (of 57 producers) total sorghum harvest of 53 181 tonnes is attained per annum of which 89% (47 331 tonnes) are marketed through the informal market and only 11% (5 850 tonnes) of sorghum marketed through the formal market. Most sorghum grains produced in Namibia are sold through the informal market.

Furthermore, sorghum prices differ in different types of markets; the informal market currently records higher prices per unit quantity than the formal market. Table 7 shows the average and price ranges of sorghum grain in different markets.

Table 7: Average and price ranges of sorghum grains in different markets

Market type	Price ranges [N\$/kg]	Average price [N\$/kg]
Informal	8 - 15	10.10
Formal	4.6 - 11.25	7.29

Farmers collect better retail/selling prices in the informal market than formal market (Table 7). This could be another contributing factor for more tonnage volumes being traded through the informal markets than the formal markets in addition to the lack of a well-established formal market. Table 8 shows the average prices of different sorghum products sold in the informal market.

Table 8: Average prices of different sorghum products sold in the informal market

Product	Price (N\$/kg or ltr)
Grain	15
Seed	56
Flour	20
Traditional beverage	21

Results depict that seed is the highest-priced commodity among all sorghum products, this might be due to high demand during peak planting seasons. Furthermore, value-added commodities are better priced than un-processed, raw products. The competition imposed by imported products makes it difficult for local farmers to penetrate and thrive in the local markets. Furthermore, input suppliers confirmed that sorghum seeds are a highly demanded commodity.

3.4.2. Value addition

Value addition is critical for the success of agricultural commodity value chain development (Musara *et al.*, 2019). World Bank report (2006), indicated that many developing countries especially in Africa lose income on agricultural commodities by not adding value or processing these agricultural commodities into finished products. According to the present study, similar results were observed (Table 8), and there is a low level of value-added activities or processing of sorghum into finished products in Namibia. Figure 13 below shows the proportion of producers selling processed sorghum products.

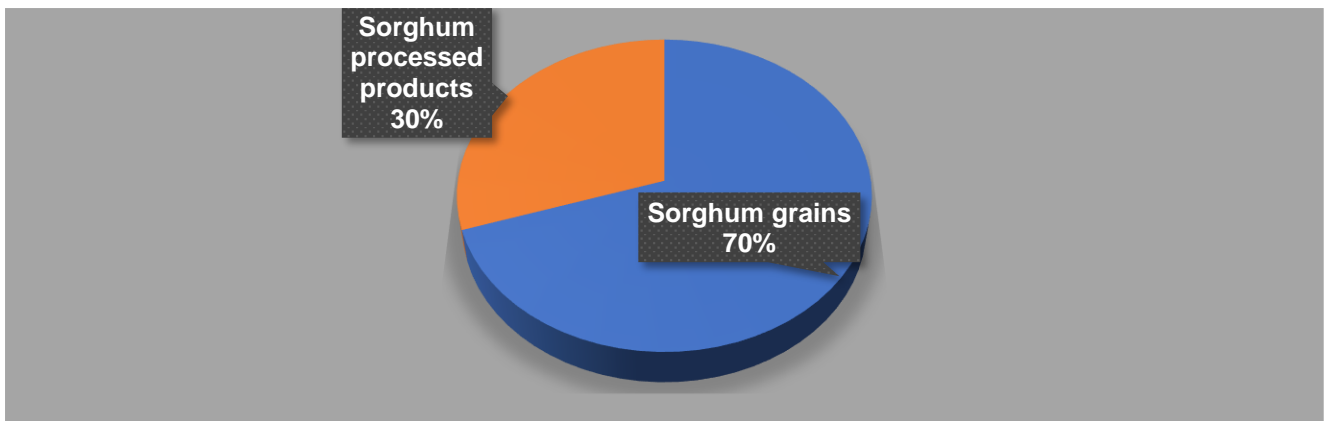


Figure 11: Proportion distribution of producers selling processed sorghum products

The majority of sorghum producers do not process or add value to the sorghum crop instead it is commonly sold as grains which accounts for over 70% of producers selling or consuming sorghum commodities as grains. Only a few producers 30% process sorghum grains but only into traditional beverages or beer and flour mainly for household consumption or family-happy events and ceremonials. It is, therefore, imperative for improvement at this stage of the Namibian sorghum value chain requires effective interventions. Limited value-addition activities on sorghum have deprived local producers of maximising the full potential of sorghum crops among different actors along the value chain.

3.4.3. Supply contract

3.4.3.1. Seeds/input suppliers

Figure 14 below shows the number of seed growers with existing supply contracts expressed in percentages.

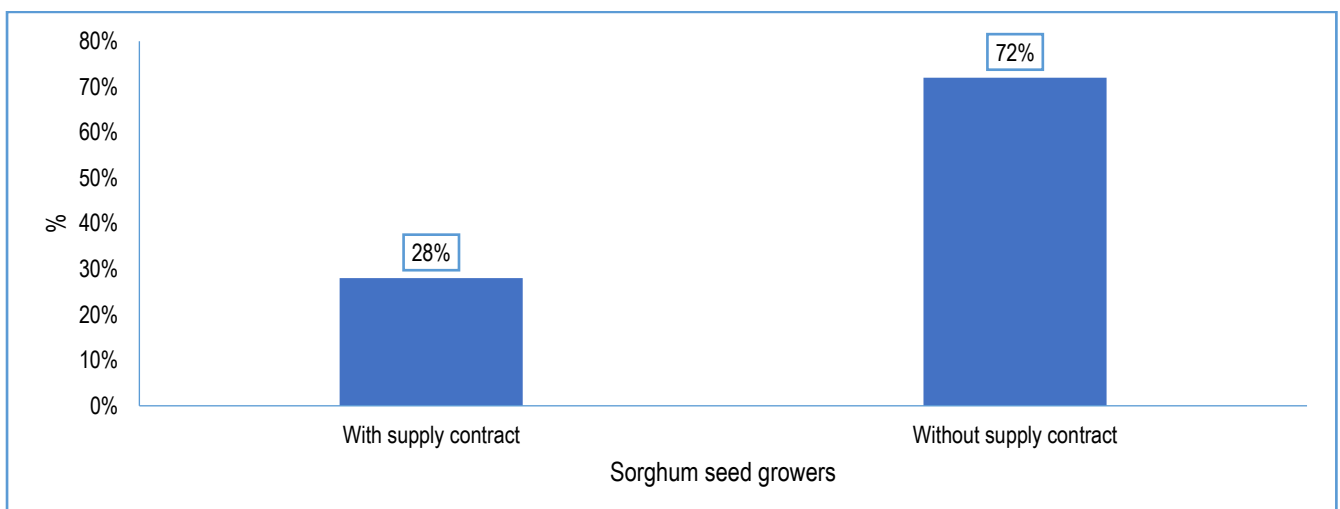


Figure 12: Sorghum seeds growers with existing supply agreement contract

Over 57% of total input suppliers are willing and interested to enter into any supply contract. But currently, among the sampled seed/inputs suppliers, only 28% have an existing supply contract mainly as seed grower members of Northern Namibian Farmers Seed Growers Cooperative (NNSGC) or The Namibia Agricultural Mechanisation and Seed Improvement Project (NAMSIP). While 72% of seed suppliers do not operate on any supply contract.

3.4.3.2. Producers

Figure 15 shows sorghum grain producers with existing supply agreement contracts.

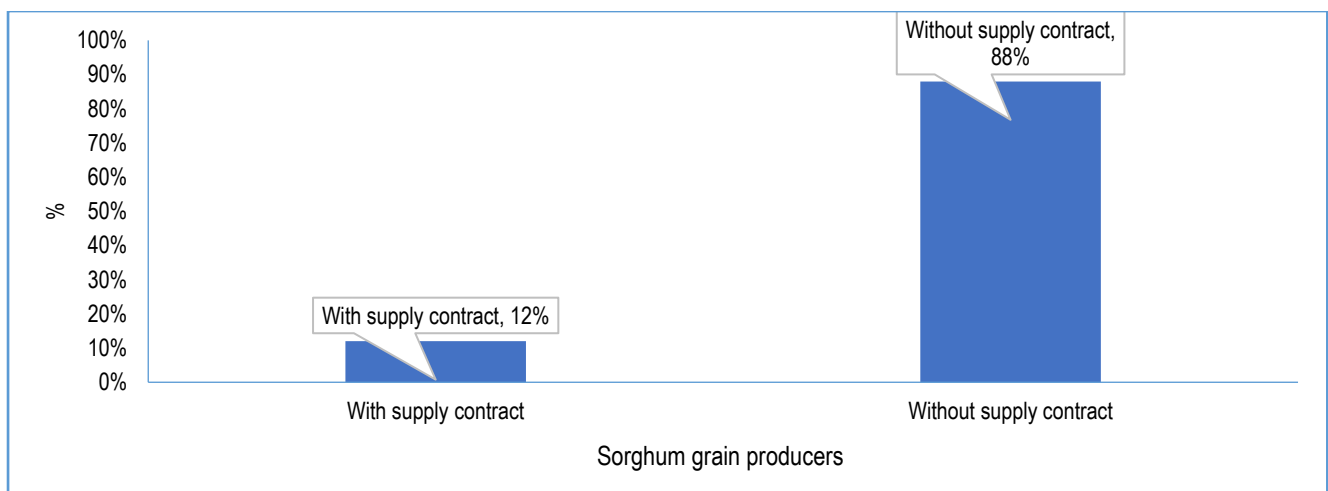


Figure 13: Sorghum grain producers with existing supply agreement contract

Over 95% of local sorghum producers showed a willingness to enter into a supply contract agreement. Despite the displayed high willingness, currently, over 88% of sorghum producers are without supply agreement contracts only 12% of sorghum producers are in supply agreement with local retailers such as Spar Otjiwarongo, and Choppies (Figure 15).

3.4.4. Storage

Proper storage practices (handling) and facilities are among the most important elements in the food supply chain of which grain is a significant nutritional source. Every year, millions of tons of grain losses are caused due to improper storage conditions the situation is worse in developing countries, especially in rural areas. Factors like humidity, heat, pests, and aeration which are effective on storage conditions affect the quality and quantity of grain and shorten the storage period (Nyambo, 1993).

The present study reveals that all the sampled sorghum producers do not have a packhouse or cold storage system. Instead, on-farm traditional storage methods are commonly used for storing sorghum grains in Namibia. According to Nyambo, (1993), grains stored in improved granaries suffer less insect attack and less loss than in traditional granaries.

3.4.5. Traders/ processors

Figure 16 below shows the % distribution of sorghum traders with or without supply contracts.

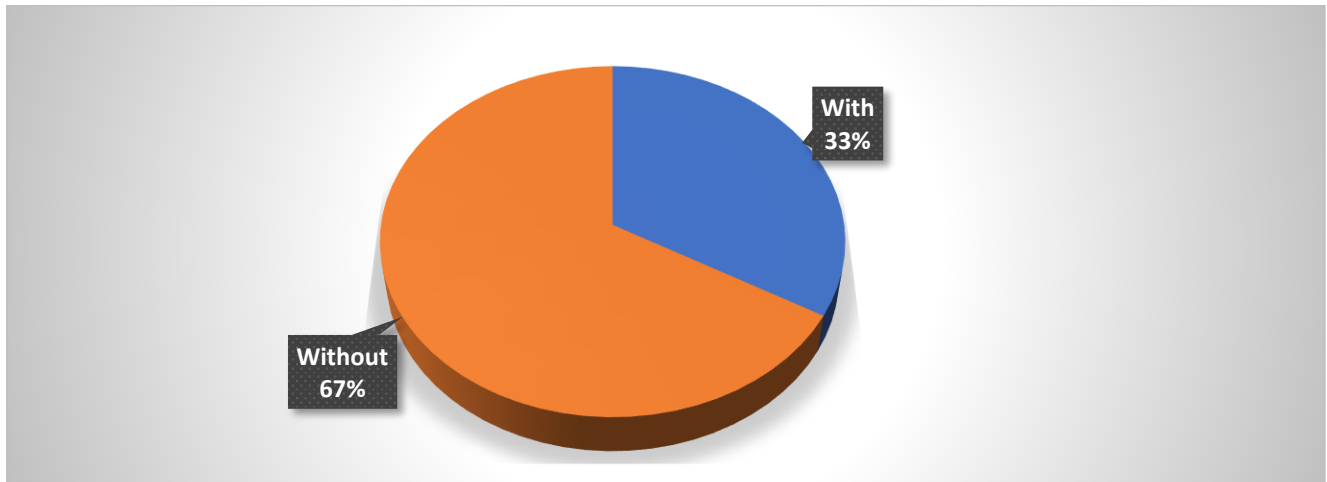


Figure 14: Proportion % distribution of sorghum traders with or without supply contracts

Six (6) traders from Central (Otjiwarongo), Zambezi and North Central (Okongo and Outapi) production zones were interviewed. The results as shown in Figure 16, indicate that only 33% of traders have existing supply contracts whilst 67% of traders do not have any supply contract or written agreement and they indicated a high willingness to enter into contracts.

This is a potential gap for local sorghum producers to fill up by entering into supply contracts with traders and consistently supplying the highly demanded and imported sorghum and sorghum products. However, there is a need for value addition or processing of sorghum grains into flour and/or into other finished products for easy marketing. Figure 17 below shows the average volume of processed sorghum products sold per trader per annum.

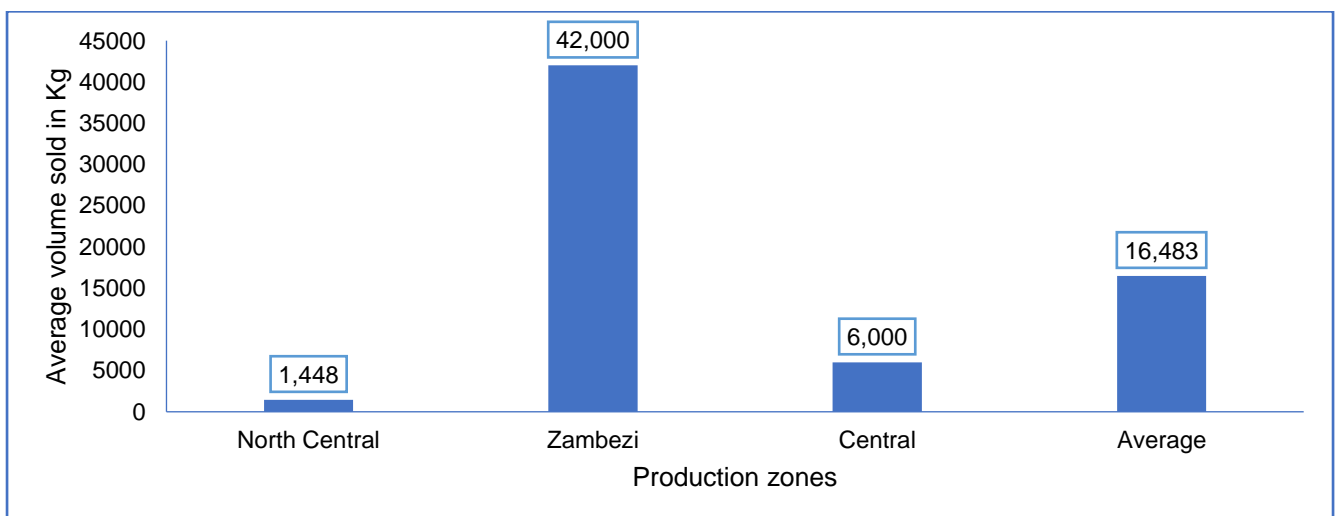


Figure 15: Average volume of processed sorghum products sold per trader per annum

The above results depict that on average 16 tonnes of processed sorghum products are being sold per trader per annum. Figure 18 shows the share (%) of sorghum products sourced from different origins, local and import.

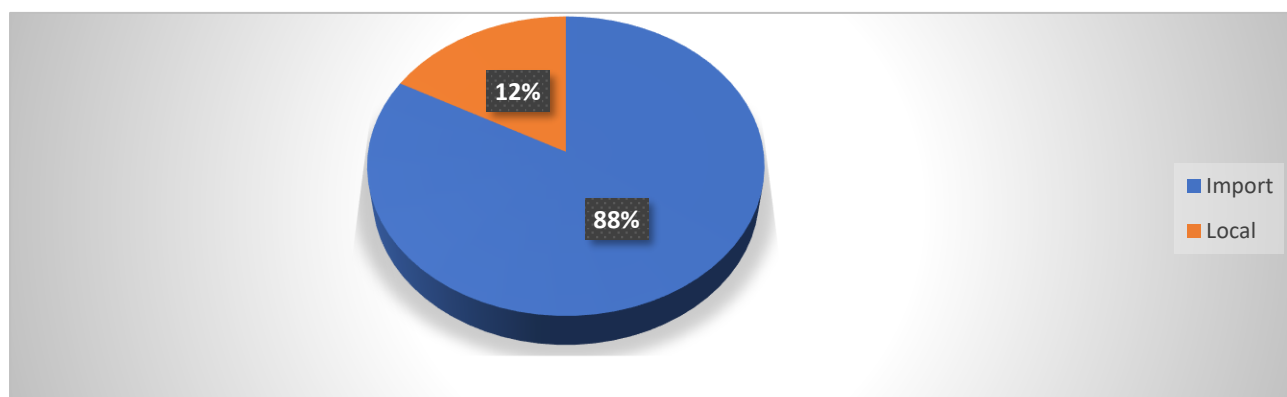


Figure 16: Share (%) of sorghum products sourced from different origins, local and import

This study reveals that only 12% of the total volume of sorghum products is sourced locally while over 88% of traders are importing sorghum products from other countries mainly from Botswana and South Africa. Botswana accounts for the largest volume of 37,448 tonnes of sorghum imports (Table 9). Currently, there is no processing nor value addition carried out at the local traders' level in Namibia as all the imported sorghum products are already processed into sorghum flour for beverage and sorghum meal flour respectively.

Table 9: Sorghum products volume and share (%) sourced from different markets, local, Botswana, and South Africa.

Country	Tonnage	Share (%)
Local	6,000	12%
South Africa	6,000	12%
Botswana	37,448	76%
Total	49,448	100%

Figure 19 shows sorghum and sorghum product import net weight over three years from 2020 to 2022.

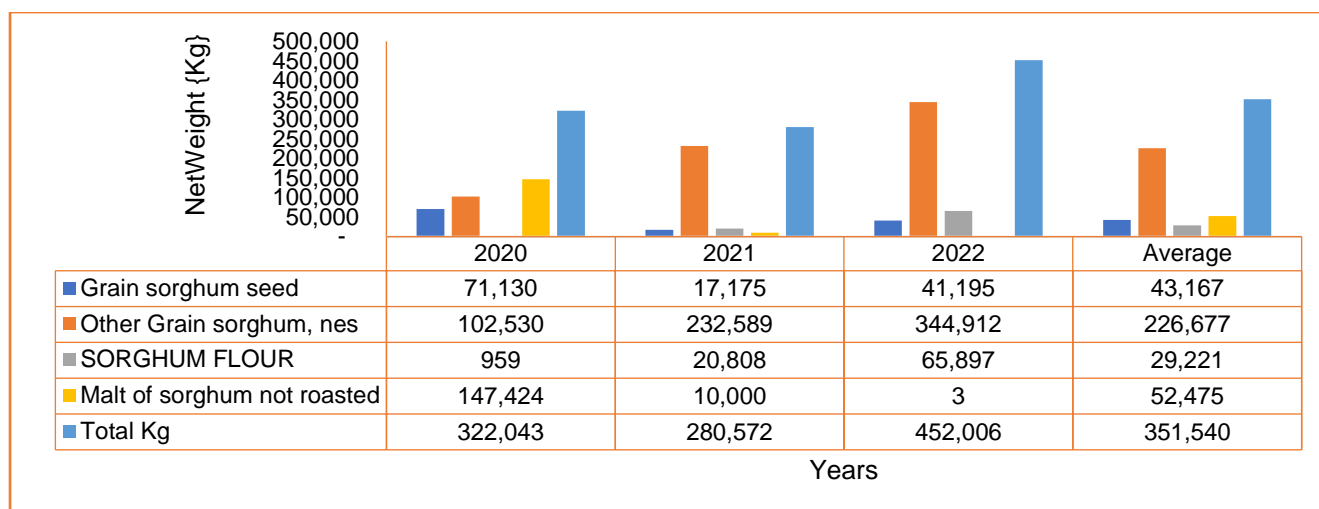


Figure 17: Sorghum and sorghum products import net weight (kg) since 2020 (NSA, 2023)

According to NSA (2023), Namibia recorded a total annual average of sorghum and sorghum products of 351,540 kg. As per average volumes of different sorghum products imports, sorghum grain constitutes the largest import volume with an annual average of 226,677 kg followed by malt of sorghum with 52,475 kg, and sorghum flour recorded the lowest volume of 29,221 kg annual average (NSA, 2023). The highest total import volumes were recorded in 2022 with 452,006 kg while the least volumes were recorded in 2021 with 280,572 kg. Figure 20 below, shows sorghum and sorghum product import value over three years from 2020 to 2022.

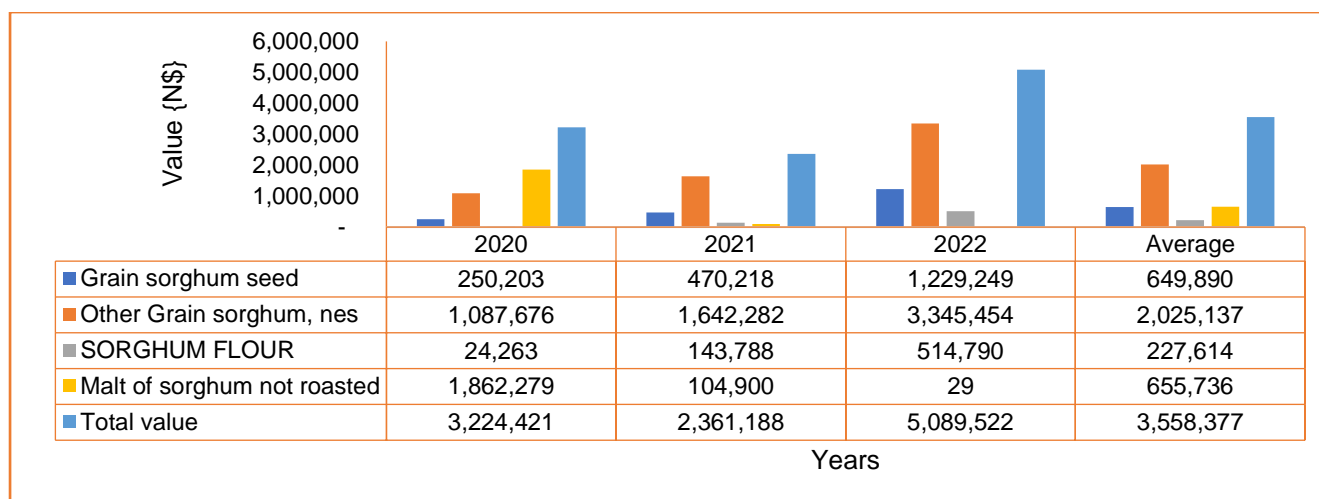


Figure 18: Sorghum and sorghum products import value (N\$) since 2020 (NSA, 2023)

According to NSA (2023), Namibia recorded a total annual average import value of N\$3,558,377. Sorghum grain constitutes the largest import value of N\$2,025,137 followed by malt of sorghum with N\$655,736 and sorghum flour recorded the lowest value of N\$227,614 annual average (NSA, 2023). The highest total import value was recorded in 2022 with N\$5,089,522 while the lowest value of N\$2,361,188 was recorded in 2021.

3.4.6. Consumption

Despite the huge sorghum production potential in Namibia, the current records by MAWLR, (2022), national sorghum consumption tonnage relies also on import volumes. Local production tonnage is not completely matching demand, creating a constant annual deficit of around 15 740 tonnes per annum on average. Table 10 shows domestic sorghum/millet production and consumption or demanded tonnage over the past five (5) years from 2018/19 – 2022/23 (MAWLR, 2022). According to MAWLR, (2022).

Table 10: National sorghum sorghum/millet production and consumption tonnage over the past 5 years

Year	Domestic supply	Consumption	Surplus/Deficit
2022/23	51 500	86 000	-34 500
2021/22	64 100	87 900	-18 900
2020/21	100 700	78 400	+22 300
2019/20	10 000	77 500	-67 500
2018/19	88 700	86 700	+1 600
Average	61 000	83 300	-22 300

(Source: Crop Prospects and Food Security Situation Report, MAWLR, 2022)

As depicted in Table 10, on an annual average, there is a national sorghum/millet consumption demand of 83,300 tonnes while 61 000 tonnes of local sorghum production is being formally marketed leaving a deficit of 22 300 tonnes on an annual basis which is currently filled through imports. However, surplus volumes of 22 300 and 1 600 tonnes were recorded in 2022/21 and 2018/19 respectively. Henceforth, local sorghum producers and value chain actors are required to increase local production consistently and add value or process sorghum grains into finished products as demanded in the formal market and meet local sorghum demand to eventually reduce sorghum import reliance or deficits.

3.5. Financing Information, training, and industry affiliation

3.5.1. Financing Information

In the present study, it is revealed that all sorghum producers finance their sorghum production activities with money from their own savings without receiving a loan or financial assistance from financial institutions. Traders could not dwell much on the financing aspect.

3.5.2. Training and industry affiliation

Group farming and organization affiliation among farmers and other value chain actors is characterised by jointly using lands and agricultural inputs such as group purchasing and group sales, it has numerous benefits in comparison to individual farming (Engindeniz & Yercan, 2002). Organised

group farming promotes efficient utilisation of scarce resources which might be land, labour, capital, etc. Figure 21 below shows sorghum value chain actors' industry affiliation.

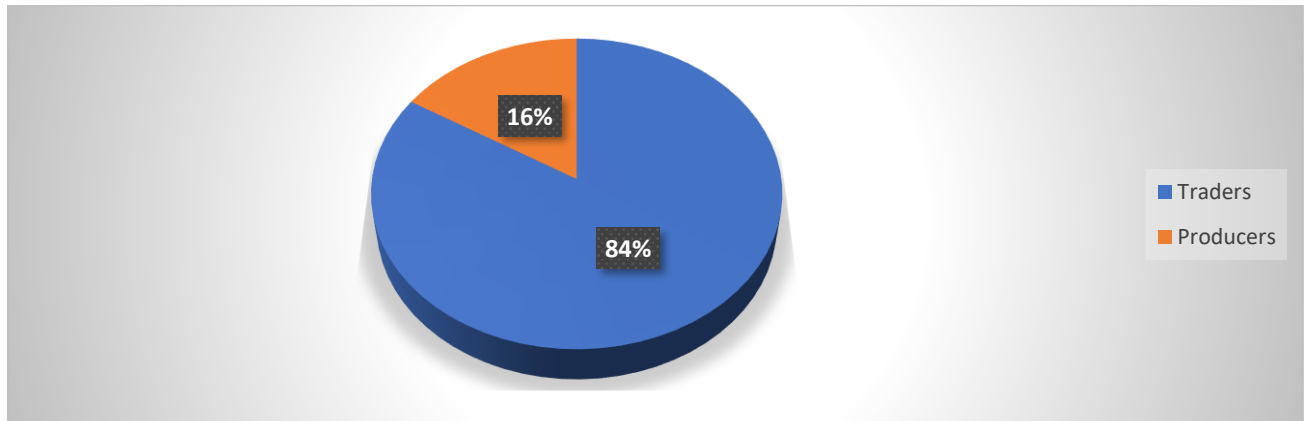


Figure 19: Sorghum value chain actors industry affiliation

Group farming is not a commonly practised production system in Namibia, only 16% of total sorghum producers are affiliated or registered with farmers' associations or organisations (Figure 21). Therefore, group farming should be introduced to the smallholder farmers in Namibia to benefit them. Group farming can promote more efficient use of resources in terms of greater farmers, participation, and effectiveness (Engindeniz & Yercan, 2002). There is a need for organized group farming and awareness creation for the benefit of farmers' associations. However, over 84% of sorghum traders are industry-affiliated with certain organisations or associations (Figure 21). Figure 22 shows sorghum producers who received training on sorghum cultivation techniques.

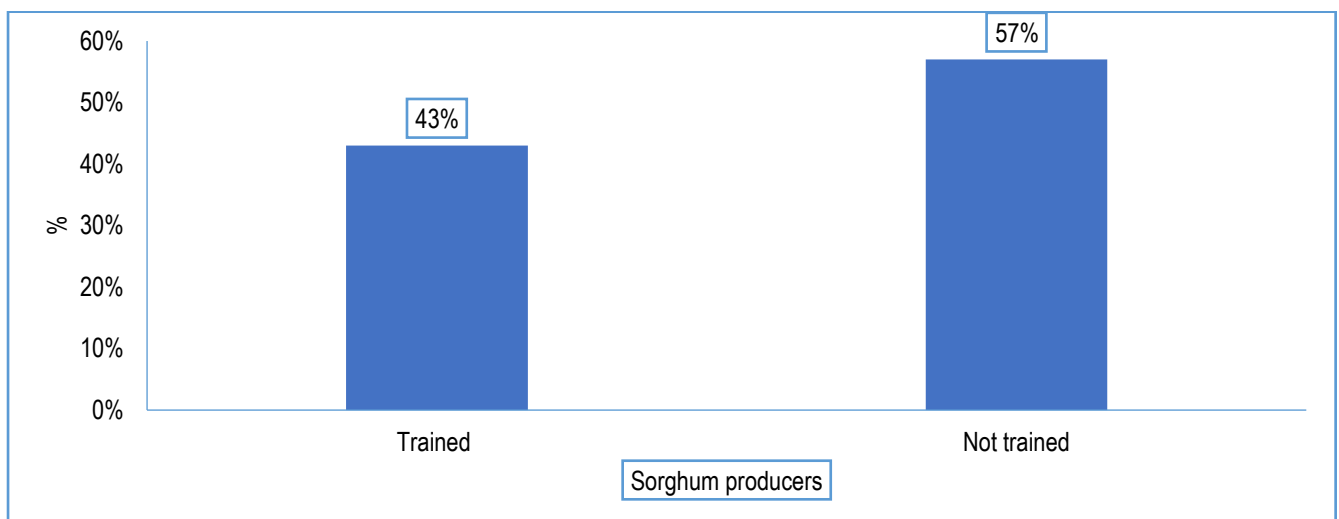


Figure 20: Sorghum producers who received training on sorghum cultivation techniques

The majority (57%) of sorghum producers have not received any training on sorghum cultivation techniques or related skills and knowledge (Figure 22). Only a few (43%) farmers, mostly seed growers received training on sorghum seed multiplication and Conservation Agriculture from MAWLR

and GIZ through their respective farmers' associations (Figure 22). Thus, farmers are currently relying on old traditional indigenous knowledge only, given new dynamics and challenges in crop cultivation there is a need for training on sorghum cultivation skills in Namibia.

3.6. Sorghum constraints and opportunities

The study revealed that input suppliers/seed growers, producers, and traders encounter several challenges as alluded to in Table 11.

Table 11: Opportunities and Challenges encountered by sorghum input suppliers, producers and traders.

Value chain actor	Challenges	Opportunities
Producers	<ul style="list-style-type: none"> • Due to the lack of a formal market and the absence of a price regulation mechanism, price fluctuation and volatility, it is further stimulated. • High competition by imports • Lack of improved seed varieties and poor rainfall/drought. • Lack of technology cultivation techniques in sorghum farming. • Lack of value addition. • Lack of support services such as sufficient ploughing services. • High input costs such as fertilisers. • Lack of training and awareness on the consumption health benefits of sorghum products. • Lack of proper storage facilities. 	<ul style="list-style-type: none"> ✓ Sorghum is a drought-resistant crop well adapted to different Namibian ecological zones. ✓ Sorghum has a low production cost in comparison to other cereal crops such as maize and pearl millet. ✓ Sorghum consumption has health-diet benefits, many ends use and ensures food security at both household and national levels. ✓ An opportunity for income generation, livelihood improvement, and Women Empowerment. ✓ Promotion of sorghum production will ensure reduced reliance and dependence on pearl millet and maize as these two crops do not perform optimally during below-average rainfall or drought seasons.
Traders	<ul style="list-style-type: none"> • Sorghum products are always out of stock. • Lack of local sorghum producers' participation in the supply chain. • Lack of pricing regulations on the local supply chain. • Lack of consistent supply by local sorghum producers. 	<ul style="list-style-type: none"> ✓ Sorghum commodities possess a high economic return on sales as the product is in high demand. This might be due to the scarcity of the commodity and the health benefits attributed to sorghum consumption.

		<ul style="list-style-type: none"> ✓ Good business opportunities for local farmers, food security, income generation, and livelihood improvement. ✓ Sorghum is demanded throughout the year.
Input suppliers	<ul style="list-style-type: none"> • Low selling prices, high transport cost to the market, poor rainfall, and pests and diseases all hinders sorghum seed production and inputs supply business operations. 	<ul style="list-style-type: none"> ✓ Revenue generation, health balance-diet consumption, and varietal use on end products such as beverages, flour, fodder, and animal feed.

3.7. Sorghum value chain mapping in Namibia

A well-established and functional value chain with value-added components has increased economic benefit to all chain actors (Minten *et al*, 2016). Figure 23 shows the existing sorghum value chain in Namibia and the current relationship linkage among chain actors in comparison to the ideal sorghum value chain. The figure depicts that there are some missing components and relationships such as traders’ assemblers, wholesale traders and processing or value addition components, and local distributors in the existing Namibian sorghum value chain.

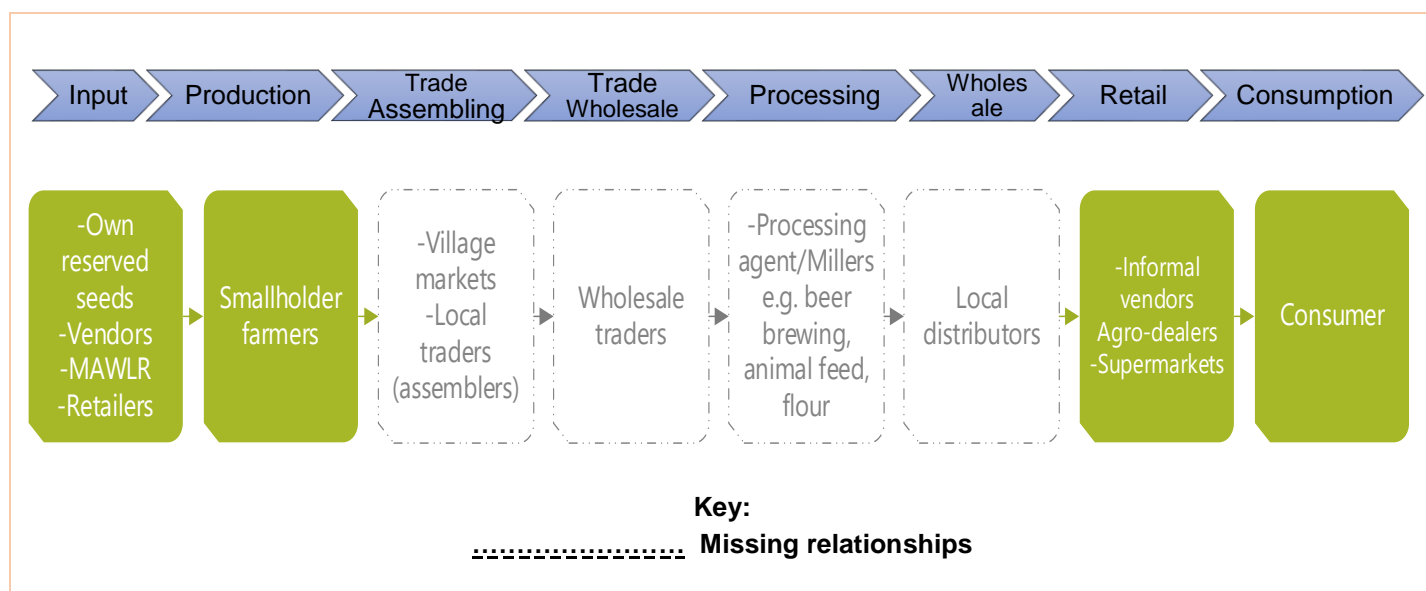


Figure 21: Sorghum Value Chain map in Namibia showing missing relationships and components (Musara *et al.*, 2019) (Source: Survey data)

4. CONCLUSION

This study analysed the Namibian sorghum value chain status and quo and prospect. The results revealed that the commercialisation prospect of sorghum crops in Namibia is feasible. However, there is inadequate and erratic supply or low availability of local sorghum and sorghum products in local and regional markets, most sorghum products in local markets are through imports. This might have continuously affected local sorghum producers from participation in formal production, processing, marketing, and consumption domains. This study indicated that the current sorghum value chain is underdeveloped, of which the value addition component is lacking. This study's results further illustrate that sorghum production is commonly popular in smallholder farming setups and the infrastructural inadequacies that characterise small-scale farming have reduced value extraction from the sorghum value chain at each nodal link in Namibia. Landrace sorghum varieties with low yield are the most used varieties in Namibia. The study further found that there is a noticeable importation of sorghum products especially sorghum meal flour and beverage flour which can easily be replaced by local supply. The imported products are vividly seen in both formal and informal markets. Although the sorghum value chain in Namibia faces various challenges such as the lack of an established formal market, poor regulation of prices lack of storage facilities, and competition by imports, sorghum production possesses huge potential opportunities for local producers, traders, and consumers. Sorghum is a climate-resilient crop, well adapted to Namibia's agroecological zones. Sorghum crop offers sustainable food, feed, and fodder sources. Results show that currently, sorghum consumption demand is waning because of gaps in processing and poor linkages to markets which can easily be improved. The health benefits of sorghum such as the reduction of diabetes, cardiovascular, and celiac diseases are not properly exploited in Namibia.

5. RECOMMENDATIONS

The study gives the following recommendations based on the findings:

- ✓ Namibian Agronomic Board should facilitate the national identification and consequent registration of all sorghum producers, traders/processors, and input suppliers nationwide, and related production and marketing data should be collected to establish accurate baseline information for necessary socio-economic development purposes.
- ✓ Ministry of Agriculture, Water and Land Reform through extension officers with other relevant stakeholders such as the Namibian Agronomic Board, Producers Association, and Regional Agronomy Association should promote sorghum production and consumer awareness to ensure consistent supply and a sustainable market chain.

- ✓ Namibian Agronomic Board should facilitate the creation of a conducive enabling business environment for the sorghum sector which promotes both horizontal and vertical linkage among value chain actors and promotion of organised group and contract farming and coordination among sorghum producers, processors, and traders.
- ✓ Namibian government and policymakers with other relevant stakeholders both public and private sectors should create an effective and adequate infrastructure at all farming system setups to increase value extraction from the sorghum value chain at each stage.
- ✓ Value addition, price regulation, and market protection by the government against imports are critically required in sorghum production and marketing in Namibia.
- ✓ Northern Namibia Farmers Seed Growers Cooperative and other seed cooperatives and the Ministry of Agriculture, Water and Land Reform through the Directorate of Agriculture Research and Development, should introduce and promote the utilisation of improved high-yielding sorghum varieties of significant benefit to sorghum producers and seed growers in Namibia.
- ✓ All stakeholders and farmers' associations should encourage contractual supply agreements between farmers and traders and a consistent supply of sorghum products to create sustainable and profitable sorghum farming in Namibia.

REFERENCES

- Almekinders, C. J., & Louwaars, N. P. (2002). The importance of the farmers' seed systems in a functional national seed sector. *Journal of new Seeds*, 4(1-2), 15-33.
- Awala, S. K., Hove, K., Wanga, M. A., Valombola, J. S., & Mwandemele, O. D. (2019). Rainfall trend and variability in semi-arid northern Namibia: Implications for smallholder agricultural production. *Welwitschia International Journal of Agricultural Sciences*, 1, 1-25.
- Deb, U K and Bantilan, M C S and Roy, AD and Rao, P (2004) *Global sorghum production scenario*. In Sorghum genetic enhancement: research process, dissemination, and impacts. International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, Andhra Pradesh, India, pp. 21-38. ISBN 92-9066-470-3.
- Dube, P., & Mujaju, C. (2013). A simplified technical guide for seed certification procedures for some crops of commercial importance in Zimbabwe. *Advanced Journal of Agricultural Research* 1 (3), 96-104.
- Engindeniz, S., & Yercan, M. (2002). An approach for Turkish agriculture: Group farming. *BODENKULTUR-WIEN AND MUNCHEN-*, 53(4), 227-233.
- Ericsson, K., Rosenqvist, H., & Nilsson, L. J. (2009). Energy crop production costs in the EU. *Biomass and bioenergy*, 33(11), 1577-1586.
- Gerrano, A. S., Lubinga, M. H., & Bairu, M. W. (2022). Genetic resources management, seed production constraints and trade performance of orphan crops in Southern Africa: A case of Cowpea. *South African Journal of Botany*, 146, 340-347.
- Maina, W. N., & Maina, F. M. P. (2012). Youth engagement in agriculture in Kenya: Challenges and prospects. *Update*, 2.
- Maps of the World (2015). Political map of Namibia Retrieved at: <https://www.mapsofworld.com/namibia/namibia-political-map.html>
- Minten, B., Tamru, S., Engida, E., & Kuma, T. (2016). Transforming staple food value chains in Africa: The case of teff in Ethiopia. *The Journal of Development Studies*, 52(5), 627-645.
- Musara, J. P., Musemwa, L., Mushunje, A., Mutenje, M., & Pfukwa, C. (2019). Sorghum value chain analysis in semi-arid Zimbabwe. *South African Journal of Agricultural Extension*, 47(1), 164-178.
- Namibia Statistic Agency (NSA, 2020). *National early warning on food security*. NSA.
- Namibia Statistic Agency (NSA, 2023). *Namibia's import statistics on sorghum & sorghum products for the years 2020 - 2022*. NSA.
- Nyambo, B. T. (1993). Post-harvest maize and sorghum grain losses in traditional and improved stores in South Nyanza District, Kenya. *International Journal of Pest Management*, 39(2), 181-187.

- Tuinstra, M. R. (2008). Food-grade sorghum varieties and production considerations: a review. *Journal of Plant Interactions*, 3(1), 69-72.
- Srinivasa Rao, P., Reddy, B. V., Nagaraj, N., & Upadhyaya, H. D. (2014). Sorghum production for diversified uses.
- Wanga, M. A., Kumar, A. A., Kanguuehi, G. N., Shimelis, H., Horn, L. N., Sarsu, F., & Andowa, J. F. (2018). Breeding sorghum using induced mutations: Future prospect for Namibia. *American Journal of Plant Sciences*, 9(13), 2696.
- You, Y. D., Shie, J. L., Chang, C. Y., Huang, S. H., Pai, C. Y., Yu, Y. H., & Chang, C. H. (2008). Economic cost analysis of biodiesel production: case in soybean oil. *Energy & Fuels*, 22(1), 182-189.