

FNS-REPRO Sudan - Key Findings from literature review, rapid Gum Arabic value chain assessment and stories of change

Report on key findings that emerged from a literature review on the Gum Arabic value chain in Sudan, a rapid Gum Arabic value chain assessment and stories of change in selected FNS-REPRO supported communities

Kusters, C.S.L., Mahmoud T.E., Boerema, E., Chapman, C., Mohammed, M.H., Abdalla, I.A.E.

FNS-REPRO Sudan - Key Findings from literature review, rapid Gum Arabic value chain assessment and stories of change

Report on key findings that emerged from a literature review on the Gum Arabic value chain in Sudan, a rapid Gum Arabic value chain assessment and stories of change in selected FNS-REPRO supported communities

Kusters, C.S.L., Mahmoud T.E., Boerema, E., Chapman, C., Mohammed, M.H., Abdalla, I.A.E.

1 Wageningen Centre for Development Innovation (WCDI), Wageningen University & Research (WUR)

2 University of Kordofan

3 University of El Fasher

FNS-REPRO is funded by the Dutch Ministry of Foreign Affairs, International Green Growth Department.

Wageningen Centre for Development Innovation
Wageningen, January 2023

Report WCDI-23-244

Kusters, C.S.L., Mahmoud T.E., Boerema, E., Chapman, C., Mohammed, M.H., Abdalla, I.A.E., 2022. *FNS-REPRO Sudan - Key Findings from literature review, rapid Gum Arabic value chain assessment and stories of change; Report on key findings that emerged from a literature review on the Gum Arabic value chain in Sudan, a rapid Gum Arabic value chain assessment and stories of change in selected FNS-REPRO supported communities*. Wageningen Centre for Development Innovation, Wageningen University & Research. Report WCDI-23-244. Wageningen.

This report describes the key findings that emerged from the analysis of the studies generated by the Food and Nutrition Security Resilience Programme (FNS-REPRO) in Sudan and from other relevant sources, and complemented by the findings from the rapid value chain assessments and stories of change undertaken in the target areas. Also subsequent recommendations that emerged from reflecting on these findings in a sensemaking event in June 2022 are included. FNS-REPRO is designed to strengthen the resilience of food systems for food and nutrition security in conflict affected regions in the Horn of Africa and focuses on Somaliland, South Sudan and Sudan. These findings have been summarized and are used as input for the annual sensemaking event in June 2022, during which they were reflected upon by FAO & WUR staff and key stakeholders, as to generate key suggestions for improvement of the program but also of staff and stakeholder to learn lessons and take action within their own sphere of influence and control. The key suggestions for improvement serve as input for the next annual plan of FNS-REPRO and as such influence adaptive programming. They also serve as input for other related issues and activities outside FNS-REPRO. The analysis of these findings and the facilitation of the sensemaking events have been carried out by Wageningen Centre for Development Innovation, Wageningen University and Research, as a key partner for the FNS-REPRO knowledge agenda.

Keywords: climate, evidence, findings, food security, gender, Gum Arabic, nutrition, producers, resilience, shocks, stressors, Sudan, youth, value chain

This report can be downloaded for free at <https://doi.org/10.18174/585752> or at www.wur.eu/cdi (under publications).



© 2022 Wageningen Centre for Development Innovation, part of the Stichting Wageningen Research. P.O. Box 88, 6700 AB Wageningen, The Netherlands. T + 31 (0)317 48 68 00, E info.cdi@wur.nl, www.wur.eu/cdi.



The Wageningen Centre for Development Innovation uses a Creative Commons Attribution 4.0 (Netherlands) licence for its reports.

The user may copy, distribute and transmit the work and create derivative works. Third-party material that has been used in the work and to which intellectual property rights apply may not be used without prior permission of the third party concerned. The user must specify the name as stated by the author or licence holder of the work, but not in such a way as to give the impression that the work of the user or the way in which the work has been used are being endorsed. The user may not use this work for commercial purposes.

The Wageningen Centre for Development Innovation accepts no liability for any damage arising from the use of the results of this research or the application of the recommendations.

Report WCDI-23-244

Photo cover: Eelke Boerema, 2022

Contents

List of abbreviations and acronyms	7
Summary	9
1 Introduction	17
1.1 Background to FNS-REPRO	17
1.2 Background to FNS-REPRO in Sudan	17
1.3 Background to this document	18
1.4 Sudan context update	19
2 Methodological approach	20
2.1 Literature review	20
2.2 Rapid value chain assessment	20
2.2.1 The value chain approach	21
2.3 Stories of change	22
3 Literature review of the Gum Arabic value chain in Sudan	23
3.1 Background on Gum Arabic in Sudan	23
3.2 Gum Arabic Value Chain	26
3.2.1 Main stages in the Gum Arabic value chain in North Darfur	28
3.2.2 Main actors in the Gum Arabic value chain in North Darfur	31
3.2.3 Distribution of profit and value along Gum Arabic value chain in North Darfur	34
3.3 Gum Arabic Value Chain in East Darfur	36
3.3.1 Main stages in the Gum Arabic value chain in East Darfur	36
3.3.2 Main actors in the Gum Arabic value chain in East Darfur	38
3.3.3 Distribution of profit and value along Gum Arabic value chain in East Darfur	40
3.4 Key challenges and bottlenecks along the Gum Arabic value chain	41
3.4.1 Challenges in terms of production of Gum Arabic	41
3.4.2 Challenges in relation to marketing and business development	43
3.4.3 Challenges for households, women and youth to participate in the Gum Arabic value chain	43
3.4.4 Enabling environment for Gum Arabic	44
3.4.5 Summary key challenges in the Gum Arabic value chain	46
3.5 Role of FNS-REPRO in Gum Arabic value chain development	47
3.5.1 Progress made in relation to Output 2	49
3.6 Recommendations for the way forward	51
4 Key findings from the Rapid Gum Arabic Value Chain Assessments	54
4.1 Objective of the RVCA	54
4.2 Data collection methods	54
4.3 Geographic coverage and participants of the consultative workshops	54
4.3.1 North Darfur State	55
4.3.2 East Darfur State	56
4.4 Key findings from the consultative workshops held in North Darfur	57
4.4.1 Key findings from stakeholder consultative workshop held in El Fasher, North Darfur (Group A)	57
4.4.2 Feedback on the project interventions with regards to Gum Arabic value chain in North Darfur (Stakeholder consultative workshop in El Fasher - Group B)	59

4.4.3	Feedback on project interventions obtained from consultative FGD held in Sani Karao, Northern Darfur	61
4.4.4	Feedback obtained from Lawabid consultative FGD	63
4.5	Key findings from the stakeholder consultative workshops held in East Darfur	65
4.5.1	Feedback from stakeholder consultative workshops held in Ed Daein, East Darfur	65
4.5.2	Community feedback from Jalabi village	66
4.5.3	Community feedback from Bakhiet village, Abu Karinka locality	68
4.5.4	Key challenges identified by the communities	69
4.5.5	Recommendations made by the communities in East Darfur	70
4.6	Summary of key recommendations emerging from the Rapid Value Chain Assessments	71
4.6.1	Concluding remarks	72
5	Key findings from Stories of Change	73
5.1	Stories of Change from North Darfur	73
5.2	Stories of Change from East Darfur	75
6	Recommendations from the sensemaking event	76
6.1	Address key challenges along the Gum Arabic (GA) value chain	76
6.2	Improve access to the GA market: smart partnerships with the private sector	78
	References	80
	Appendix 1 Key activities under Output 2 – Gum Arabic production	82
	Appendix 2 Post Distribution Monitoring (PDM)	83
	Appendix 3 MEAL monitoring data	84

List of figures

Figure 1	FNS-REPRO Theory of Change.	18
Figure 2	Defining the value chain.	21
Figure 3	Map of the Republic of Sudan. Source: UN Geospatial, 2021.	24
Figure 4	Map of the gum belt in Sudan. Source: Mariod, 2018.	25
Figure 5	Gum Arabic exports from Sudan (1980-2019). Source: Derived from Tarig et al. (2017).	26
Figure 6	Gum Arabic global value chain: simplified scheme. Source: UNCTAD, 2018a.	28
Figure 7	Direct value chain actors in REPRO localities in North Darfur. Source: FAO, 2021a.	32
Figure 8	Types of Gum Arabic farming in REPRO localities in North Darfur. Source: FAO, 2021a.	32
Figure 9	Summary map of the Gum Arabic value chain configuration in North and East Darfur. Source: FAO, 2021a.	35
Figure 10	Tapped GA with visible physical impurities at Sani Karao market, North Darfur. Source: FAO, 2021a.	35
Figure 11	Concentration and distribution of Gum Arabic trees in REPRO localities in East Darfur. Source: FAO, 2021a.	36
Figure 12	Types of Gum Arabic farming in REPRO localities in East Darfur. Source: FAO, 2021a.	39
Figure 13	Margin distributions across value chains of gum. Source: Mahmoud (2016).	40
Figure 14	Change in Gum Arabic exports by market (1997-2020). Source: OEC, 2021.	45
Figure 15	Overview of FNS-REPRO beneficiaries and target areas for Year 3. Source: FNS-REPRO annual progress report (2021).	47
Figure 16	Focus Group Discussions for the PDM assessment for Sudan. Source: FNS-REPRO Sudan, PDM assessment (Mohamed, 2021).	53
Figure 17	Group photo, Lawabid community.	56
Figure 18	FGD with Sani Karao community.	56
Figure 19	FGD during El Fasher consultative workshop.	61
Figure 20	Tapping tools Axe (1), Makmak (2) and Sonki.	64
Figure 21	Members from the Jalabi Community.	68
Figure 22	Training women on making improved stoves in Jalabi village.	68
Figure 23	Solar water powered pump, Jalabi village.	68
Figure 24	Carts waiting for water, Jalabi village.	68
Figure 25	Community members from the Bakhiet community.	69
Figure 26	Suleiman Muhammed Ali Hammouda. Figure 27 Gum Arabic tree.	74
Figure 28	Camels in Lawabid.	75
Figure 29	Water point in Lawabid.	75

List of tables

Table 1	Gum Arabic products by ascending level of sophistication.	27
Table 2	Areas of Gum Arabic holdings in the FNS-REPRO localities in North Darfur.	29
Table 3	Investigated Gum Arabic urban and tributary markets in North Darfur.	30
Table 4	Number, status and performance of GAPAs in REPRO localities in North Darfur.	33
Table 5	Areas of Gum Arabic holdings in the REPRO localities in East Darfur.	37
Table 6	Challenges in crop production disaggregated by beneficiary type and sex of household head.	41
Table 7	Constraints and bottlenecks, identified by producers.	42
Table 8	Beneficiaries detailed breakdown for Year 3.	48
Table 9	Number of beneficiaries per year for Sudan.	48
Table 10	Beneficiaries breakdown by village for Year 3.	48
Table 11	Consultative workshops and focus group discussions in Darfur.	55
Table 12	Key challenges identified by Jalabi and Bakhiet communities.	70
Table 13	Recommendations made by Jalabi and Bakhiet communities.	70
Table 14	Key suggestions for smart partnerships.	79

List of boxes

Box 1	Story of Abdelrahman Dawalbait from Um Harazak village, North Darfur	73
Box 2	Story of Suleiman Muhammed Ali Hammouda from Um Harazah village, North Darfur	74
Box 3	Story of Essam Mohamed Issa from Jalabi village	75

List of abbreviations and acronyms

ARC	Agriculture Research Corporation
CoP	Community of Practice
FAO	Food and Agriculture Organization of the United Nations
FGD	Focus Group Discussion
FNC	Forest National Corporation
FNS	Food and Nutrition Security
FNS-REPRO	Food and Nutrition Security Resilience Programme
GA	Gum Arabic
GAB	Gum Arabic Board
GAC	Gum Arabic Company
GAP	Good Agriculture Practice(s)
GAPA	Gum Arabic Producers' Association
GAVC	Gum Arabic Value Chain
GNAFC	Global Network Against Food Crises
HDP	Humanitarian Development Peace Nexus
MEAL	Monitoring, Evaluation, Accountability, Learning
MoP&E	State Ministry of Production and Economic Resources
NRM	Natural Resource Management
NWFP	Non-Wood Forest Products
PDM	Post Distribution Monitoring
RIMA	Resilience Index Measurement and Analysis
RVCA	Rapid Value Chain Assessment
SDG	The Sudanese Pound
SSMO	The Sudanese Standards and Metrology Organization
ToT	Training of Trainers
USD	United States Dollar
WCDI	Wageningen Centre for Development Innovation, Wageningen University & Research
WUR	Wageningen University & Research

Summary

This report describes the key findings from a series of assessments that were undertaken in preparation for the annual Food and Nutrition Security Resilience Program (FNS-REPRO) sensemaking workshop held in Sudan in June 2022. The purpose of these events is to consolidate and critically reflect on key evidence that relates to FNS-REPRO and its context, and to support evidence-based decision making and adaptive management, in particular the development of the upcoming annual plans and to adjust mid-year planning in response to key contextual issues affecting the success of the programme. To support and strengthen this evidence-based and adaptive programming process, three key assessments were undertaken in 2022: a literature review on Gum Arabic (GA), a rapid Gum Arabic value chain assessment in selected communities, and stories of change in selected communities. Below is a summary of the key findings that emerged from each of these three main assessments as well as from recommendations made during the sensemaking event in June 2022.

Key suggestions for improvement include:

- *Address pests and diseases;*
- *Ensure organisation of Gum Arabic (GA) producers:* empower GAPA's;
- *Ensure capacity development:* GAPs, GA production, agroforestry, improved technologies, post-harvest activities, value addition, marketing, entrepreneurship, NRM, conflict & peace;
- *Ensure access to improved tools, technologies, equipment and other inputs:* e.g. fertilizers, improved seeds, donkey ploughs, Sonki tools, Hashab seedlings, home/village nurseries;
- *Ensure natural resource protection & management:* fencing & rehabilitation of rangeland, enforcement;
- *Ensure adequate land allocation;*
- *Strengthen market linkages and smart partnerships;*
- *Support value addition and export;*
- *Improve market:* information system, auction market, GA prices, smart partnerships;
- *Improve infrastructure:* water, storage, feeder roads, transportation means;
- *Improve services:* water & veterinary services and animal health care along livestock corridor; market related services; access to finance;
- *Ensure enabling environment:* improved land rights and land tenure systems; minimum floor price for GA at auction markets; less/no taxes and fees at auction markets;
- *Resolve conflict & enhance peace:* peace dialogues, diversified peace mechanisms, address insecurity;
- *Enhance research;*
- *Engage and target women and youth and (disadvantaged) tribes:* improve access to and control over resources (e.g. water, finance, market information, labor).

Key findings from the literature review on the Gum Arabic value chain

A brief literature review of the Gum Arabic value chain (GAVC) was undertaken to identify the current structure and key actors involved along the GAVC in North and East Darfur. This involved reviewing key information and knowledge generated by FNS-REPRO and a review of other relevant literature, publications and information sources. The literature review was structured around a set of key learning questions. The evidence and findings from the literature review help to answer these key learning questions. Key findings are described below.

Gum Arabic is a strategic sector for the Government of Sudan, generating social, economic and environmental dividends for communities in the region. Sudan is the world's largest producer and exporter of raw Gum Arabic, "with an annual production corresponding to 70% of the world's raw exports" (AFD, 2021). The Darfur region, in particular, presents favorable conditions for the production of high-quality Gum Arabic,

from the Acacia Senegal tree, commonly known as Hashab. However, producers and upstream value chain actors face key challenges concerning productivity, negotiating good farmgate prices, access to market and finance. Likewise, processing the gum attracts high taxes and producers are constrained by limited access to market information or credit (FAO newsletter, 2021c).

The eight western states (Kordofan and Darfur states) supply more than 75% of hashab gum (Acacia Senegal gum) in the country and Gum Arabic is an important export product (FAO, 2021a, p. 26).

Gum Arabic is one of the most important trading commodities coming out of Sudan. Around 80% of the global production of Gum Arabic comes from the Acacia Senegal in Sudan with the second resource being the Acacia Seyal, which produces an inferior quality gum (FAO, 2021a, p. 26). Darfur, Kordofan and Blue Nile states are the predominant producers of Gum Arabic due to geographic location within 'the gum belt', a geographic area running along the Sahel where climate conditions are ideal for the Acacia trees.

Main stages in the Gum Arabic value chain in North Darfur

What are the main stages in the Gum Arabic value chain?

Key elements of the Gum Arabic value chain are described below and include: Gum Arabic production and supply; markets and supply systems – rural markets and urban or wholesale markets; central auction markets; Gum Arabic exports.

Main actors in the Gum Arabic value chain

Who are the main actors at each point in the value chain?

North Darfur

Depending on their role, the key actors in North Darfur state can be classified into two major groups as: i) direct value chain actors, and ii) indirect value chain actors (supporters). The direct value chain actors in North Darfur (mostly found in Kalamendo, Tewisha and to some extent Ele'iet) are represented by small to medium scale producers, middlemen, village traders, producer agents, Gum Arabic producer associations (GAPAs), and city or assembly traders. The indirect value chain actors provide support and regulatory services that facilitate the overall performance of the chain and of the direct actors. The most important indirect value chain actors are represented by the line ministries and administrations, Forest National Cooperation (FNC), Agriculture Research Corporation (ARC), businessman federations, El Fasher University, FAO and other UN agencies (FAO, 2021a).

East Darfur

Direct value chain actors in the three project localities in East Darfur (Adila, Abu Karinka, and Ed Daein) are represented by the upstream Gum Arabic stakeholders. These include small scale producers, middlemen, village traders, GAPAs and city or assembly traders. Indirect value chain actors are represented by the different institutions and administrations belonging to the MoP&E, FNC, ARC, Ed Daein University, FAO and other UN agencies. Although it is difficult to evaluate the role of indirect value chain actors in East Darfur, it seems that their supportive role is very limited due to technical, institutional and logistic gaps (FAO, 2021a).

Distribution of profit and value along Gum Arabic value chain in North Darfur

What are the flows of the product (and by product) between different actors? Where and to what degree is value added, or value lost, as the product moves along the chain? Which stages of the value chain are most profitable for which actors?

The Gum Arabic moves from rural to urban markets and finally to the central auction markets. Village and urban markets are present in North and East Darfur, while central auction markets are only located in Elobeid and Ennuhud (Kurdofan). The export and processing companies are mostly found in Elobeid, Khartoum and Port Sudan. This makes the current Gum Arabic value chain originating from North and East Darfur short and driven by few actors in urban markets.

The Gum Arabic mainly moves as “a raw gum” without any significant cleaning, drying, sorting, grading and other micro-processing activities. Historically, some of these postharvest activities in Northern Darfur were regularly used to be practiced by the Gum Arabic Company (GAC) agents in El Fasher, Um Keddada, Kalamendo, Tewisha and Ele’iet localities. Also in East Darfur their post-harvest activities used to be undertaken by the GAC agents. These agents used to dry, clean, sort and grade the gum in their warehouses into 4 categories: Hand-Picked and Selected (H.P.S), Cleaned and Sifted (CAS), Siftings (S), and Dust (D). These grades no longer exist in the North and East Darfur states after the abolition of the GAC monopoly in 2009. These activities are very important to make product differentiations and value addition, which in turn improve the income to upstream value chain actors (as regularly practiced by traders in North and West Kordofan states) (FAO, 2021a).

Key challenges in the Gum Arabic value chain

What are key bottlenecks along the Gum Arabic VC?

All in all key challenges and constraints, particularly for Gum Arabic producers, in the GA value chain include (not in order of importance):

- *Pests and plant diseases*;
- *Inadequate capacities*: there is a low level of education and GA producers lack training on good agricultural practices, post-harvest handling, value addition (e.g. processing, gum standardization measures), entrepreneurship; Women like these capacities more than men and their role in GA production is undervalued;
- *Lack of agricultural tools and equipment*: high prices and low availability of inputs; inadequate tools and equipment for tapping, planting and storing gum and for processing and preservation equipment;
- *Loss of trees and gum* due to bush fire, overcutting and theft coupled with low regeneration capacity of the Hashab tree;
- *Inadequate access to and control over resources*, especially for women, youth and certain tribes:
 - Water: lack of (access to) drinking water when in the field;
 - Finance: inadequate access to finance, credit, loans and investments; access to and control over financial resources (gender based); access to finance is more difficult for women and youth;
 - Inadequate access to market information;
 - Lack of labor for GA production;
 - Note: there are differences for men and women, youth but also tribes in terms of access to and use of resources (such as land, which is mainly owned by men), but there is still inadequate targeting. Poor role of women in decision making, women facing discrimination in some villages.
- *Inadequate organisation*: Gum Arabic producers are poorly organized. They sell the Gum Arabic to independent traders and not through registered cooperative groups, even though they may belong to a Gum Arabic producer association (GAPA). They “do not have the ability to negotiate, as a group, with buyers, and cooperate in terms of, for example, prices, and do not undertake group activities such as sharing the costs of transporting their product to distant markets” (Adam, 2016). Also there is lack of women cooperatives;
- *Inadequate markets*: inadequate access and functioning of rural and urban markets; limited access to market information; low prices for GA;
- *Conflict*: inadequate conflict resolution mechanisms; insecurity limits access to farm fields;
- *Inadequate enabling environment*: inadequate development and enforcement of land rights and land tenure systems; price liberalisation policies have led to absence of minimum floor price at auction markets; taxes and fees at auction markets.

Role of FNS-REPRO

What has been the role of FNS-REPRO in Gum Arabic VC development?

FNS-REPRO has one output that focuses on “Improved livelihood and income opportunities along the Gum Arabic Value Chain”. This includes:

1. Capacity building for producers along the Gum Arabic Value Chain
2. Improve capacity and support GAPAs
3. Increase access to locally adapted seed and seedlings
4. Support establishment of Farmer Field Schools and Demonstration Farms

Whilst there is progress, FNS-REPRO also still faces some operational challenges that need to be addressed as well as challenges in the context, such as insecurity due to conflict or other challenges already mentioned in the previous section.

Recommendations for the way forward

What are the options for change?

Based on the review of available literature and documents (including beneficiary feedback) the following recommendations emerged for the way forward:

- *Organisation of Gum Arabic (GA) producers*: improve producers' negotiating position.
- *Capacity development of GA producers*: enhance adoption of good practices concerning nursery operations, land preparation and tapping techniques; increase the awareness of beneficiaries around agroforestry and the environmental and economic value of Hashab trees; training on tapping, sorting, storage and marketing; capacity building of women around nutrition, hand crafts, alternative sources of energy.
- *Improve access to improved tools, technologies and equipment*: stimulate innovation and investment in GA tools and technologies for GA tapping, collection and primary processing; ensure timely (in June) provision and adequate amounts of seedlings, cash crops and agricultural inputs; distribute Hashab seeds and seedlings to the local administrative leaders and to interested beneficiaries who own the agricultural land, and provide cash crops and agricultural tools later as incentives; distribute agricultural tools to the beneficiaries who need it most; ensure transparency in the distribution processes with involvement of local administrative leaders; ensure irrigation at the field level before distribution of seedlings; use seeds from local sources; also provide water bags.
- *Protect hashab trees*: ensure protection of Hashab trees from diseases, illegal cutting for horizontal expansion of agriculture and grazing.
- *Land allocation*: increase the area under agroforestry.
- *Support value addition and export*: support local value addition and export promotion; support Sudan's interest in two separate Codex specifications.
- *Improve market*: increase the prices of Gum Arabic; link the producers with the private sector for marketing and to cut the chain of middle men; improve the Gum Arabic value chain.
- *Ensure infrastructure and services*: improve infrastructure and services (water, storage, transportation and feeder roads) at the Gum Arabic production areas.
- *Ensure enabling environment*: Gum Arabic subsector should receive special consideration in the government strategies and plans together with other actors to survey, manage and conserve the resource base.
- *Resolve conflict*: resolve conflicts on land tenure systems via set up of obvious regulations on the basis of win-win arrangements agreed upon between different stakeholders.
- *Enhance research*: promote research in expanded uses of Gum Arabic; survey production and consumption of Gum Arabic commodity in order to link their supply and demand to the forest potential within the national forest inventory (NFI).
- *Target women and youth*: ensure targeted interventions for women and youth.

Key recommendations from the rapid Gum Arabic value chain assessment

A key information source for the 2022 evidence-based and adaptive programming cycle was a Rapid Value Chain Assessment (RVCA) focusing on the Gum Arabic VC, which was undertaken in preparation for the FNS-REPRO sense making & planning events held in June, 2022. As part of the RVCA, one consultative workshop with key stakeholders in the GAVC and two focus group discussions were undertaken in both El Fasher, North Darfur and Ed Daein, East Darfur. The objective of these meetings was to identify the impact of FNS-REPRO interventions. Below you can find a summary of recommendations that emerged from the RVCA's undertaken in selected communities and with selected stakeholders in North and East Darfur. The recommendations are categorized as follows (not in order of importance): capacity development; protection and natural resource management; pests and diseases; infrastructure; producer organization & market linkages; inputs; services; enabling environment; conflict; women and youth; research; and scaling.

-
- *Capacity development:*
 - a. Raise awareness of Gum Arabic producers to improve the quantity and quality of Gum Arabic products;
 - b. Ensure adoption of good practices that improve post-harvest activities and promote value addition across Gum Arabic supply value chain;
 - c. Stimulate innovative intermediate technologies for GA producers, approved and produced by the research centres and academic institutions (e.g. Agricultural Research Corporation, Gum Arabic Research Institute) to the concerned producers and their institutions;
 - d. Ensure capacity development on entrepreneurship;
 - e. Conduct training in the supply and value chain for the actors in power (for all dealers);
 - f. Intensify awareness on advantages of the agroforestry system;
 - g. Train women and youth on tapping and collection of GA;
 - h. Organise exchange visits of Gum Arabic value chain actors among producing states (e.g. North and West Kordofan);
 - i. Raise community awareness on food diversification for healthier diets;
 - j. Suggest income generating activities & find best mechanisms to address pastoral communities;
 - k. More training, capacity building & access to information are needed for GA producers and community members;
 - l. More training, capacity building, exchange visits and access to information are needed for local extensionists;
 - m. Intensify community awareness programs and peace dialogue to resolve problems of customary land tenure systems.
 - *Protection and natural resource management:*
 - a. Ensure protection measures to mitigate the effects of overgrazing and overcutting of GA trees and encroachment by animals and stealing by humans:
 - i. Open fire lines timely (early before the grass dries up; September-October) and try to cover large areas;
 - ii. Complete demarcation of livestock corridors;
 - iii. Raise the awareness of communities;
 - iv. Activate the role of native administrations and enforce (by-) laws;
 - v. Provide social fencing coupled with voluntary forests guards from villagers to protect forest stands.
 - b. Continue rehabilitation of existing range/pastures with high quality/nutritive species.
 - *Pests and diseases: enhance pest and disease control activities.*
 - *Infrastructure:*
 - a. Improve access to water:
 - i. Continue rehabilitation of existing water sources;
 - ii. Establish new water sources in areas of field crops & gum gardens;
 - iii. Provide water along livestock corridors.
 - b. Improve other infrastructure: storage facilities, transportation means, feeder roads.
 - *Producer organisation & market linkages:*
 - a. Ensure empowerment of GAPAs;
 - b. Build producer associations and link them to financial institutions, companies and employers;
 - c. Create Gum Arabic portfolios to provide an easy and timely financing service for producers and other actors;
 - d. Ensure endorsement of smart partnerships between GA value chain actors on the basis of win-win & fair-trade mechanisms.
 - *Inputs:*
 - a. Provide (and distribute early) more fertilizers, improved seeds, and donkey ploughs;
 - b. Provide more Sonki tools with related training packages;
 - c. Provide Hashab seedlings and seeds to producers (early) from well-known sources;
 - d. Establish home/village nurseries.

-
- *Services:*
 - a. Provide water & veterinary services and animal health care (include fridge for vaccines powered by solar cell in each locality) along livestock corridor;
 - b. Ensure market related services.
 - *Enabling environment:*
 - a. Support an enabling environment on the production sites and rural markets;
 - b. Ensure provision of preferential policies (finance, taxes, alms) to support an enabling environment in the production sites;
 - c. Mitigate market distortions and rationalize policy intervention measures to control and defeat smuggling;
 - d. Adopt high quality and specification measures through all stages of the GAVC activities;
 - e. Encourage micro-financing institutions to enter the area;
 - f. Establishment of an auction market and stock exchanges in the state.
 - *Conflict & peace:*
 - a. Generalize and recognize dialogue as a powerful tool for peacebuilding and conflict resolution;
 - b. Engage women and youth in peace dialogues;
 - c. Diversify peacebuilding mechanisms (communication networks, consensus, Judia, etc);
 - d. Intensify community awareness programs and peace dialogue to resolve problems of customary land tenure systems.
 - *Women and youth:*
 - a. Ensure a business development consultant to focus on integration and development of entrepreneurship with regards to women and youth;
 - b. Engage more youth and women in the GA business (production, micro-processing and trade activities).
 - *Research:*
 - a. Establish a Gum Arabic Research Centre in North Darfur State (Al Fashir University and Agricultural Research Corporation);
 - b. Conduct a study in order to find the best way to finance associations to ensure their sustainability.
 - *Scaling:* work to expand the project's umbrella and its activities in the future in the other states of Darfur.

Key findings from the stories of change

Coupled with the WUR commissioned RVCA, the data collection mission by FAO also collected stories of change. The stories of change, being of qualitative nature, assessed a wider range of impacts (so far) by FNS-REPRO in the respective target communities and identified what worked well, what did not work well, what good practices were emerging and remaining key challenges. Chapter 6 presents the complete stories of change from different FNS-REPRO supported communities in Northern Darfur (2 persons) and Eastern Darfur (2 persons). Below is a brief summary of the key findings that emerged from the stories of change. They reflect a variety of issues mentioned, even though not all issues related to all 'story tellers'.

Changes observed

Two of the four people that shared their story of change mentioned that they were already producing Gum Arabic before the onset of FNS-REPRO and they had learned from their father or from working in remote states such as Kordofan. They mentioned receiving training and tools (Sonki, for tapping gum) which helped them to intensify Gum Arabic production. As a result they mentioned increased income whilst the gum also served as food and medicine. Also other community members were seen to increase the production of Gum Arabic and intensifying tapping of the trees. Other benefits mentioned include having 'belt defence' by planting Hashab trees "for controlling desert from our village, bringing rainfall and improving the soil."

Challenges

Challenges they perceived mainly relate to protection of the Hashab trees, due to destruction by camels (which caused conflict and a broken hand) or other animals and due to stealing by school children and others. Another important challenge was locust. Other issues mentioned include shortage of labour and that youth were not interested to engage in Gum Arabic (GA) production.

Opportunities

There is a need for GA producers to be connected to companies and as well as to establish an auction market in El Fasher town. Other opportunities as observed by the LAFPs include:

- Help to document and transfer indigenous knowledge on Gum Arabic good practices from eldest people to youth;
- Try to integrate youth and women in Gum Arabic business;
- Support protection of Gum Arabic orchards during collection of gum;
- Support key producers who have good experience to encourage and involve other producers in Gum Arabic production;
- Direct contribution of Gum Arabic to households in terms of food and medicine;
- How to tackle pest and disease problems (e.g. Tree locust).

Key recommendations from the sensemaking event

During the sensemaking event with key staff, implementing partners and stakeholders key issues were reflected upon. These resulted in key recommendations to address key challenges along the Gum Arabic (GA) value chain, and for smart partnerships with the private sector in order to improve access to the GA market. Key recommendations are provided below.

Address key challenges along the Gum Arabic (GA) value chain

Below suggestions are provided along different parts of the GA value chain.

Seeds for pasture; GA seedlings, resource base, drivers

Ensure protection of hashab tree itself and minimise deforestation. This can be done by:

- Enforcement;
- Awareness raising;
- Fencing & rehabilitation of rangeland;
- Pasture seed and GA seedlings;
- Provision of water.

GA production (tree ready for tapping): protection of trees, capacities, locust, tapping, access to water, agro-silvo-pastoral/agro-forestry system etc.

- Tools for tapping: right tapping time, tool, intensity and age;
- Pre-financing for early tapping;
- Provide a model bag for GA collection (within smart partnership).

Pre-harvest activities

Ensure gum is collected after maturity to avoid clothing or green gum. Have the first picking after 45 days.

Post-harvest value creation (e.g. cleaning, drying, packaging, aggregation, storage, transportation, building warehouses, other value addition).

- Improve value addition (to increase quality and price): drying, cleaning, sorting, packaging, processing;
- Awareness raising;
- Improve storage;
- Empower GAPA's.

Marketing relations & sales (including access to market, business development, etc) and uptake/use of GA (middlemen, auctions, etc)

- Capacity building of GA producers;
- Organize GA producers in GAPA's;
- Strengthen market information system;
- Ensure smart partnerships;
- Engage the government – auction market;
- Engage the private sector.

Improve access to the GA market: smart partnerships with the private sector

Ultimately, to be successful FNS-REPRO will need to show that smart partnerships can work in Darfur. Once a few good practices have been established, with clear benefits for both producers and companies, it is likely that other partnerships will follow. This will then also take away some of the barriers that exist in Darfur compared to Kordofan, where smart partnerships are common practice, as in Darfur:

- Gum Arabic production is lower;
- Insecurity leads to lower accessibility;
- There is a knowledge gap at beneficiary and GAPA level;
- There is no auction market, or Gum Arabic board;
- The distance to the main markets is larger;
- There is a lack of awareness around the importance and value of Hashab trees and Gum Arabic.

Key suggestions for smart partnerships are detailed in 7.1.2.

1 Introduction

1.1 Background to FNS-REPRO

The Netherlands-funded Food and Nutrition Security Resilience Program (hereinafter: FNS-REPRO) is the first programme in Eastern Africa specifically designed to foster peace and food security at scale, through a livelihood and resilience-based approach, in some of the least stable regions, where interventions are normally of humanitarian programming nature exclusively¹. Its design allows FAO and partners to set examples of building food system resilience in protracted crises. The four-year programme (2019-2023) is implemented in South-Sudan, Sudan and Somaliland. FNS-REPRO adopted a food system resilience approach and focusses on strengthening strategic value chains at country level. In Sudan, the focus is on strengthening the Gum Arabic value chain in North and East Darfur².

The programme is an initiative by the Dutch Government to operationalise United Nations Security Council Resolution 2417³, which forbids the creation of food crises and famine as an act or result of war, by investing in food system resilience in times of crises and situations of conflict.

The programme is also unique in its approach to programme across the Humanitarian, Development and Peace (HDP) Nexus and encompasses a rigorous learning and capacity building agenda implemented by Wageningen Centre for Development Innovation (WC DI) of Wageningen University & Research (WUR). The uniqueness of the learning agenda lies with a grassroots and localised approach to learning where targeted communities and local institutions will be active participants in the design and implementation of the intervention – rather than just being key informants. Furthermore, the learning agenda will contribute to quality programme implementation (through flexible and adaptive programming) as well as to policy dialogue as it will be linked to the Global Network Against Food Crises (GNAFC), through alignment of learning targets, processes and methodologies.

The programme's overall outcome is resilient livelihoods and food systems, and contributions to sustainable localized peace. This will be achieved through:

1. Improved, inclusive access and management of local natural resources,
2. Improved livelihood and income opportunities along the gum Arabic value chain,
3. Enhanced knowledge, skills and capacity of local communities around nutrition-sensitive livelihood support, and
4. Establish and implement a learning mechanism that reinforces field activities and facilitates improved policy and practice on food system resilience.

1.2 Background to FNS-REPRO in Sudan

The gum Arabic value chain has been selected as the FNS-REPRO entry point. This is because it plays a central element in people's livelihood strategies ranging from survival (during humanitarian crises) to improved management of new and existing resources; to providing additional income-earning opportunities and livelihood diversification (stabilization and development). The gum Arabic value chain is essential to the farming system and the resilience of target beneficiaries' in Darfur.

¹ To read more about FNS-REPRO: [FNS-REPRO: building food system resilience in protracted crises - WUR](#)

² To read more about FNS-REPRO in Sudan: [Sudan - Food and Nutrition Security Resilience Program \(fns-repro.com\)](#)

³ To read more about UNSCR2417: [Security Council Resolution 2417 - UNSCR](#)

FNS-REPRO's proposed activities centred on the gum Arabic value chain in Darfur will increase the resilience of communities and their food security status by:

- Diversifying livelihoods and increasing incomes, through improving technical, organizational and commercial capacity to produce and market gum Arabic;
- Supporting landscape restoration and reduce degradation, thus building back the green belt in Darfur;
- Reducing conflict between crop and livestock producers, through rehabilitating livestock corridors and increasing fodder availability; and
- Increasing the share in the benefits of the gum Arabic production for women and youth, such as through the support of existing and creation of new dedicated women and youth producer groups.

The FNS-REPRO Theory of Change is illustrated in Figure 1 below ⁴.

1.3 Background to this document

This document describes the key findings that result from assessments that have been undertaken in support of the second annual evidence-based and adaptive programming cycle of FNS-REPRO. These findings informed the sensemaking event held in June 2022 in Sudan⁵. The purpose of these events is to consolidate and critically reflect upon key evidence that relates to FNS-REPRO and its context, and to support evidence-informed decision making and adaptive management. Earlier FNS-REPRO sensemaking events were organized in June 2021 (first annual sensemaking event), and in February 2022 (mid-year sensemaking event). In particular, the development of the upcoming annual plans and adjust mid-year planning in response to key contextual issues affecting the success of the program. For the purpose of the annual sensemaking event in June 2022 the following key activities have been undertaken:

1. Rapid literature review
2. Rapid Gum Arabic value chain assessment
3. Stories of change (producer groups, community committees)

The approaches and key findings are further explained in this document.

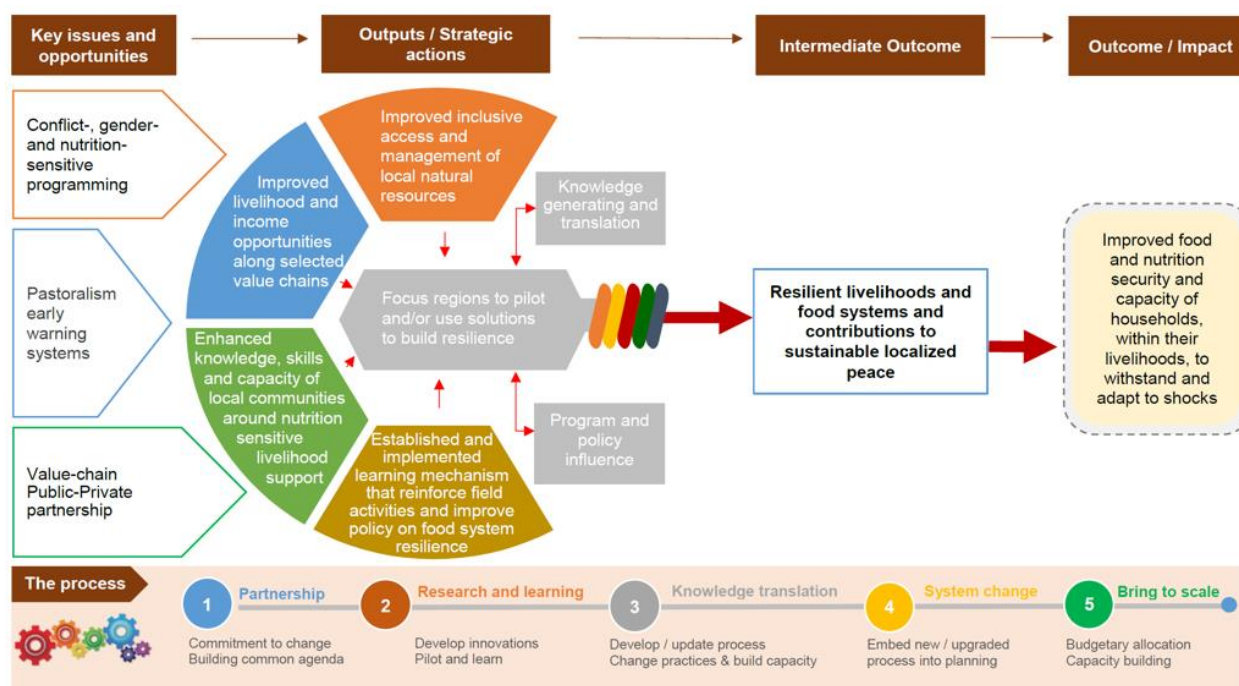


Figure 1 FNS-REPRO Theory of Change.

⁴ For the revised and updated Theory of Change for FNS-REPRO in Sudan: [FNS-REPRO Sensemaking workshop report Sudan \(wur.nl\)](#)

⁵ To read the 2022 sensemaking event workshop report for Sudan: [FNS-REPRO Sensemaking workshop report Sudan \(wur.nl\)](#)

1.4 Sudan context update

According to the Integrated Food Security Phase Classification (IPC) information that was published on 21 June 2022 (April 2022-February 2023), "Sudan food insecurity levels continue to increase driven by the worsening macro-economic situation, poor harvest and conflict." They explain that "With significant increases in food and other commodity prices, a reduced harvest, and continued conflict, acute food insecurity in Sudan continues to worsen rapidly..... The situation is projected to worsen between June and September, with up to 11.7 million people likely to be in Crisis (IPC Phase 3 or worse)." The more detailed IPC report shows that for the second projection period (October 2022 – February 2023) the situation is expected to slightly improve but various factors are highly unpredictable. "The situation remains extremely volatile with several highly unpredictable factors, most notably the conflict in Ukraine, the impacts of which can be much more consequential than envisioned in this analysis.... High prices, low purchasing power, intercommunal conflicts, and seasonal floods will remain the key drivers of food insecurity....Sudan's macroeconomic situation is expected to continue to deteriorate through the year 2022. The macroeconomic outlook indicates persistent risks of political instability and shocks related to the Russia-Ukraine conflict (notably higher food and oil prices), including lack of a sustainable hard currency stream and the increased need to import essential food and non-food items will likely drive further currency depreciation. Continued increases in the prices of food and transportation and the local food basket are expected to negatively impact the purchasing power of poor households and likely drive an increase in the inflation rate" (Kusters, et al., 2022).

2 Methodological approach

For the purpose of the annual sensemaking event in June 2022 the following key activities have been undertaken:

1. Literature & document review of the Gum Arabic value chain
2. Rapid Gum Arabic Value Chain Assessment
3. Stories of change (producer groups, community committees)

The purpose and approach behind each of the above assessments, are further explained below.

2.1 Literature review

Purpose and key learning questions

Literature review of the Gum Arabic value chain in Sudan involved analysing and reviewing available literature. The purpose of the literature review was to answer the following key learning questions, so as to get a better understanding of the GAVC in Sudan and generate useful insights for FNS-REPRO:

- Who are the main actors at each point in the seed GAVC?
- What are the main stages in the GAVC?
- What are the flows of Gum Arabic between different actors?
- Which stages of the GAVC are most profitable for which actors?
- Where and to what degree is value added, or value lost, as Gum Arabic moves along the VC?
- What are key bottlenecks along the GAVC?
- What has been the role of FNS-REPRO in GAVC development?
- What are options for change?

These learning questions also formed the basis for the rapid seed value chain assessment.

Sources

A quick literature review on the GAVC in Sudan involved analysing and reviewing available literature from FNS-REPRO and other sources. Key FNS-REPRO documents that were reviewed include: the Sensemaking workshop report for Sudan (Kusters et al., 2022); the Resilience Index Measurement and Analysis (RIMA) baseline report for Sudan (FAO, 2020a); The Multidimensional context analysis in the North and East Darfur States (FAO, 2021a); The FNS-REPRO Annual Plan (October 2021 – September 2022) (FAO, 2021b).

MEAL data from the Annual Progress Report (January – December 2021) and from a Post Distribution Monitoring (PDM) assessment (Mohamed, F., 2021) was also included to evaluate the impact that the FNS-REPRO has had on the development of the GAVC thus far. Also literature from other sources has been reviewed.

2.2 Rapid value chain assessment

The **purpose** of the rapid Gum Arabic Value Chain (GAVC) assessment included:

1. To map the changes along the GAVC in Sudan in selected FNS-REPRO areas.
2. To relate these changes in the GAVC to FNS-REPRO interventions & to other factors & actors.
3. To identify key gaps in the GAVC & opportunities to strengthen the GAVC in FNS-REPRO project areas.

Note: the idea was not to be complete but rather to undertake a light VC assessment so that it could serve as input in the sensemaking event in June 2022 and following events and processes related to the seed sector/value chain.

Key overarching question to be addressed was: *What did the seed value chain look like at the onset of FNS-REPRO interventions (early 2020), how did it change over time and why did these changes happen (relate to role of FSN REPRO and other actors & factors)?*

Approach for the rapid GAVC:

A participatory RSVCA was undertaken by actively engaging stakeholders in selected FNS-REPRO areas so that learning takes place and realistic and relevant options for change are identified. Focus was on changes in the VC as a result of FNS-REPRO and other influencing factors and actors. There were 2 key activities:

1. Mapping the VC since the FNS-REPRO interventions started (early 2020).
2. Mapping VC related services & influencing factors.

What is a 'Value Chain'?

A value chain includes all the activities that are undertaken in transforming raw materials into a product that is sold and consumed. These include the direct functions of primary production, collection, processing, wholesaling and retailing, as well as the support functions, such as input supply, financial services, transport, packaging and advertising. The terms "value chain" and "supply chain" are often used interchangeably. In this guide we use the term value chain to reflect the understanding that value is added at each point in the chain (Vermeulen et al., 2008).

Figure 2 Defining the value chain.

Mapping and understanding the value chain – key learning questions

A list of key learning questions was devised to assist in mapping and understanding the Gum Arabic VC (similar to those for the literature review):

1. What are the main stages in the Gum Arabic VC?
2. Who are the main actors at each point in the Gum Arabic VC?
3. What are the flows of Gum Arabic (and by product) between different actors?
4. Where and to what degree is value added, or lost, as the product moves along the VC?
5. Which stages of the Gum Arabic VC are most profitable for which actors?
6. What are key bottlenecks along the Gum Arabic VC?
7. What has been the role of FNS-REPRO in Gum Arabic VC development?
8. What are options for change?

2.2.1 The value chain approach

Studies illustrate the importance of a value chain approach for understanding how to contribute to the agricultural sector's growth and expansion (Vermeulen, 2008). The value chain approach illustrates the various actors playing a role as a primary agriculture product moves along a chain, in addition to the relationship between these actors, from inputs to production, post-production, processing, and distribution/marketing. Indeed, one of the main paradigms shifts in agricultural knowledge building and implementation has been the inclusion of the value chain approach. Given the growing consensus amongst development practitioners that agriculture is key for lifting rural populations out of poverty and improving livelihoods, it is important that the conversation around agriculture moves from one simply being about cultivation and harvest to one that focuses on the entire value chain approach.

As noted in Devaux et al. (2018), what is needed is a holistic approach that takes into account the entire agriculture chain, looking at the challenges and opportunities of the input suppliers all the way to the consumption of a final product itself and, in fact, an evaluation of the final product following its consumption. "For agricultural research to benefit the rural poor, it needs to complement other efforts that improve the policy environment, alleviate resource constraints, and build local capacity for responding to changing technological and economic challenges and opportunities" (Devaux et al., 2018).

Primary actors are usually more actively involved in input supply, production, storage, retain, and consumption - with farmers usually being associated as primary actors. On the other hand, secondary actors are involved in the value chain more indirectly through provision of services and functions to primary actors, such as transportation and credit provision, without working in the actual crop production (World Bank, 2019). The value chain approach considers how different actors - such as energy service providers, technicians, researchers, traders - can interact with the agriculture sector and, in fact, become key value chain actors themselves.

There are also support activities that help enable the success of more primary activity. The value chain approach looks at activities such as infrastructure, technology, social capital, and other resources (Porter, 2001). The supporting activities and the surrounding atmosphere are key in the value chain approach. As such, it is worth asking how the environment surrounding stakeholders can be improved. The value chain approach also necessitates that understanding the market looks at both the domestic and export oriented, international scale. Moreover, a constructive and amenable policy environment that prioritizes rural populations and agricultural development is necessary. Technology that enables higher productivity and up-scaling of crops to make them more likely to be exported is also included in this.

2.3 Stories of change

The **purpose** of the stories of change includes:

- To identify key stories of change for FNS-REPRO target groups (producers/producer groups, committees).
- To identify the role of FNS-REPRO and other influencing factors and actors that affect their ambitions (livelihoods).
- To identify stories of change, emerging good practices & lessons learned from FSN REPRO (& other programs?), relevant for food system transformation initiatives and related challenges and opportunities.
- To identify key options for FNS-REPRO support in the final year of implementation.

The **approach** for the stories of change included interviewing producers/producer groups & community committees to tell their stories of change in relation to being engaged in FNS-REPRO.

Key question to be addressed: *How & why have the producers/producer groups, committees (and the community) changed since the onset of FNS-REPRO interventions (early 2020)?*

3 Literature review of the Gum Arabic value chain in Sudan

The literature review was conducted on the Gum Arabic value chain (VC) in Sudan. See chapter 3 for the methodological approach. The literature review is structured around a set of key learning questions, described at the start of each section below. The chapter starts with describing the background of Gum Arabic in Sudan. After that the different learning questions are addressed.

3.1 Background on Gum Arabic in Sudan

Gum Arabic is a strategic sector for the Government of Sudan, generating social, economic and environmental dividends for communities in the region. Sudan is the world's largest producer and exporter of raw Gum Arabic, "with an annual production corresponding to 70% of the world's raw exports" (AFD, 2021). Gum Arabic production is principally practiced in the traditional rainfed agriculture areas of western and central Sudan (Figure 4). The Gum Arabic producers involved in Gum Arabic activities are estimated up to 20% of Sudan's population, or around 6 million people, and are among the poorest and most vulnerable to food insecurity (Hassan et al., 2017).

The Darfur region (as seen in Figure 3), in particular, presents favorable conditions for the production of high-quality Gum Arabic, from the *Acacia Senegal* tree, commonly known as Hashab. However, producers and upstream value chain actors face key challenges concerning productivity, negotiating good farmgate prices, access to market and finance. Likewise, processing the gum attracts high taxes and producers are constrained by limited access to market information or credit (FAO newsletter, 2021c). These key challenges and bottlenecks will be further explored in section 4.4. For now, a background on Gum Arabic in Sudan is presented, highlighting the value of the sector and thus, the need to further understand the key actors and activities along the value chain, in order to identify key gaps & priorities that can be supported by FNS-REPRO in its final year of implementation.



Figure 3 Map of the Republic of Sudan.

Source: UN Geospatial, 2021.

Geographic significance of Gum Arabic

According to the *Multi-dimensional context analysis in the North and East Darfur States* (FAO, 2021a), Gum Arabic is one of the most important trading commodities coming out of Sudan. Around 80% of the global production of Gum Arabic comes from the *Acacia Senegal* in Sudan with the second resource being the *Acacia Seyal*, which produces an inferior quality gum (FAO, 2021a, p. 26). Darfur, Kordofan and Blue Nile states are the predominant producers of Gum Arabic due to geographic location within 'the gum belt', a geographic area running along the Sahel where climate conditions are ideal for the *Acacia* trees. A map of the gum belt (Mariod, 2018) is presented in Figure 4 below.



Figure 4 Map of the gum belt in Sudan.
Source: Mariod, 2018.

The *Acacia Senegal* tree serves many functions to the livelihood system around the gum belt. The foliage and pods are a primary source of fodder for animals, the wood is used for carpentry and tool making, the seeds can be dried for human consumption in times of food insecurity, branches can be used for animal enclosures. The trees drought resistant properties allow them to serve as windbreaker. The leaves, bark and gum are used for their medicinal properties, the flowers produce honey and the roots can be used for the making of rope (FAO, 2021a). Another significant property of the *Acacia Senegal* is that it produces superior quality charcoal.

Economic significance of Gum Arabic

Gum Arabic production is principally practiced in the traditional rainfed agricultural region of western and central Sudan. The Gum Arabic producers involved in Gum Arabic activities are estimated to be up to 20 percent of Sudan's population, or around 6 million people, and are among the poorest and most vulnerable to food insecurity (Adam, 2016). The eight western states (Kordofan and Darfur states) supply more than 75% of hashab gum (*Acacia Senegal* gum) in the country and gum is an important export product (Figure 5). The Blue Nile and Sennar states are important production centers of commercial *Acacia Seyal* and *Acacia Polyacantha*. Together, these states constitute the core Gum Arabic production in the country and contribute to about (85 percent) of the national Gum Arabic export portfolio (FAO, 2021a, p. 26). The Gum-Arabic business is booming because of the growing international demand of the natural resin which is widely used in food, soft drinks, cosmetics and medicines (UNCTAD, 2018).

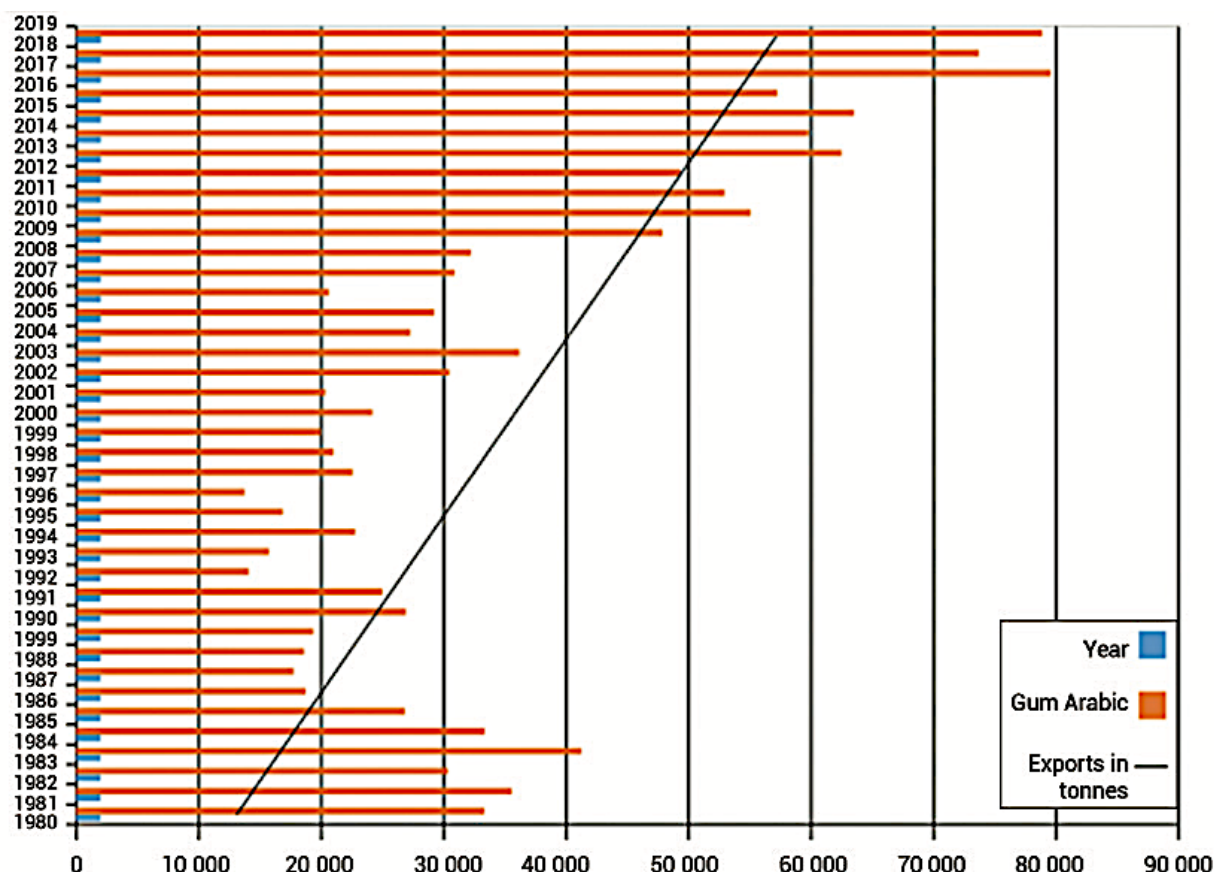


Figure 5 Gum Arabic exports from Sudan (1980-2019).

Source: Derived from Tarig et al. (2017).

Besides being an important commodity for export, the Gum Arabic trade employs a large amount of people in Sudan, making it an essential part of the livelihood system. Below is an overview of the various groups of actors involved in the GAVC (adapted from Adam, 2016) but section 4.2.2 and 4.3.2 provide a more elaborate overview of actors and their functions in the Gum Arabic value chain.

- **Producers:** Producers who have no property rights gain access to the forest through permits from tribal leaders. The producers establish relationships with village traders, so as to access credit to pay for initial investments in the production process, including food and tools.
- **Village traders:** Village traders have access to markets and market information. Village traders and middlemen have access to capital in the form of credit from town traders and agents. Traders in most cases borrow money on behalf of producers, and therefore those producers have to sell their products to them.
- **Town traders and agents:** Town traders and agents have access to capital and have knowledge of the quality requirements of exporters due to their access to exporters and their agents. Higher amounts of capital are invested at the town traders and agents for cleaning and packing. Town traders use credit arrangement mechanisms and have strong social ties with village traders to maintain access to benefits.
- **Forest National Corporation (FNC):** The FNC charges traders' fees and royalties when they transport gum from rural and urban markets.

3.2 Gum Arabic Value Chain

What are the main stages in the Gum Arabic value chain?

The UNCTAD publication 'Commodities at a glance - special issue on Gum Arabic' (UNCTAD, 2018a), identifies the main stages of the Gum Arabic value chain. However, it should be noted that this is a generalized description, based on multiple countries in Sub Saharan Africa. A more detailed look at the GA

value chain in North and East Darfur States is provided in section 4.2.1 and 4.3.1 respectively. Nevertheless, the information provided here is indeed relevant and characteristic of the GA value chain in Sudan.

Value chains describe the range of activities required to bring a commodity from the producer to the consumer, emphasizing the value added at each successive stage. "In the case of Gum Arabic, it may include tree cultivation, harvesting, drying, cleaning, sorting, grading, transportation, storage, processing, marketing and industrial application. Some activities, such as sorting, transportation and processing, may occur several times, at different stages and locations, before the gum reaches the end consumer" (UNCTAD, 2018a). A simplified schematic overview of the Gum Arabic global value chain is depicted in Figure 6.¹

"As Gum Arabic advances through successive stages in the value chain, it may undergo a number of phases. Table 1 lists types and grades of Gum Arabic by ascending level of product sophistication. The gum collected by producers needs to be dried for at least three weeks before it can be packed and sold to merchants. It must also be cleaned, sorted and graded based on botanical origin and physical characteristics, such as nodule size and colour, before it is sold to processors or exporters. In the Sudan, *Cleaned* is the standard grade of hard gum. It is composed of whole and broken nodules with a diameter between 10 mm and 20 mm. Although free of dust, it contains siftings. *Cleaned amber and sifted (CAS)* is a step above *Cleaned*. It is composed of whole and broken nodules with a diameter above 20 mm, pale to dark amber in colour. It does not contain dust or siftings. The highest grade of hard gum is *Handpicked select (HPS)*, which is composed of whole nodules with a diameter above 30 mm and light in colour. HPS is manually cleaned and does not contain fragments, siftings or dust. The siftings collected during the cleaning and sorting process are sold as a by-product. For friable gum, the common grades in the Sudan are *Talha cleaned* (diameter above 4 mm), *Talha sifting* (0.5–4mm in diameter) and *Talha dust* (diameter below 0.5 mm)" (UNCTAD, 2018a).

Table 1 Gum Arabic products by ascending level of sophistication.

Type or grade	Description
Wet gum	Freshly collected gum
Natural gum	Semi-dried gum (about three weeks after collection)
Cleaned	Whole or broken nodules (diameter: 10-20 mm)
Cleaned amber and sifted (CAS)	Whole or broken nodules (diameter above 20 mm), pale to dark amber colour, dust and siftings removed
Handpicked selected (HPS)	Whole nodules (diameter above 30 mm), lightest colour, dust and siftings removed by hand
Kibbled gum	Mechanically broken and sieved CAS or HPS
Mechanical powder	Mechanically broken and sieved CAS or HPS
Spray-dried powder	Spray-dry powdered HPS, CAS or kibbled gum
Instant soluble gum	Granulated gum with improved solubility

Source: UNCTAD, 2018a

Figure 6 below provides a simplified version of the global Gum Arabic value chain.

¹ Note: This diagram provides a simplified graphical representation of the agents, activities and products involved in the Gum Arabic value chain. Actual flows may vary significantly across countries and over time.

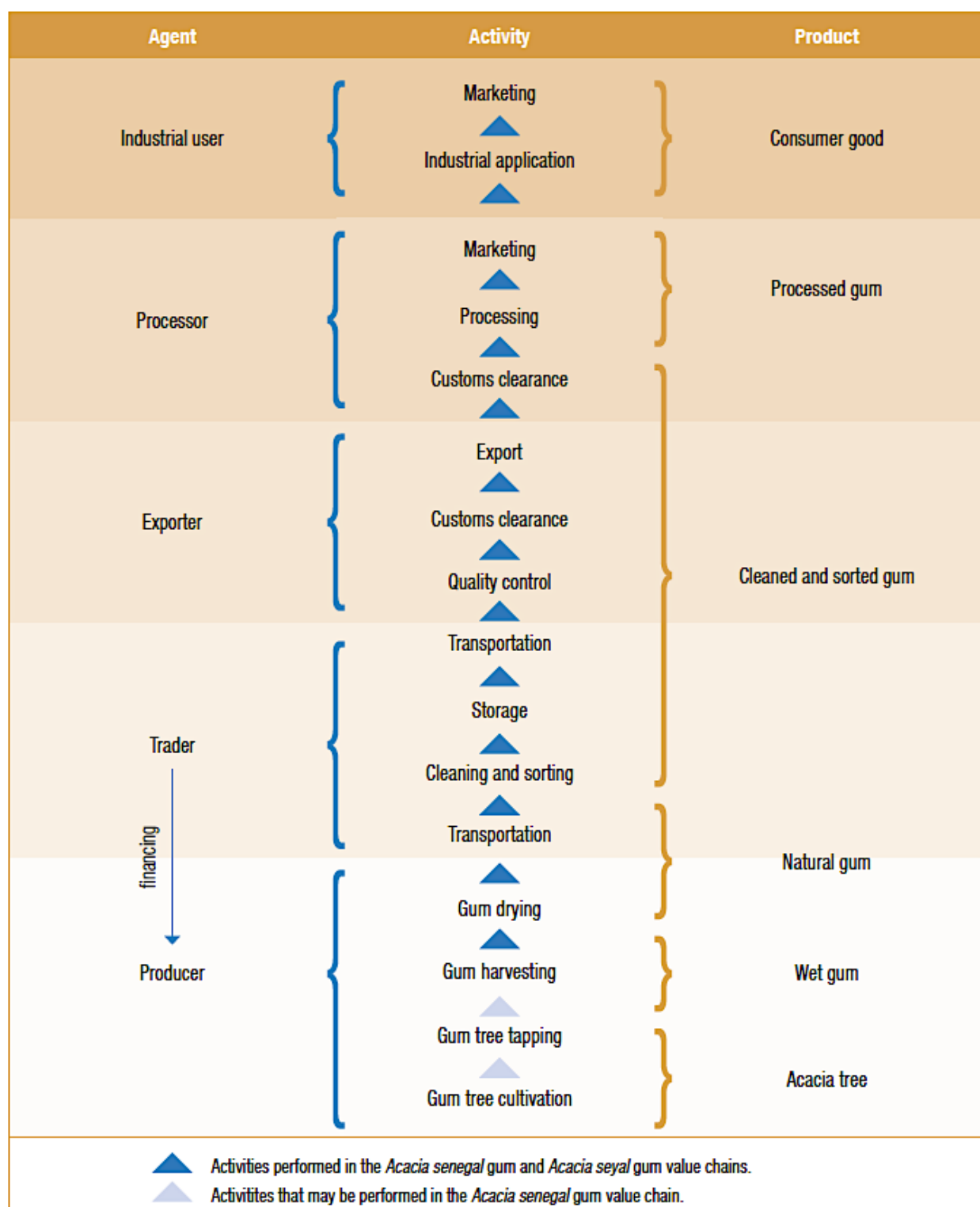


Figure 6 Gum Arabic global value chain: simplified scheme.
Source: UNCTAD, 2018a.

3.2.1 Main stages in the Gum Arabic value chain in North Darfur

The Sudan *Multi-dimensional context analysis in the North and East Darfur States* (FAO, 2021a), provides a brief explanation of the main stages of the GAVC and how the produce is processed along the chain. "North Darfur state is a known source of high-quality Gum Arabic produced within the sand plain soil of the western part of the Gum Arabic belt which spans across the whole country. If the rainy season in North Darfur is good (from June to end of August up to early September), Gum Arabic production and tapping start from mid-October – 45 days after the end of the rainy season. Tapping continues until early March with intervals of

2 weeks, for a total of 6 – 7 collections per productive year. If the rainy season comes late, like the past year in North Darfur, Gum Arabic tapping can start in mid-November and go on until April” (FAO, 2021a: 50). Key elements of the Gum Arabic value chain are described below and include: Gum Arabic production and supply; markets and supply systems – rural markets and urban or wholesale markets; central auction markets; Gum Arabic exports.

A. Gum Arabic Production and Supply

Gum trees in the target localities are not distributed equally, with important variation with regard to number and productivity. 85 percent of Hashab trees are concentrated in the localities of Kalamendo, Tewisha and to a lesser extent in Ele’iet, covering different areas. Um Kaddada locality ranks second with production level of 10 percent, with trees mostly concentrated in the south. El Fasher locality registers the lowest productivity (5 percent) with hashab trees scattered in small quantities over widely fragmented areas. The yield per tree and the number of trees per unit area vary from one locality to another and also from one season to the next (FAO, 2021a).

The percentage of the actual Gum Arabic tapping and collection compared to the existing hashab stands is generally low, equivalent to 20 percent in total. In this respect, Kalamendo ranks first (40 percent), followed by Tewisha (30 percent), while Elfashir, Um Kaddada and Ele’iet localities indicate less quantity of tapped Gum Arabic (FAO, 2021a).

Communities in the villages of Kalamendo and Tewisha indicated that the average productivity of hashab is ranging from 0.25 to 0.75 Kg/tree (0.5 Kg/tree on average) (FAO, 2021a: 51). This amount can be obtained from five pickings (on average) per season per single tree. The yield per tree and the number of trees per unit area varies from one locality to another and also from one season to the next. The number of trees also varies from a low to a medium density with an overall average of 120 trees/feddans (285 trees/hectare) (FAO, 2021a).

The area allocated to Gum Arabic production varies significantly in the target localities (Table 2). The two investigated villages in Elfashir locality showed no significant hashab gardens. The result was similar for El Abyiad village in Um Keddada locality, while less than 5 feddans per garden were reported in Brooch village (Um Keddada). Unlike the previous cases, the areas allocated to hashab trees in Kalamendo and Tewisha are much bigger, ranging from 10 to more than 100 feddans per garden. The average Gum Arabic holding in Al’lait is small, approximately less than 10 feddan. Despite the great potential for Gum Arabic production in Ele’iet locality, most of the hashab trees have been uprooted since 2017 and their areas have been shifted into groundnuts cultivation (FAO, 2021a).

Table 2 Areas of Gum Arabic holdings in the FNS-REPRO localities in North Darfur.

Locality	Average area of individual Gum Arabic garden (fedddan)
El Fasher	Not significant
Um Keddada	Very limited hashab gardens in Broush (less than 5 feddans/garden)
Kalamendo	Many hashab gardens in Sani Karao (10–50 feddans/ garden). Many hashab gardens in Gussa Jamat (more than 100 feddans/garden).
Tewisha	Many hashab gardens in Gabir and Eyal Amin (10–100 feddans/garden).
Ele’iet	Limited number of hashab gardens in Fataha (less than 10 feddans/garden). Very limited number of hashab gardens in Abu Sufian (less than five feddans/garden).

Source: FAO, 2021a.

B. Market and supply systems

FAO’s analysis of the current value chain in FNS-REPRO target localities i.e. as emerging from the *multi-dimensional context analysis* (FAO, 2021a), “indicated that Gum Arabic markets can be classified in two levels only: rural traditional markets (Umdurwar) and urban markets. After reaching the urban market, the commodity is driven to the central auction markets outside the state”.

Rural markets. “The rural markets act as small assembly markets, which receive and aggregate the Gum Arabic commodity from the peripheral and nearby markets. Most of the investigated rural markets in North Darfur possess this type of markets (Broosh, Sani Karao, Gusa Gamat, Wada’a, Iyal Amin, Gabir, Abu Sufian and Fataha). All rural markets are operating on a weekly basis (one or two days per week). Most of these markets are located in vicinity of the production sites. Transportation of the commodity from the forests to the rural markets is done by animals, cart and/or on foot. Thus, transportation costs are at minimal level. By contrast, the Gum Arabic commodity withdrawal from the rural markets is done by lorries or special pickups cars called Umcheleli” (FAO, 2021a).

“Rural markets are also considered social and cultural fora (e.g. Sani Karao market). Sani Karao market, which is located in Kalamendo locality, is administered by a local village committee with one administrative officer and one market guard. The market area is very small and unfenced without any reliable administrative buildings. Gum Arabic commodity is displayed in an irregular manner at shades made out of crop sticks and sometimes kept inside muddy or cemented stores. Nevertheless, Sani Karao market is considered as an important Gum Arabic rural market due to the vast amounts of commodity received during the season (January - May). The feedback from group discussion estimated that the weekly quantities of the Gum Arabic received is about 500 quintals per a market day, which is equivalent to 20,000 quintal per season. Nevertheless, the market is inaccessible to most of Gum Arabic city traders and companies due to the harsh conditions and inappropriate feeder roads. This phenomenon, from economic point of view is known as a “market discrimination” (FAO, 2021a).

Urban or wholesale markets. “The urban or wholesale markets receive Gum Arabic supplies from the rural or small assembly markets and move them to the urban centres. These markets are positioned between the central and rural markets. Some of the project localities have this type of markets. The Hajr Gudoo is the main urban crop market in North Darfur and its authority is shared between locality and state level. Currently, Gum Arabic does not feature as one of the key traded commodities and it does not have a specific market yard. Vice versa, other cash and food crops have specific market yards and they go through the auctioning processes. The other urban markets in North Darfur (Kalamendo, Tewisha, Um Keddada and Ele’iet) are smaller in size and have limited financial capabilities. Yet they are regularly carrying out large business transactions in Gum Arabic commodity compared to El Fasher market” (FAO, 2021a).

Results from the *Sudan context analysis* (FAO, 2021a), revealed that several tributary markets (rural markets) provide the commodity to the nearby urban markets in North Darfur (Table 3); from the urban markets the commodity reaches the auction markets in Ennuhud or Elobeid (Kurdufan).

Table 3 Investigated Gum Arabic urban and tributary markets in North Darfur.

Tributary markets supplying the urban market	Gum Arabic urban market	Final destination (Central auction markets)
Lawabid, Um Haraza, Abu Hemira, Babiker	El Fasher (less active than in the past).	
Shani Karo, Gusa Jamat, Wada’a	Kalamendo (very active).	
Brooch, El Abyiad, Setiha	Um Keddada (less active than in the past)	Directly to Ennuhud or Elobeid auction markets (West and North Kurdufan).
Gabir, El Manarah, Hinteer, Abu Ajajah and Iyal Amin, Um Saaona, Tolo, Asban	Tewisha (active).	Gum Arabic reaches Giebash urban market (West Kurdufan) before reaching Ennuhud or Elobeid auction markets (West and North Kurdufan).
Fataha, Wad Baleela, Um Ishreen and Abu Sufian	Ele’iet (active in the past).	
Abu Karinka, Hilal, Adila, Abu Jabra, Abu Gantora, Eltaalba, Jadelseid, Bakheit, Jild Sagir, Fajag, Wad Baliela, Um Ishrin, Salah Eldin	Ed Daein (less active than in the past) receives approx. 30 percent of the Gum Arabic supply from the East Darfur state. Giebaish (West Kordofan) receives approx. 50 percent of the Gum Arabic supply from the East Darfur state.	Ennuhud or Elobeid auction markets (West and North Kurdufan).

Source: adapted from FAO, 2021a.

The feedback from the Executive Director of Ele'iet locality indicated that there are some market organizational measures imposed by state authorities to allow the dealers to access the urban markets in North Darfur. These measures have not strictly been ratified (e.g. valid trade license, official document indicating that the market dealer is free from taxes and alms (Zakat), certificate of financial capability etc.) (FAO, 2021a).

C. Central auction markets

The central auction markets do not exist in North Darfur. From the urban markets, Gum is mostly driven to auction markets by city traders and/or producers' agents (often from Elfashir, Kalamendo, Tewisha, Um Keddada and Ele'iet) to the nearby auction markets in Elobeid and/or Ennuhud (Kurdufan). Central auction markets are organized by the government as part of the main Gum Arabic marketing system in the country. The auction markets can easily be accessed almost all the year round. The markets are characterized by a prevalence of a large number of Gum Arabic actors: producer's agents, city traders, middlemen, companies or company's agents and processors (FAO, 2021a).

The Elobeid crops market, in North Kurdufan, is situated in the centre of the city near the railway station in an area of 18324 m². It consists of different specialized sections: information office, auction hall, market yard, executive authority office, electronic and conventional balances and nursery. Other offices are assigned to representatives of alms (Zakat), taxes and duties and the Sudanese Standards and Metrology Organization (SSMO). Basic services of water and electric power are available in addition to security elements to protect crops and assets inside the market. Marketing activities occur every day except public holidays. There are no storage facilities in the market. Management manpower in the market is more than a hundred and fifty people, in addition to taxes, FNC and alms employees (FAO, 2021a).

D. Gum Arabic Exports

From the central auction markets, the Gum Arabic product is mostly exported as clean raw gum (75 percent), kibbled (15 percent) or mechanical powdered (10 percent) gum (Mahmoud et al. 2014). The total amount of Gum Arabic exports from Sudan in 2019 was indicated to be almost 50,000 MT (FAO, 2021a).

3.2.2 Main actors in the Gum Arabic value chain in North Darfur

Who are the main actors at each point in the value chain?

The Sudan *multi-dimensional context analysis* (FAO, 2021a), provides an overview of the different Gum Arabic value chain actors in North Darfur and the different activities they engage in.

The Gum Arabic Value Chain actors interact in different ways. Value chain actors in FNS-REPRO target localities carry out little value adding activities. Depending on their role, the key actors in North Darfur state can be classified into two major groups as: i) direct value chain actors, and ii) indirect value chain actors (supporters) (FAO, 2021a).

Direct value chain actors. The direct value chain actors in North Darfur (mostly found in Kalamendo, Tewisha and to some extent Ele'iet) are represented by small to medium scale producers, middlemen, village traders, producer agents, Gum Arabic producer associations (GAPAs), and city or assembly traders (Figure 7). The producers are the economic active groups who take the ownership of the product at the starting of the chain (upstream) and perform essential activities in the Gum Arabic tapping and collection (using traditional tools such as Sonki, axe and makmak), transportation (using animal, carts and lorries) and local marketing (mainly distribution of the commodity in a raw form at the rural markets) (FAO, 2021a).

Indirect value chain actors. The indirect value chain actors provide support and regulatory services that facilitate the overall performance of the chain and of the direct actors. The most important indirect value chain actors are represented by the line ministries and administrations, FNC, Agriculture Research Corporation (ARC), businessman federations, El Fasher University, FAO and other UN agencies. Although it is difficult to quantify the exact number of direct actors at each stage of the chain, the role of the different actors in the project area is presented in the subsequent sections. Small-scale Gum Arabic producers (FAO, 2021a).

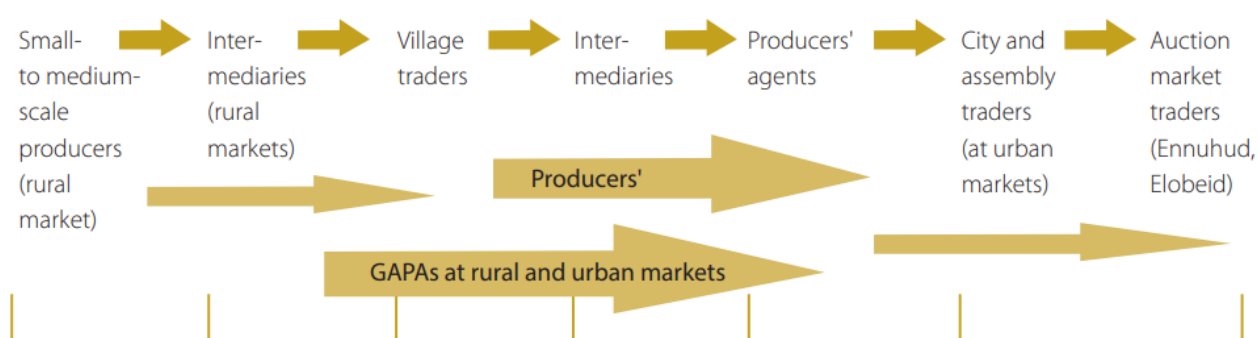


Figure 7 Direct value chain actors in REPRO localities in North Darfur.
Source: FAO, 2021a.

Small-scale Gum Arabic producers. The results of the Sudan multi-dimensional context analysis (FAO, 2021a) indicate that small to medium scale farming producers supply the largest share of Gum Arabic in North Darfur. Medium and large-scale farming are also found in Tewisha and Kalamendo (Figure 8). Gum Arabic production in Kalamendo and Tewisha localities is largely managed by family labour (56 percent), followed by hired labour (33 percent) and other arrangements (11 percent) i.e. sharecropping arrangements (FAO, 2021a).

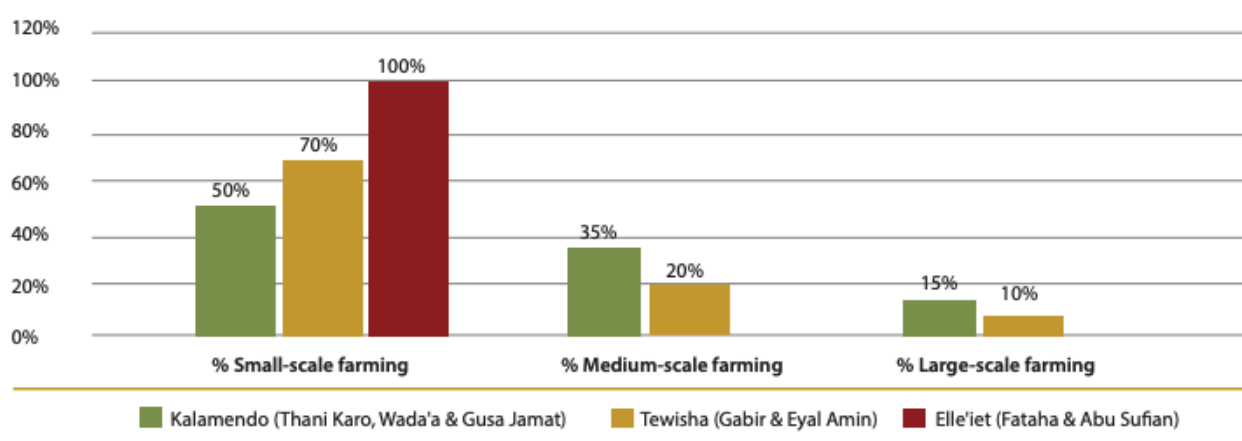


Figure 8 Types of Gum Arabic farming in REPRO localities in North Darfur.
Source: FAO, 2021a.

Village traders exist at the rural level and they usually undertake small-scale transactions. They buy the commodity directly (or through middlemen) from the gum producers at village shops or mobile markets (Umduarwar) on market days and sell the amount they collect to traders at the markets in the nearby towns (urban markets) or to trucks visiting the assembly markets. They constitute the first marketing link, aggregating the dispersed Gum Arabic supply at farm gate and/or assembly village markets. The number of village traders per rural market varies across the visited villages, ranging from 2 to 7 traders per village. These traders are reported to collect Gum Arabic at farm gate and control the commodity prices. Most of the interviewed village traders were male with a relatively long experience in Gum Arabic trade (> 12 years) (FAO, 2021a).

GAPAs: The Gum Arabic Producer Organisations (GAPAs) in North Darfur state are organized under the regulations of producer associations established by FNC, in accordance with the "Cooperative Law" amended in 2003. Most of the interviewed producers (70 percent) in the target localities belong to GAPAs in their respective villages. The total number of GAPAs in Kalamendo, Ele'iet, Tewisha and Um Keddada were found to be 168 (data sourced from the GAM's project report - 2018). The majority of them are located in

Kalamendo locality (66 percent). According to their mandate, the GAPAs' role is to provide tangible benefits to improving producers' access to services such as credit, training and extension, as well as to community development projects (e.g. construction of water reservoir, Gum Arabic stores, schools and mosques) (FAO, 2021a). As of 2018, 168 GAPAs were reported to be present within four of the five project localities (no data on rural El Fasher were reported). GAPA's members reported to be not satisfied with the services provided as shown by the very low satisfaction rate (20 percent) (Table 4).

Table 4 Number, status and performance of GAPAs in REPRO localities in North Darfur.

Locality	Number	%	Active GAPAs (%)	Satisfaction (%)
Kalamendo	112	66%	40%	30%
Ele'iet	13	8%	20%	10%
Um Keddada	22	13%	15%	20%
Tewisha	21	13%	10%	20%
Total	168	100%	21% (average)	20% (average)

Source: FAO, 2021a.

Partnerships: No contact farming agreements involving Gum Arabic producers and their GAPAs with the private sectors (e.g. Gum Arabic exporting companies) were active in most of the investigated localities in North Darfur. The few partnerships found are reported to be below aspirations. Smart partnerships between GAPAs and some exporting companies on the basis of fair-trade mechanisms, or at least win-win situations, are running successfully in North Kordofan State. Lessons learnt from this experience could successfully be demonstrated, discussed and implemented in the case of North Darfur (FAO, 2021a).

City traders are small in numbers and some of them operate as assembly traders or company agents who may be self-financed or supported by main dealers in big cities (e.g. El Fasher, Ele'iet, Geibaish, Ennuhud, Elobeid). They represent the top tier in the hierarchy of the local marketing setup, and they rarely carry out postharvest activities like drying, cleaning, grading and transporting the commodity to the auction markets (FAO, 2021a).

Middlemen (Samasrah) act as a link between producers and traders. They receive a commission, which varies according to the transaction value, number of market actors and the nature of the Gum Arabic market. Sometimes, they tend to collect the harvest from remote production sites and crop markets. The role of middlemen in North Darfur seems crucial since most of the Gum Arabic production takes place in remote places and to some extent also in "discriminated areas" from the urban and central markets (e.g. Kalamendo and Tewisha localities). Middlemen in each rural market are used to undermine the producers' prices by at least 10 to 20 percent on average. This happens largely due to the inactiveness or nonexistence of GAPAs (FAO, 2021a).

Producers' agents are sometimes represented by middlemen, commission agents, purchasing agents and speculators. They seal the deal for a specific amount of money. Few of them are only found in Kalamendo and Tewisha (FAO, 2021a).

Export and processing companies. The export and processing companies are mostly found in Elobeid, Khartoum and Port Sudan (FAO, 2021a). Other supporting actors include:

Central and state departments involved in the sector supervision (Departments in the ministries of environment, agriculture, finance, interior, etc.).

Gum Arabic Board (GAB) is a public body set up by a Presidential Decree in 2009 to perform several major activities related to improving gum production, processing, trade and sector development.

Forests National Corporation (FNC) is one of the most important bodies that targets environment protection issues. In the meantime, it ensures direct management of the forest sector and supervises most of the Gum Arabic projects.

3.2.3 Distribution of profit and value along Gum Arabic value chain in North Darfur

What are the flows of the product (and by product) between different actors? Where and to what degree is value added, or value lost, as the product moves along the chain? Which stages of the value chain are most profitable for which actors?

Flow of Gum Arabic product between different actors

Figure 9 illustrates a summary map of the Gum Arabic Value Chain configuration and performance in North and East Darfur. The first row shows the direct and indirect value chain actors. It also illustrates the value chain's dynamics and stages of the commodity's movement - from rural to urban markets and finally to the central auction markets. Village and urban markets are present in North Darfur, while central auction markets are only located in Elobeid and Ennuhud (Kordofan). The export and processing companies are mostly found in Elobeid, Khartoum and Port Sudan. This makes the current Gum Arabic Value Chain originating from North Darfur short and driven by few actors in urban markets. On the contrary, the Gum Arabic Value Chain originating from North and West Kordofan is often long and driven by different actors up to the auction and processing warehouses, though sometimes it moves up to the export markets. Overall, local consumption of Gum Arabic is carried out in small amounts all over the country (less than 10 percent) (FAO, 2021a).

Postharvest activities – Quality, safety and losses

As illustrated in the section above, Gum Arabic flows from the rural to the urban markets in North Darfur as "a raw gum" without any significant cleaning, drying, sorting, grading and other micro-processing activities. Historically, some of these postharvest activities were regularly used to be practiced by the Gum Arabic Company (GAC) agents in El Fasher, Um Keddada, Kalamendo, Tewisha and Ele'iet localities. These agents used to dry, clean, sort and grade the gum in their warehouses into 4 categories: Hand-Picked and Selected (H.P.S), Cleaned and Sifted (CAS), Siftings (S), and Dust (D). These grades no longer exist in the North Darfur state after the abolition of the GAC monopoly in 2009. These activities are very important to make product differentiations and value addition, which in turn improve the income to upstream value chain actors (as regularly practiced by traders in North and West Kordofan states) (FAO, 2021a).

Most of the investigated traders estimated the percentages of physical impurities (Figure 10) in the rural markets of North Darfur at 5 percent on average. Their estimation is slightly higher than that of Elobeid crops market (3 percent). Despite that, the team recognized a higher percentage of physical impurities in Kalamendo village through direct field observations. In Gum Arabic nodules, impurities are usually either organic material like bark and leaf residues or inorganic material like grit or small stones. These impurities may appear during the process of tapping and picking as well as during the conventional storage by the producers. The value of moisture loss was estimated to be equivalent to 14 percent on average. On the positive side, mixing of gum hashab with other gum types was not detected in the visited localities of North Darfur. This could be attributed to the high skilfulness of Gum Arabic producers in the area (FAO, 2021a).

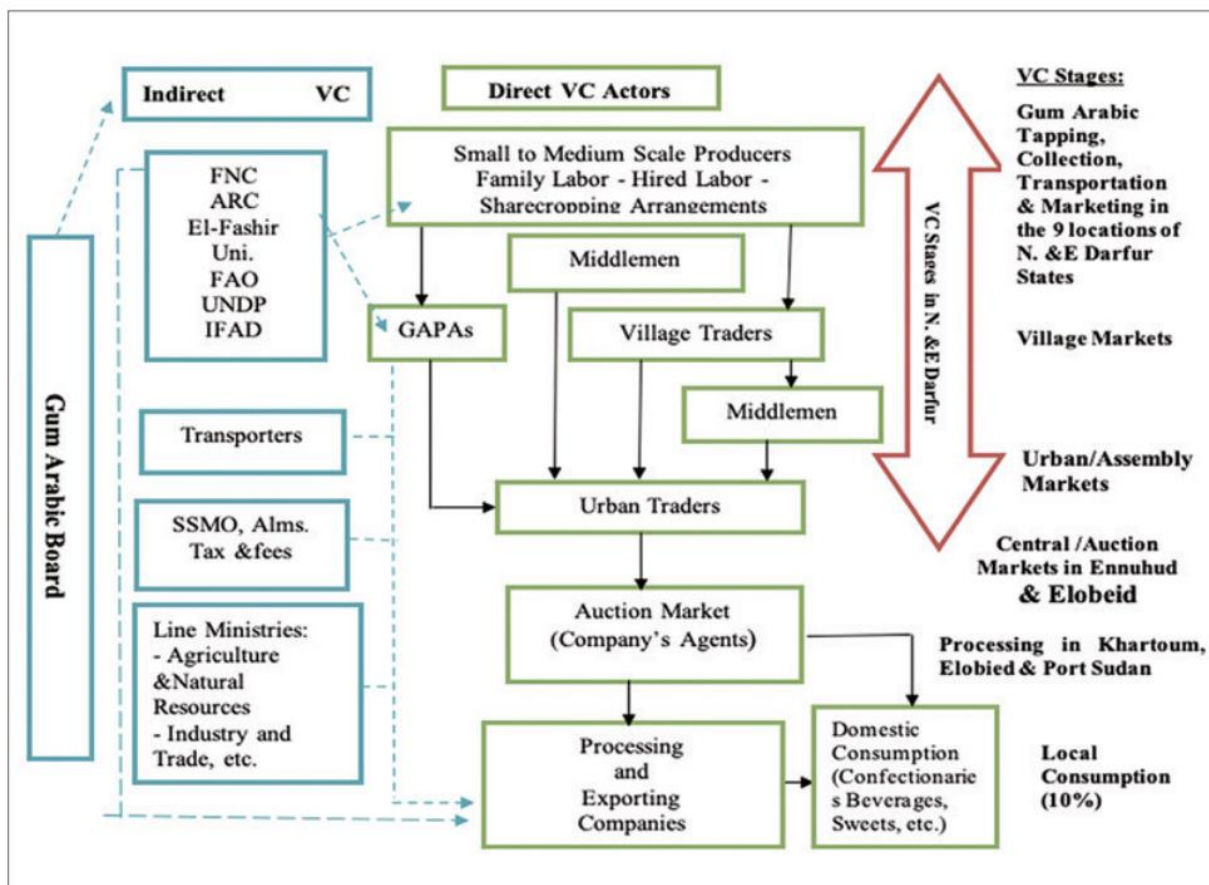


Figure 9 Summary map of the Gum Arabic value chain configuration in North and East Darfur.
 Source: FAO, 2021a.



Figure 10 Tapped GA with visible physical impurities at Sani Karao market, North Darfur.
 Source: FAO, 2021a.

3.3 Gum Arabic Value Chain in East Darfur

3.3.1 Main stages in the Gum Arabic value chain in East Darfur

What are the main stages in the value chain for the product?

The Sudan *multi-dimensional context analysis* (FAO, 2021a), provides an overview of the different value chain actors in East Darfur and the different activities they engage in:

East Darfur is part of the western part of the Gum Arabic belt which spans across the whole country. Gum Arabic production in the State is obtained from both *Acacia senegal* (Hashab) and *Acacia seyal* (Talha) trees. Hashab trees are grown in the areas covered by REPRO, while *Acacia seyal* production (inferior quality) is mostly concentrated in Bhr Elarab, Abugabra and El-frados localities (FAO, 2021a).

The overall area under Gum Arabic production has reduced significantly due to several factors. Namely, conflicts, low commodity prices, the shift towards groundnut production, population pressure and displacement as well as land availability. The state vision is to cultivate 25 percent of the trees which host important NWFPs including Gum Arabic from both species (*Acacia senegal* & *Acacia seyal*) within and out these forests (FAO, 2021a).

A. Gum Arabic Production and Supply

Production, yielding and trees holding

The Gum Arabic production in the three REPRO localities in East Darfur is somewhat less significant compared to North Darfur (Kalamendo and Tewisha in particular). The results of the study revealed that the concentration of hashab trees is higher in Adila (60 percent), followed by Abu Karinka (30 percent) and Ed Daein (10 percent) (Figure 11) (FAO, 2021a).

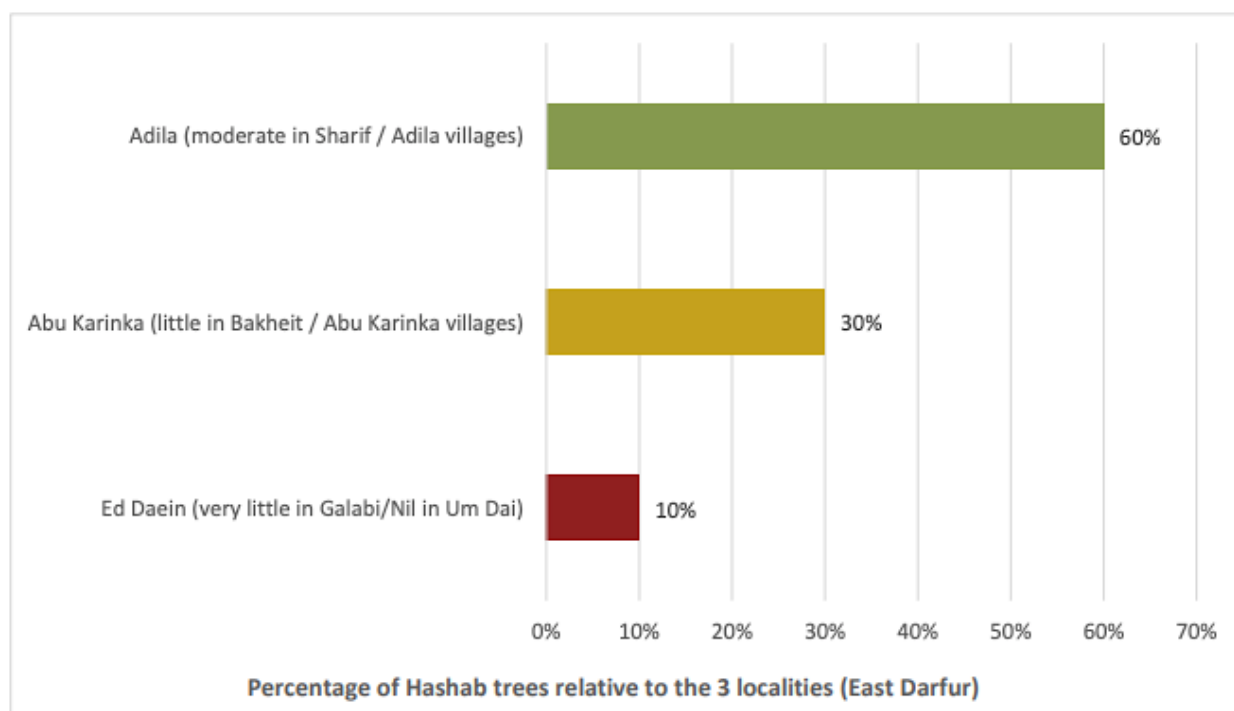


Figure 11 Concentration and distribution of Gum Arabic trees in REPRO localities in East Darfur.
Source: FAO, 2021a.

The percentage of the actual Gum Arabic tapping and collection compared to the existing hashab stands is on average very low (10 percent). In this context, Adila ranks first (15 percent), followed by Abu Karinka (10 percent) and Ed Daein (5 percent).

According to the feedback from the investigated villages, most of the farmers do not consider Gum Arabic production as a top priority business due to many reasons: lack of credit facilities for small Gum Arabic producers via the available official and non-official sources of finance; the higher margins from the groundnut commodity compared to the farm-gate prices for Gum Arabic; the recurrence of fire outbreaks (in Abu Karinka and Adila specifically); the long distance to be walked by farmers to reach Gum Arabic gardens from their homes; the poor availability of water and other basic services nearby Gum Arabic plantations; the nomadic nature of East Darfur communities (Rhizaigat and Malia tribes), which might contradict the Gum Arabic production and harvesting cycle (tapping and collection requires about 3-4 months to be accomplished after the rainy season); the wrong perception by some farmers that the presence of the hashab trees within the agroforestry system will eventually deplete the soil fertility for some cash crops like groundnuts (FAO, 2021a).

The results from Adila and Abu Karinka localities pointed out that the average productivity of hashab is ranging from 0.10 to 0.70 Kg/tree (0.40 Kg/tree on average). This amount of Gum Arabic can be obtained from four pickings per a single tree/season. The number of trees per garden also varies, from low to medium density, with an overall average number of 100 trees/feddans (240 trees/hectare) (FAO, 2021a).

Historically, East Darfur state was considered an important source of high-quality Gum Arabic commodity from both species (*Acacia Senegal* & *Acacia Seyal*). Recently, the areas allocated to Gum Arabic orchards in the three target localities have been substantially reduced both in number of trees as well as in terms of unit area dedicated to Gum Arabic cultivation (Table 5). The two investigated villages in Adila locality (Adila and Sharif) have a larger number of hashab gardens, with an area per garden equivalent to 10 feddans. The number of hashab gardens in Abu Karinka was found to be limited, with an area per garden equivalent to less than 5 feddans. For Ed Daein locality, the results indicate a very limited number of hashab gardens in Jalabi, with an area per garden equivalent to less than 5 feddans, while no significant areas were allocated to hashab gardens in Um Dai. Regardless of the historical potential of Gum Arabic production in East Darfur, most of the hashab stands were recently uprooted and their areas were transformed into the groundnuts cultivation (FAO, 2021a: 85).

Table 5 Areas of Gum Arabic holdings in the REPRO localities in East Darfur.

Locality	Average area of individual Gum Arabic garden (fedddan)
Abu Karinka	Limited number of hashab gardens in Abu Karinka and Bakheit villages (average area per single garden = less than five feddans).
Adila	Relatively large number of hashab gardens in Adila and Sharif villages (average area/single garden = 10 feddans).
Ad Daein	Very limited number of hashab gardens in Galabi (average area per single garden = less than five feddans). No areas allocated to hashab gardens in Um Dai.

Source: FAO, 2021a.

B. Markets and supply systems

The value chain originating from the three localities in East Darfur state takes the same pathway that was previously indicated for North Darfur. There are only two levels of Gum Arabic markets: rural traditional markets (Umdurwar) and urban markets. From there, the commodity is driven to the central auction markets in Ennuhud (West Kordofan) and Elobeid (North Kordofan) (FAO, 2021a: 85).

Rural traditional markets. The rural traditional markets in these localities operate with less efficiency compared to those markets in North Darfur. Rural marketers normally collect the Gum Arabic commodity in small quantities from the peripheral and nearby markets inside or outside East Darfur state (e.g. Abu Karinka, Hilal, Adila, Abu Jabra, Abu Gantora, Eltaalba, Jad Elseid, Bakheit, Jild Sagair, Fajag, Wad Baliela, Um Ishrin, Salah Eldin). All rural markets in East Darfur are operating on weekly basis (one or two days per

week). Most of these markets are situated in surrounding or remote areas of Gum Arabic production. Most of the visited markets (e.g. Adila, Abu Karinka and Galabi rural markets) are established in small unfenced areas. Gum Arabic is displayed on unroofed and uncemented market yards, or sometimes kept in small traditional stores. Transportation of the commodity from the rural markets to urban centres requires special vehicles due to the lack of paved roads. The feedback from the FGDs revealed that the quantities of the Gum Arabic commodity received at Abu Karinka and Adila rural markets is about 80 and 120 kantar per market/day, respectively. The average supply to these markets is 100 kantar per market/day, which is equivalent to less than 45 percent of the Gum Arabic supply in North Darfur. The quantity of Gum Arabic received by the two village markets is equivalent to about 4,000 kantar (180 tons) per season. The average commodity price per kantar was estimated to be SDG 3,300 (2019). The price in rural East Darfur markets is 24 percent higher than the average price for the commodity in North Darfur markets (SDG 2,657) (FAO, 2021a).

Urban or wholesale market. The only significant urban or wholesale market in the state is found in Ed Daein city. Ed Daein urban market is located at a crossroad that connects the Darfur states to Khartoum. The city is placed 157 km away from Nyala (South Darfur) and 180 km from Al Mijlad in South Kordofan. The market is linked by rail across Kordofan states in the east to Khartoum and through Nyala city to the west. It also comprises a small airport. This market receives Gum Arabic supplies from the rural markets and moves them to the urban centres. In addition to Gum Arabic, the agricultural products in the market include groundnuts, millet, sorghum, sesame, hibiscus, watermelon and livestock. The livestock market in El Daein is one of the largest livestock markets in Sudan (FAO, 2021a).

The results of the analysis revealed that several tributary markets, both in REPRO target localities and outside (Abu Karinka, Adila, Abu Jabra, Abu Bakheit, and Wad Baliela,), supply the commodity to Ed Daein urban market as well as to other urban markets outside the State.

C. Central auction markets.

The central auction markets do not exist in East Darfur state. The commodity is sent by city traders - often from Ed Daein - to the nearby auction markets in Elobeid and/or Ennuhud (Kurdofan). Ennuhud auction market (West Kurdofan) receives 60 percent of the Gum Arabic supply and Elobeid (North Kurdofan) receives 40 percent per the of supply. As illustrated in the North Darfur section, central auction markets are organized by the government as part of the main Gum Arabic marketing system in the country. The auction markets constitute the core of the Gum Arabic supply from peripheral rural and urban markets, mainly from Kordofan and Darfur states. They can easily be accessed almost all the year round. The markets are characterized by a prevalence of a large number of Gum Arabic actors: producer's agents, city traders, middlemen, companies or company's agents and processors (FAO, 2021a).

D. Gum Arabic Exports

From the central auction markets, the Gum Arabic product is mostly exported as clean raw gum (75 percent), kibbled (15 percent) or mechanical powdered (10 percent) gum (Mahmoud et al. 2014). The total amount of Gum Arabic exports from Sudan in 2019 was indicated to be almost 50,000 MT (FAO, 2021a: 87).

3.3.2 Main actors in the Gum Arabic value chain in East Darfur

Who are the main actors at each point in the value chain?

The Sudan multi-dimensional context analysis (FAO, 2021a), provides an overview of the different value chain actors in East Darfur and the different activities they engage in:

Direct and indirect value chain actors

Gum Arabic value chain actors in East Darfur state are classified into two groups represented by direct and indirect value chain actors. Direct value chain actors in the three project localities in East Darfur (Adila, Abu Karinka, and Ed Daein) are represented by the upstream Gum Arabic stakeholders. These include small scale producers, middlemen, village traders, GAPAs and city or assembly traders. Indirect value chain actors are represented by the different institutions and administrations belonging to the MoP&E, FNC, ARC, Ed Daein University, FAO and other UN agencies. Although it is difficult to evaluate the role of indirect value chain

actors in East Darfur, it seems that their supportive role is very limited due to technical, institutional and logistic gaps (FAO, 2021a).

Small-scale Gum Arabic producers

The results of the study highlighted that Gum Arabic Value Chain actors originating from East Darfur state comprise of only small-scale producers as upstream value chain actors. Unlike North Darfur, medium and large-scale Gum Arabic producers do not exist in East Darfur. This result might be explained by the high number of producers engaged in the groundnut sector. Figure 12 reveals that the Gum Arabic production under the existing farming system in Adila and Abu Karinka localities is regularly performed by family labour (75 percent) and to a lesser extent by hired labour (20 percent). This activity is completely (100 percent) undertaken by family labour in the case of Ed Daein locality (Galabi) (FAO, 2021a).

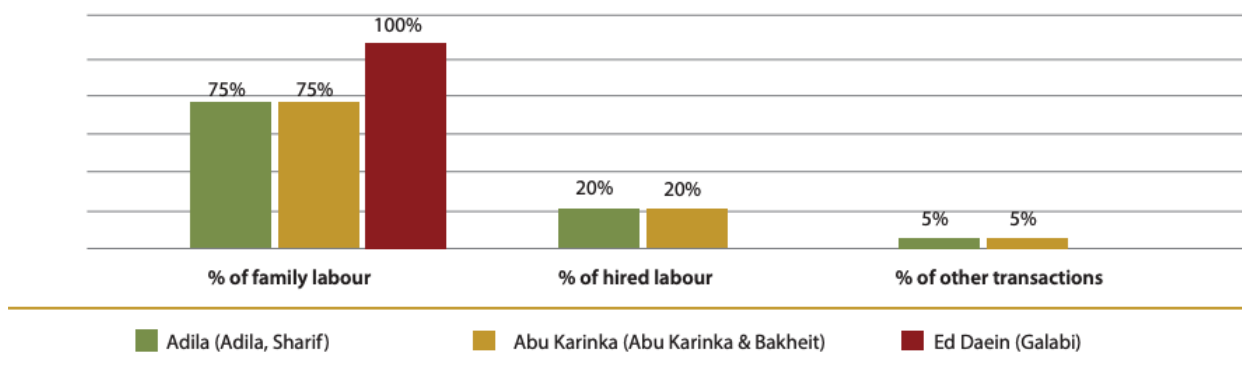


Figure 12 Types of Gum Arabic farming in REPRO localities in East Darfur.

Source: FAO, 2021a.

Village traders in East Darfur undertake very small-scale transactions ranging from 1 to 10 kantar at once. They buy the commodity directly (or through middlemen) from the gum producers at mobile markets on market days and they sell the amount collected to traders at the nearby markets, or to traders in Ed Daein, Giebaish or Ele'iet markets directly. The number of village traders per rural market is ranges from 2 to 4 traders. These traders were reported to collect Gum Arabic at the farmgate and they always control the market in terms of price-setting mechanisms (FAO, 2021a).

GAPAs: Like in North Darfur, the GAPAs operating in East Darfur are organized under the regulations of producers' associations established in accordance with the provision of the "Cooperative Law" amended in 2003. Few (10 percent) of the interviewed producers belong to GAPAs in their respective villages. The total number of GAPAs in Abu Karinka, Adila and Ed Daein is unknown. The feedback from the validation workshop that took place in Ed Daein indicates that there are about 300 GAPAs in the state. That the majority of the them are located in Adila, Abu Karinka, Yassin, Elfordoos, Sheairia, Abu Jabra and Ed Daein localities. Despite of the large number of the GAPAs in the past, the current performance of the GAPA in East Darfur is fairly weak. Most of the people interviewed pointed out that GAPAs do not provide any tangible benefits to their members with regards to access to credit, training and extension services. In addition, no contact farming agreements involving Gum Arabic producers and their GAPAs with the private sectors (e.g. Gum Arabic exporting companies) were recorded in East Darfur (FAO, 2021a).

Middlemen act as a link between the Gum Arabic producers, village traders and other market dealers. The role of middlemen in East Darfur seems critical since there are no producers' agents in East Darfur. The number of middlemen in rural markets were found to be relatively higher than the other value chain actors (FAO, 2021a).

City traders are very small in numbers and some of them operate as assembly traders who are mostly supported by main dealers in big cities (e.g. Ed Daein, Ele'iet or Ennuhud). They sell the Gum Arabic commodity as they receive it in a raw form without performing any tangible postharvest activities like drying, cleaning, grading or sorting (FAO, 2021a).

3.3.3 Distribution of profit and value along Gum Arabic value chain in East Darfur

What are the flows of the product (and by product) between different actors? Where and to what degree is value added, or value lost, as the product moves along the chain? Which stages of the value chain are most profitable for which actors?

Flow of Gum Arabic product between different actors

The value chain configuration in East Darfur is the same as the one illustrated for North Darfur (see Figure 9 above). On the left there are the indirect value chain actors (blue), in the middle the direct value chain actors (green) and on the right the value chain stages are represented. The latter indicate the sequence of markets and value links from the point where the produced commodity moves from rural to urban markets and ends up at the central auction markets - present in Elobeid and Ennuhud (North and West Kordofan). The export and processing companies are mostly found in Elobeid, Khartoum and Port Sudan. This makes the current GAVC originating from East Darfur short and driven by few actors. On the contrary, the GAVC originating from North and West Kordofan is often long and driven by different actors up to the auction and processing warehouses, though sometimes it moves up to the export markets (FAO, 2021a).

Postharvest activities – Quality, safety and losses

As illustrated in the section above, Gum Arabic commodity moves through different value chain actors, from the rural to the urban markets in East Darfur as “a raw gum” without any significant value addition activities. Historically, as the case of North Darfur, some of the postharvest activities (cleaning, drying, sorting and grading) were regularly used to be practiced by the GAC agents. Gum Arabic used to be grouped into 4 categories: Hand-Picked and Selected (H.P.S), Cleaned and Sifted (CAS), Siftings (S), and Dust (D). These grades no longer exist in the East Darfur state after the abolition of the GAC monopoly in 2009 (FAO, 2021a: 90).

Most of the investigated traders estimated the percentages of physical impurities in the rural markets of East Darfur at 6 percent, on average. Their estimation is higher (and more accurate) than those recorded in North Darfur markets (1 percent). Gum Arabic moisture losses at Ed Daein urban market was estimated to be 12 percent on average (FAO, 2021a).

Mahmoud (2016) conducted a marginal analysis to compare the performance of income generated and costs encountered throughout the value chain, as the Gum Arabic product moves from farm gate to rural markets and from rural markets to urban and central markets for export markets. In case of Gum Arabic, the product is mostly (90 percent) exported as raw, kibbled or mechanical powdered gum. The calculations of margin percentages across the different categories of Gum Arabic products are expressed in Figure 13.

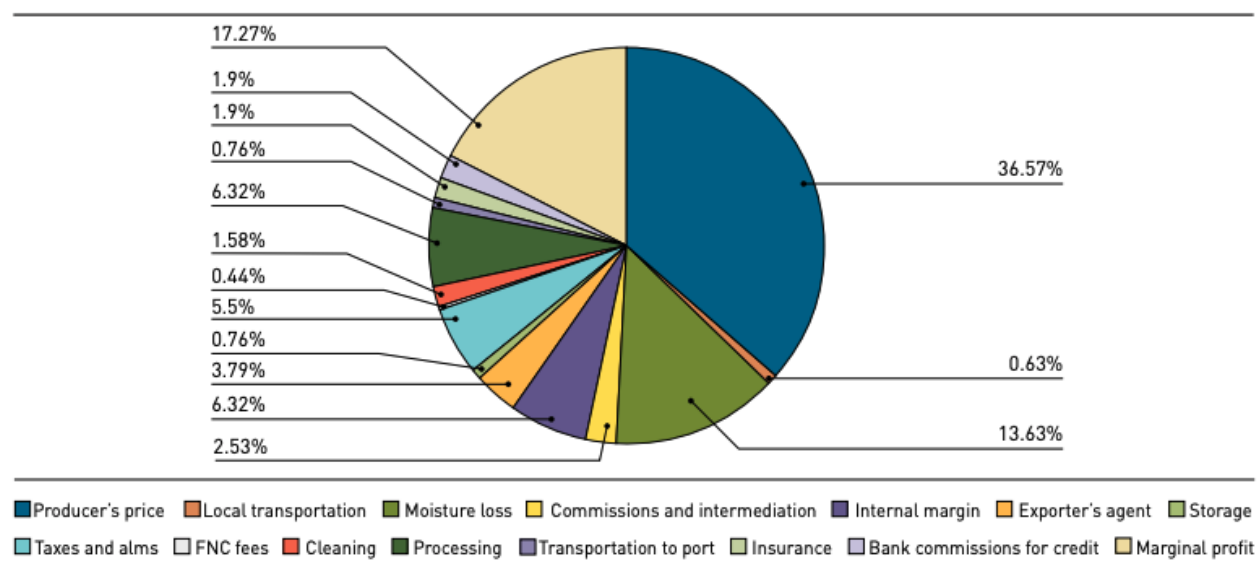


Figure 13 Margin distributions across value chains of gum.

Source: Mahmoud (2016).

3.4 Key challenges and bottlenecks along the Gum Arabic value chain

What are the key bottlenecks along the Gum Arabic value chain?

There are various challenges and bottlenecks along the Gum Arabic value chain. For example Gum Arabic producers face challenges in terms of production and marketing. These are further explained in the following sections.

3.4.1 Challenges in terms of production of Gum Arabic

The RIMA report (2020a) provides an overview of GA production in Sudan: "Approximately 22.7% of the households reported to have at least one member of the household involved in Gum Arabic production in the last 12 months and majority of these households are in North Darfur. Of these households involved in Gum Arabic production, 10% are female-headed households. The median household land under Hashab tree/Acacia trees is 10 Mukhamas. Among the households involved in Gum Arabic production, 44% reported to be mixing the production of Gum Arabic with other crops. Approximately 21% of households accessed Gum Arabic market information in the last 12 months. All the households surveyed in the project area sell the Gum Arabic produced as independent traders; none sells through registered cooperative groups" (RIMA, 2020a). Some of the challenges that these producers face are explained below.

Table 6 below presents challenges faced by households while undertaking crop production in the survey area. The main challenges are pests and plant diseases, high prices and low availability of agricultural inputs, and lack of labour (adapted from RIMA, 2020a). There are slight differences for male and female producers, for example in terms of access to labour (more an issue for men) and access to technical assistance (more an issue for women).

Table 6 Challenges in crop production disaggregated by beneficiary type and sex of household head.

	Beneficiary	Non-beneficiary	Male	Female	Overall
Pests and plant diseases	72%	81%	76%	75%	76%
Low availability of agricultural inputs	27%	29%	28%	27%	28%
Too high prices of agricultural inputs	48%	50%	49%	50%	49%
Lack of labour	28%	29%	30%	22%	28%
Low access to technical assistance services	13%	9%	11%	16%	12%
Too much rain	3%	5%	3%	6%	4%
Too little rain	13%	7%	11%	9%	11%
Untimely rain	1%	0%	1%	1%	1%
Poor roads	1%	0%	1%	1%	1%
Poor soil fertility	12%	10%	10%	18%	11%
Bush fire	1%	2%	1%	1%	1%
Area of small size	7%	9%	8%	9%	8%
Insecurity/conflict	0%	0%	0%	0%	0%

Source: RIMA baseline report (FAO, 2020a).

In terms of production, the problem is that producers mostly rely on traditional tapping methods and don't get good returns. "This coupled with improper gum collection, cleaning, grading and storage practices, do not allow gum producers to realize good returns from the gum business. To add to this, there are many middlemen along the gum value chain, who reap more financial benefits than the producers" (Adam, 2016). The RIMA baseline report (FAO, 2020a), also shows that the way Gum Arabic is tapped needs improvement: "Over 94% of the households in the project area involved in Gum Arabic production, use Sonki as a tool to tap Gum Arabic and the same proportion do not use protective gear while undertaking the tapping".

The RIMA also refers to poor agricultural practices, including:

- No conservation agriculture practices were reported.
- No intercropping methods of agroforestry were reported. The only exception is Kalamendo locality where agroforestry systems (GA and water melon seeds) were observed (Sani Karao).
- Use of chemical or organic fertilizers was not reported.
- The horizontal expansion of agriculture land is proceeding in an unsustainable way putting additional pressure on the already precarious livelihoods of communities (adapted from RIMA, 2020a).

These poor agricultural practices are partly related to lack of training. "Majority of the households (83%) did not receive any training while 15% received training on improved tapping techniques and 7% received training on agroforestry". Other studies found that producers lack training on gum post-handling activities and knowledge and capacities on sustainable Gum Arabic production, value- addition and entrepreneurship (see for example: Adam, 2016).

There are more challenges that Gum Arabic producers face. The five main constraints are pests and diseases (56%), bush fire (42%), overcutting (24%), theft (20%) and low access to technical assistance (15%), according to the Sudan RIMA baseline report (FAO, 2020a). The RIMA report further identifies a number of constraints and bottlenecks producers face (Table 7). These include: low gum prices and lack of market information (100 per cent), lack of a producers' organization (95 per cent), lack of financial credit (92 per cent), lack of training on gum tapping and drying (90 per cent) and lack of drinking water (90 per cent), while over three quarters (78 per cent) listed low regeneration capacity of the Hashab tree.

Table 7 Constraints and bottlenecks, identified by producers.

Constraints/bottlenecks	% Of producers (n-130) *
Low gum prices	100
Lack of market information	100
Lack of producer's organization	95
Lack of financial credit	92
Lack of training on tree tapping and gum cleaning and drying	90
Lack of drinking water	90
Low regeneration capacity of Hashab trees	78
Poor tree resource management	30

Source: Sudan RIMA baseline report, FAO 2020a.

Some of the above-mentioned challenges faced by Gum Arabic producers in North and East Darfur, are similar to constraints in Kordofan, also this area is more developed in terms of the Gum Arabic value chain. Hassan et al. (2017) indicates a number of constraints to Gum Arabic production in Kordofan. "Gum Arabic production has been constrained with several problems such as lack and poor management of village nurseries, traditional way of gum production (using of axe, collection tools and mal-cultural practices, low tapping intensity per trees and per area, lack of large-scale production)".

"It is worth mentioning that some production sites are in remote areas compared to markets, with poor infrastructures and services. These are: drinking water, storage facilities, means of transportation, extension, official finance, education and health units, limited sources of income, insufficient and unskilled labor force, traditional gold mining, rural-urban migration, lack of value addition activities fire hazards, tree locust & other pests."

According to the results obtained from the Sudan 2021 CoP survey and learning event, the key areas requiring improvement for Gum Arabic production and incomes (in order of priority):

1. Access to drinking water (73.7%);
2. Tools and equipment for GA production (e.g., tapping, planting, storing; 68.4%);
3. Development and enforcement of land rights and land tenure systems (68.4%);
4. Access to finance, credit, loans and investments (63.2%);
5. Labour force for GA production (52.6%);

6. Conflict resolution mechanisms (to mediate conflict over land, resources, e.g., farmer and pastoral clashes, land-based conflicts; 47.4%);
7. Training on and documentation of good agricultural practices (e.g., agro-forestry, biodiversity, soilhealth, Gum Arabic production and value addition, etc.; 47.4%);
8. Training on good Gum Arabic practices (42.1%);
9. Access to rural markets (42.1%);
10. Access to rural markets (42.1%).

3.4.2 Challenges in relation to marketing and business development

Apart from the challenges related to production, the Gum Arabic producers face a series of other challenges, mostly related to marketing and business development. The below studies identified the following challenges that make it difficult for Gum Arabic producers to develop as a business and produce for the market:

- Limited access to market information: "Approximately 21% of households accessed Gum Arabic market information in the last 12 months" (FAO, 2020a).
- Access to credit is another point that needs attention: "If producers were able to get access to credit for their initial investment in gum production, they would have more control over the prices they receive for their product and their profits would increase tremendously" (Adam, 2016). The RIMA report also refers to lack of financial credit as a key challenge (FAO, 2020a).
- Value addition would also need attention: "... value added processing at the local level has high potential to increase the profits of the producers. Primary processing requires training on processing and gum standardization measures, processing and preservation equipment, and access to credit" (Adam, 2016).
- Gum Arabic producers are poorly organized: "They also lack organization, so do not have the ability to negotiate, as a group, with buyers, and cooperate in terms of, for example, prices, and do not undertake group activities such as sharing the costs of transporting their product to distant markets" (Adam, 2016). "All the households surveyed in the project area sell the Gum Arabic produced as independent traders; none sells through registered cooperative groups. However, 42% of these households reported to belong to at least one GAPA" (FAO, 2020a).
- Other studies found that producers lack training on gum tapping and drying and other post-handling activities and knowledge and capacities value- addition and entrepreneurship (see for example: Adam, 2016 but also FAO, 2020a).
- Furthermore there are gum prices are low (FAO, 202a).

3.4.3 Challenges for households, women and youth to participate in the Gum Arabic value chain

A survey undertaken by the Sudan Community of Practice (CoP) in 2021 showed that the main areas requiring improvement to increase participation in GAVC activities (in order of priority) are:

1. Access to and control over financial resources (gender based; 89.5%);
2. Access to markets (73.7%);
3. Level of education of all household members (male and female; 57.9%);
4. Technical competencies (e.g., in production, processing; 52.6%).

The Sudan CoP learning also identified the following as key challenges in Gum Arabic Value Chain participation:

- A gendered approach to structuring activities is needed. Role of women is underestimated. Men do heavy labour and sales, but women do a lot of the other works. Role of women should be more appreciated.
- There is unequal access and participation, depending on tribe norms. Powerful tribes dominate lands and do not offer equal access to other tribes. Furthermore there are disparities between groups which creates friction.

A Post Distribution Monitoring (PDM) was conducted by the FNS-REPRO Sudan team in January 2022 (Mohamed, 2021). It refers to challenges that are particular for women and youth. This therefore needs a gender and youth specific approach.

Challenges faced by women

- Poor ownership of agricultural land compared to men;
- Difficulties associated with the access to the fields;
- Lack of agriculture tools;
- Lack of women cooperative;
- Lack of access to healthy drinking water specially when in the fields;
- Poor role of women in decision making, women faced discrimination in some villages (e.g., Abu Sufiyan);
- Poor health care in particular for pregnant women, access to education, water, income generating activities, women cooperative groups, small project enterprises and alternative source of energy;
- Poverty;
- Women have to engage in hard daily work and in agriculture fields work to feed their families specifically for women headed households with low income;
- Low capacity of women in nutrition and handcrafts activities.

Specific priorities for women

- Capacity building and training to become more productive and have access to small income enterprises projects;
- Improve access to education, better health care, small and safety and health water;
- Construction of training center;
- Women empowerment and to value the role of women in the society;
- Support them with agriculture inputs and tools.

Challenges faced by youth

- Lack of agricultural inputs and tools;
- Lack of jobs opportunities and income generating activities;
- Lack of youth cultural centers;
- Limited engagement in civil services;
- Access to funding and land.

Priorities of the youth

- Support them with agricultural inputs and tools;
- Improve access to funding and land;
- Improve access to job opportunities and small enterprises projects;
- Capacity building;
- Establishment of youth cultural centers;
- Improve access to funding;
- Improve access to land.

3.4.4 Enabling environment for Gum Arabic

Gum Arabic export markets

In regards to exports, the Gum Arabic market is still dominated by Sudan in spite of many years of disruption caused by the civil war, frequent policy intervention and market failure. The Observatory of Economic Complexity (OEC)² provides interesting data on the Gum Arabic export market in Sudan:

"In 2020, Sudan exported \$102M in Gum Arabic, making it the 2nd largest exporter of Gum Arabic in the world. At the same year, Gum Arabic was the 7th most exported product in Sudan. The main destination of Gum Arabic exports from Sudan are: France (\$52.8M), United States (\$10.5M), Germany (\$10.1M), United Kingdom (\$7.71M), and India (\$5.01M). The fastest growing export markets for Gum Arabic of Sudan between 2019 and 2020 were United States (\$3.42M), Germany (\$2.55M), and France (\$1.87M). The fastest declining markets for the export of Gum Arabic by Sudan were (2019 - 2020): India, -\$4.22M (-45.7%),

² The Observatory of Economic Complexity (OEC) is an online data visualization and distribution platform focused on the geography and dynamics of economic activities. The OEC integrates and distributes data from a variety of sources to empower analysts in the private sector, public sector, and academia.

Ethiopia, -\$3.79M (-70%), Slovakia, -\$1.59M (-37.5%)" (OEC, 2021).³ Figure 14 shows the historical change in Gum Arabic exports globally, for the period of 1997-2020.

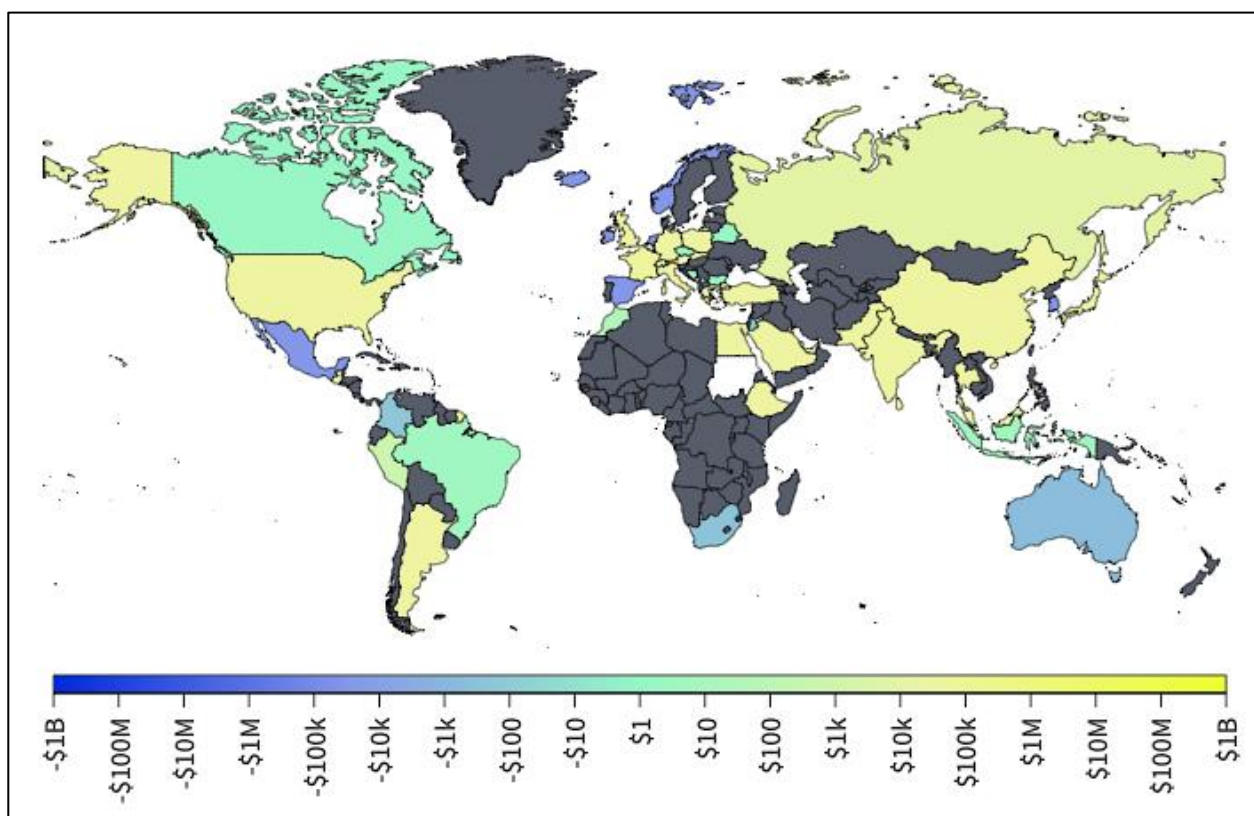


Figure 14 Change in Gum Arabic exports by market (1997-2020).

Source: OEC, 2021.

Measures and policy interventions

The report by Mahmoud (2016) provides an overview of the key measures and policy interventions of the Gum Arabic international market. The following points list the main policies and government interventions that affect Gum Arabic production, local marketing, processing and exports in the country (Mahmoud et al., 2016):

- 1920:** Gum exported officially from the port of Suakin in Red Sea.
- 1922:** Gum Arabic auctioning (oligopoly of foreign companies).
- 1932:** Forest policies emphasized the importance of gum tree and gum trade as a core issue for developing the forest sector, particularly in rural areas.
- 1962:** Producer floor price declared for the first time to support Gum Arabic producers.
- 1966:** Concentration fund imposed by the Federal Ministry of Commerce to rehabilitate Gum Arabic production areas.
- 1969:** Government-sponsored (Gum Arabic Company-GAC) established, aided with monopoly power.
- 1976:** Gum Arabic producers' unions involved in GAC as real partners for the first time.
- 1990/91:** GAC concession abolished and restored again at the end of 1991.
- 1992:** Overall liberalization policies set in motion (Gum Arabic exempted).
- 1989-1994:** Gum Arabic substitutes prospered due to sharp increase in Gum Arabic worldwide.
- 1997:** American embargo and economic sanctions on Sudan (Gum Arabic was excluded).
- 2000:** Gradual change in GAC concession power.
- 2001:** Gum Arabic processing started.

³ Source: <https://oec.world/en/profile/bilateral-product/gum-arabic/reporter/sdn?redirect=true>

2002:	Debates and arguments for and against the liberalization of the gum trade. These debates ended up with the GAC concession being abolished for only three months prior to its rejection by the National Assembly in Sudan.
2003:	Ministry of Investment endorsed about 12 Gum Arabic processing companies, considered as a turning point on GAC concession.
2005:	Cabinet Decree (No.118, 3 September) passed to abolish GAC concession on the Gum Arabic trade.
2006:	Mansoor Khalid's famous report presented to the National Assembly on Gum Arabic trade.
2007:	Elkindi National Committee Report on the Gum Arabic trade.
2008:	The consequences of the global financial crisis on the Gum Arabic trade.
2009:	Presidential Decree issued to liberalize gum trade.
2009:	Gum Arabic Board (GAB) established.
2014:	Debate on how to define Gum Arabic (Sudan provided some scientific arguments to restrict the definition of Gum Arabic to <i>Acacia senegal</i> gum only).
2015:	Presidential Decree approved the Sudanese Standardization of Gum Arabic.
2015:	Presidential Decree prohibiting tree felling in accordance with the REDD international initiative.

The overall effect of these policies on Gum Arabic are summarized by Mahmoud et al., 2014:

1. Historically the price mechanism of Gum Arabic at the auction market was dependent on the minimum floor price which was mainly determined by the Federal Ministry of Commerce, whereby the producers are theoretically protected because the floor price was considered to be the starting price for Gum Arabic bidding.
2. According to current price liberalization policies (Presidential Decree in 2009), the minimum floor price is no longer valid. This situation most likely leads to price dimness among Gum Arabic dealers prior to entering the auction hall.
3. Many traders prefer to sell their Gum Arabic commodity outside the auction markets due to many factors, including lower rates of taxes and fees imposed on crops, less bureaucracy resulting in higher profit margins obtained at these markets.

3.4.5 Summary key challenges in the Gum Arabic value chain

All in all key challenges and constraints, particularly for Gum Arabic producers, in the GA value chain include (not in order or importance):

- *Pests and plant diseases;*
- *Inadequate capacities:* there is a low level of education and GA producers lack training on good agricultural practices, post-harvest handling, value addition (e.g. processing, gum standardization measures), entrepreneurship; Women like these capacities more than men and their role in GA production is undervalued;
- *Lack of agricultural tools and equipment:* high prices and low availability of inputs; inadequate tools and equipment for tapping, planting and storing gum and for processing and preservation equipment;
- *Loss of trees and gum* due to bush fire, overcutting and theft coupled with low regeneration capacity of the Hashab tree;
- *Inadequate access to and control over resources*, especially for women, youth and certain tribes:
 - Water: lack of (access to) drinking water when in the field;
 - Finance: inadequate access to finance, credit, loans and investments; access to and control over financial resources (gender based); access to finance is more difficult for women and youth;
 - Inadequate access to market information;
 - Lack of labor for GA production;
 - Note: there are differences for men and women, youth but also tribes in terms of access to and use of resources (such as land, which is mainly owned by men), but there is still inadequate targeting. Poor role of women in decision making, women facing discrimination in some villages.
- *Inadequate organisation:* Gum Arabic producers are poorly organized. They sell the Gum Arabic to independent traders and not through registered cooperative groups, even though they may belong to a Gum Arabic producer association (GAPA). They "do not have the ability to negotiate, as a group, with buyers, and cooperate in terms of, for example, prices, and do not undertake group activities such as

sharing the costs of transporting their product to distant markets” (Adam, 2016). Also there is lack of women cooperatives;

- *Inadequate markets*: inadequate access and functioning of rural and urban markets; limited access to market information; low prices for GA;
- *Conflict*: inadequate conflict resolution mechanisms; insecurity limits access to farm fields;
- *Inadequate enabling environment*: inadequate development and enforcement of land rights and land tenure systems; price liberalisation policies have led to absence of minimum floor price at auction markets; taxes and fees at auction markets.

3.5 Role of FNS-REPRO in Gum Arabic value chain development

What has been the role of FNS-REPRO in Gum Arabic VC development?

The most recent FNS-REPRO annual progress report provides an overview of the progress made in Sudan last year (January – December 2021). FNS-REPRO activities in Sudan are implemented in North and East Darfur states and are centered on the Gum Arabic value chain. An overview of FNS-REPRO beneficiaries and target areas for Year 3 is presented in Figure 15 below.

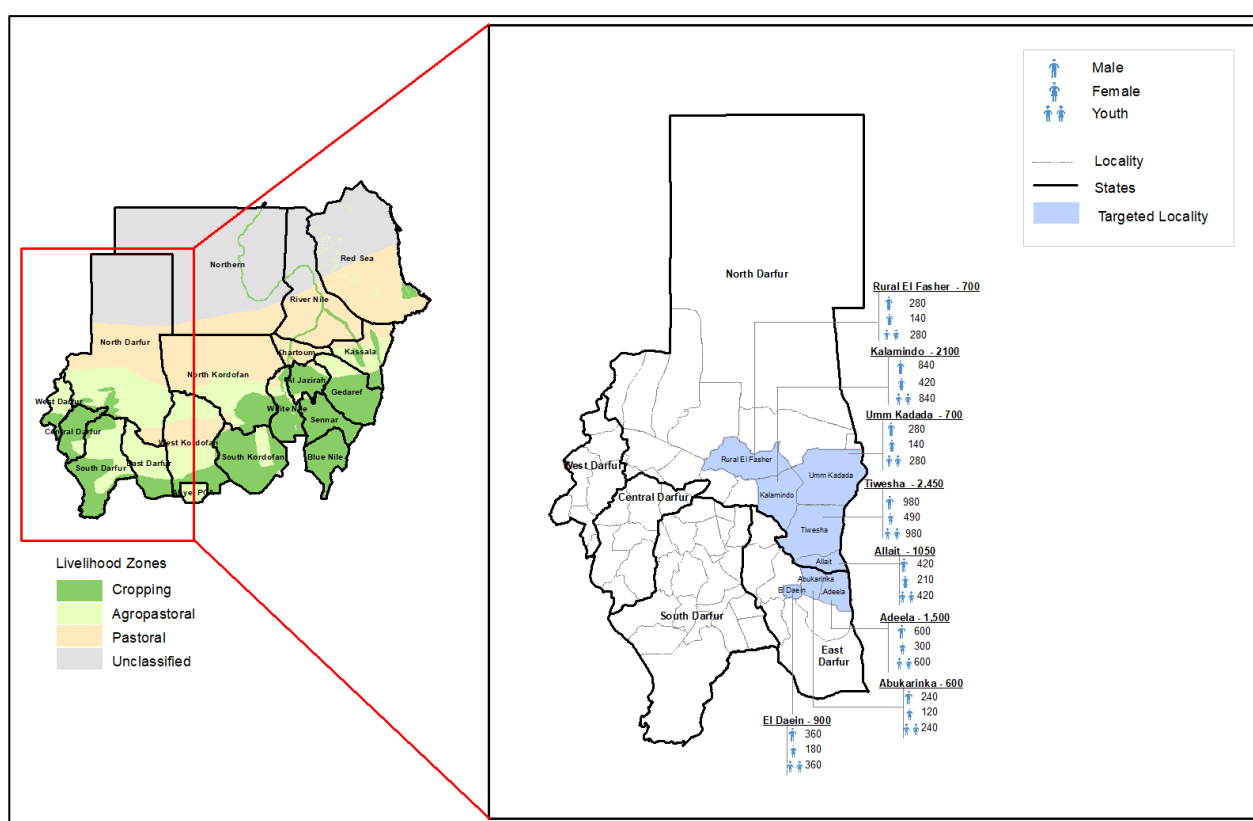


Figure 15 Overview of FNS-REPRO beneficiaries and target areas for Year 3.
Source: FNS-REPRO annual progress report (2021).

In the October 2021 – September 2022 implementation period, the number of beneficiaries reached by FNS-REPRO in Sudan is presented in Table 8. The number of beneficiaries reached for the entire duration of FNS-REPRO is presented in Table 9.

Table 8 Beneficiaries detailed breakdown for Year 3.

Target area	Male	Female	Youth (<35)	Total
East Darfur	1,500	1,000	500	3,000
North Darfur	4,000	1,500	1,500	7,000
TOTAL HH	5,500	2,500	2,000	10,000

Source: FNS-REPRO annual progress report (2021).

Table 9 Number of beneficiaries per year for Sudan.

Target area	Reached in Year 1	Reached in Year 2	Planned for Year 3	Planned for Year 4	Total
East Darfur	1,200	2,000	3,000	2,128	8,328
North Darfur	1,800	4,000	7,000	4,256	17,056
TOTAL HH	3,000	6,000	10,000	6,384	25,384

Source: FNS-REPRO annual progress report (2021).

Furthermore, the FNS-REPRO Annual Plan (Oct 21–Sep 22) (FAO, 2021b) provides a recent update on the progress and role of FNS-REPRO towards the development of the Gum Arabic value chain in Sudan: “The development of a sustainable Gum Arabic (GA) value chain in Darfur is very crucial because Gum Arabic is a high value commodity in North and East Darfur states with great economic importance and potential, in rural areas particularly. Furthermore, GA is a source of income generation for households engaged in producing, cleaning and trading of Gum Arabic. Recently, this important sector has faced a lot of problems and constraints; namely lack of drinking water, disorganization of producers, low productivity, low prices, and poor regeneration capacity of hashab trees and lack of financial credit.” A breakdown of the FNS-REPRO target beneficiaries is presented in Table 10 below.

Table 10 Beneficiaries breakdown by village for Year 3.

North Darfur		
Locality	Village Council	#Beneficiary farmers
Rural El Fasher	Lawabit	700
Umm Kadada	Brouch	700
Kalamendo	Sani Karao	1050
Kalamendo	Gusa Jamat	1050
Allait	Abusufyan	1050
Tiwesha	Gabir	1400
Tiwesha	Eyal Amin	1050
Subtotal		7000
East Darfur		
Locality	Village Council	#Beneficiary farmers
Al Daein	Jalabi	900
Abukarinka	Bakhiet	600
Adeela	Adeela	900
Adeela	Sharif	600
Subtotal		3000
Grand Total		10000

Source: Adapted from FNS-REPRO annual progress report (2021).

These factors have negatively impacted production efficiency and to address these challenges/constraints, FNS-REPRO has developed strands of interventions. To mention a few:

- “Increasing the areas under agroforestry through planting of acacia seedlings and seeds;
- Rehabilitating community/localities nurseries supported by intensive extension services to increase production and productivity;

- Building capacities of Gum Arabic Producers Associations (GAPAs) and linking them with the private sector through developing smart partnership agreement between GAPAS and private sector companies. These will provide great potential to generate income for farmers, boost local development, ensure food security and mitigate and adapt to climate change related impacts;
- Access and management of natural resources and promotion of conflict resolution mechanisms at village level;
- Enhance the knowledge, skills and capacity of local communities around nutrition-sensitive livelihood activities are still the top key priorities of the FNS-REPRO."

3.5.1 Progress made in relation to Output 2

The most recent FNS-REPRO annual progress report provides a brief overview of the progress made up to end of September 2021 in regards to implementing Output 2.

Output 2: Improved livelihood and income opportunities along the Gum Arabic Value Chain

- "9,000 beneficiaries were reached and received seeds and seedling of hashab trees.
- Cash crop seeds (groundnuts, sesame, millet, and sorghum), agriculture tools (donkey cart, donkey plough), and Gum Arabic tapping tools (sonkies) were distributed to beneficiaries.
- Beneficiaries were trained on good Gum Arabic harvesting and post-harvest practices, extension officers and lead farmers trained on agroforestry and conservation agriculture.
- A range of capacity building interventions started for extension officers and lead farmers, local institutions, GAPAs, traders, with focus on youth and women and will continue in the next annual work plan."

Key activities and milestones for the October 2021 – September 2022 implementation period are listed in Appendix 1. See also FNS-REPRO annual progress report (2021).

A **Post Distribution Monitoring** (PDM) was conducted by the FNS-REPRO Sudan in January 2022. The objective of the PDM assessment is stated below. With this objective in mind, the PDM assessment provides important information in relation to the effects (both positive and negative) of the distribution process of inputs to beneficiary groups, including: farmers, pastoralists and community members. In doing so, the PDM assessment data also provide valuable information into changes that have taken place due to the project's distribution of key inputs and resources, thereby highlighting key developments of the Gum Arabic value chain in North and East Darfur target localities.

Objective of post distribution assessment: "The ultimate objective of the post distribution assessment is to ensure that the target beneficiaries have received the stated amounts of Acacia sees and seedlings, cash crops and agricultural tools as planned in a way that the distribution process did not create tensions within the community or between farmers and pastoralists or other groups" (Mohamed, 2021).

The PDM assessment is built on direct data collection through structured surveys targeting the beneficiaries and key informant groups (NRM committee and Local administrative leaders). The project has to reach this year (2022), according to the most recent annual working plan (Oct 2021 – Sept 2022), 6,000 beneficiaries in both states North and East Darfur (4,000 and 2,000 respectively) through an agroforestry approach by distributing cash crops, Acacia Senegal (Hashab) seeds & seedling and agricultural tools. See Appendix 2 for a comparison between inputs which were planned to be distributed to the beneficiaries versus the actual number of inputs distributed to the beneficiaries in North and East Darfur.

Summary of the PDMs key findings

The PDM assessment provides an overview of the progress made in Sudan last year (January – December 2021):

- Based on the follow up with FNS-REPRO field coordinators and Forest National Corporation (FNC) authorities in North and East Darfur states, the agreed amount of seeds, seedlings, cash crops and agriculture tools were received and distributed to the beneficiaries except the donkey carts, which were delivered only to two villages in ND (Lawabid and Brouch) based on the fact that the donkey carts delivered to ED failed to meet the agreed specifications and were therefore rejected (Mohamed, 2021).

- The total number of registered beneficiaries are 5,942 out of 6,000 (4,000 out of 4,000 for North Darfur and 1,942 out of 2,000 for East Darfur). 70.67% of the beneficiaries are male House Hold Heads (HHH) and 29.33% are women HHH. The number of responded beneficiaries of the PDM survey, in the 11 targeted villages, are 47 out of which 29 male HHH and 18 female HHH (Mohamed, 2021).
- Seeds & seedlings of Hashab were not distributed to all beneficiaries due to the limited number of seedlings delivered by FNC to the targeted beneficiaries and the poor willingness of beneficiaries to adopt the concept of agroforestry system, generally because some of them access the agricultural land on rent basis and 29.79% of the respondents stated that they haven't received any instruction from FNC on agroforestry practice (Mohamed, 2021).
- 82.98% of the respondents indicated that they have planted the seeds and seedlings delivered to them, however only 27.66% stated that they plant the seeds & seedlings of Hashab adopting agroforestry practice. There are no major tensions to occur between the village residents (Mohamed, 2021).
- The average of Hashab seedlings planted is 30% per beneficiary (Mohamed, 2021).

Beneficiary feedback on the distribution process

- All the beneficiaries have to be covered equally with Hashab seeds/seedlings, cash crops and agricultural tools;
- The amount of cash crops and agricultural tools are not enough to cover all beneficiaries there is a need to increase the amount received;
- Some of the beneficiaries refuse to receive the seeds and seedlings of Hashab;
- Agricultural inputs distributed unfairly sometimes excluded women. Hashab seeds/seedlings have to be distributed to the willing people from the community even if they are not the targeted beneficiaries;
- Hashab seeds distributed are of low validity we need to introduce local seeds and plant them in our community nursery and use them for agroforestry;
- Distribution of Hashab seedlings to administrative leaders who own the land;
- Distributed the donkey carts and plough to the most needed beneficiaries such as widow and divorced women (adapted from Mohamed, 2021).

The Sudan MEAL team conducted a **quick MEAL assessment** focusing on Gum Arabic prices and marketing. This survey was conducted in January 2022 and was completed by 28 respondents, who each owned a Gum Arabic farm. Some of the key results are listed below (the data presented are the mean results):

Results on Yield:

- What is the total area of your Hashab tree holding? = 545.18
- 82% of respondents tap their Gum Arabic (Hashab) trees, while 18% do not
- Average yield (kg / per tree) = 5.41 kg
- Average no of trees, per feddan = 41
- Average yield (kg / ha) = 213 kg

Results on revenue:

- 93% of respondents sell their Gum Arabic at local markets, while only 7% sell at the town market
- Gum Arabic price received by producers in SDG/kantar = 13,607 SDG (= USD 30)
- The revenue received by the small producer for actual yield = 415,035 SDG (= USD 927)
- What is the share of rental value of one hectare in SDG? = 1,396.25 (= USD 3.12)

Results on cost:

- Average cost of food in SDG season = 97,775 SDG (= USD 218)
- Average cost of water in SDG season = 32,817.86 (= USD 73)
- Average costs in SDG season = 5,1085.71 (= USD 114)
- Average (cost of) plastic sack in SDG = 15,310.71 (= USD 34)
- Average costs in SDG season = 24,692.86 (= USD 55)
- Cost of storage in SDG season = 4,571.43 (= USD 10)
- Cost of at repaid by traders?? = 1,859.29 (= USD 4.15)
- What is the cost of drying in SDG Kantar? = 321.43 (=USD 0.72)
- What is the total cost at rural market? = 8,395.83 (=USD 18.76)
- What is the total cost at the city market? = 14,217.39 (=USD 31.77)
- What are the total costs encountered by producers at rural market? = 5,083.33 (=USD 11.36)

Results on losses:

- Losses due to (physical impurities) = 1.04
- Losses due to moisture content = 14.59

Results on profits:

- What is the Profit received by producer for the actual production (SDG)? = 116,541.67 (=USD 260)
- What is the Profit received by a village trader per SDG\ kantar of GA in SDG? = 4,326.43 (=USD 9.67)
- What is the Profit received by an urban trader per kantar of GA in SDG? = 5456.52 (=USD 12.20)

Refer to Appendix 3 for the MEAL survey results in full.

3.6 Recommendations for the way forward

Key question: What are options for change?

With a general overview of Sudan's Gum Arabic value chain (GAVC) and its key actors and functions, it is now necessary to review the key recommendations which have emerged from different reports and sources. This will assist FNS-REPRO and its partners to identify key priorities and areas of improvement that can be supported by FNS-REPRO in its final year of implementation.

Recommendations from Gum Arabic Value Chain study

The Gum Arabic value chain study (Hassan, 2017) concludes with five major recommendations for upgrading the GAVC in Sudan:

- "Stimulate innovation and investment in Gum Arabic tapping tools utilizing design competitions to promote and encourage commercialization of designs made by local artisanal workers.
- Promote research in expanded uses of Gum Arabic with focus on medical and health-promoting applications capitalizing on emerging scientific evidence that attributes health benefits to Gum Arabic.
- Support local value addition and export promotion with focus on improving the marketing capacities of Sudanese producers, traders and exporters and linking them with knowledge and trade facilitation resources.
- Support Sudan's interest in two separate Codex specifications by providing technical assistance in the application process and by supporting lobbying at relevant international organizations.
- Improve producers' negotiating position by building the marketing capacities of GAPAs and through facilitating timely access to price and market information" (Hassan, 2017).

Recommendations from Sudan multi-dimensional context analysis

The Sudan multi-dimensional context analysis in East and North Darfur States (FAO, 2021a), confirmed integrated actions toward:

- i) inclusive access and management of local natural resources;
- ii) improved livelihood and income opportunities along the Gum Arabic Value Chain, and;
- iii) enhanced knowledge, skills and capacity of local communities around nutrition-sensitive livelihood support, are pivotal dimensions that need to be enhanced in order to improve the food security and resilience of the target communities.

Recommendations from Dr. Yahia Omar Adam

The study titled conducted by Dr. Yahia Omar Adam et al. (2016): 'Gum Talha (Acacia seyal) Value Chain Analysis in East Darfur, Sudan', concludes with a number of recommendations:

- Gum Arabic subsector should receive special consideration in the government strategies and plans together with other actors to survey, manage and conserve the resource base.
- Surveying of production and consumption of Gum Arabic commodity in order to link their supply and demand to the forest potential within the national forest inventory (NFI).
- Resolving conflicts on land tenure systems via set up of obvious regulations on the basis of win-win arrangements agreed upon between different stakeholders.
- Adoption of good practices concerning nursery operations, land preparation and tapping techniques.

- Improvement of infrastructures and services (water, storage, transportation and feeder roads) at the Gum Arabic production areas.
- Encouraging developers of intermediate technologies to design suitable tools for Gum Arabic tapping, collection and primary processing.

Beneficiaries Recommendations from the PDM assessment (Mohamed, 2021)

The PDM assessment for Sudan (Mohamed, 2021), provides a number of recommendations coming from the beneficiaries themselves. These recommendations largely focus on improving the distribution process, Gum Arabic production and productivity:

Main areas that need to be improved (according to beneficiaries):

- Seedlings, cash crops and agricultural inputs have to be received earlier.
- Increase the awareness of beneficiaries around agroforestry and the environmental and economic value of Hashab trees.
- Distribution of Hashab seeds and seedlings to the local administrative leaders who own the agricultural land.
- The distribution of agricultural tools has to target the most needed beneficiaries.
- Increase the amount of the cash crops and agricultural tools.
- Distributions of Hashab seeds and seedlings to the interested beneficiaries who own the lands then cash crops and agricultural tools comes later as incentives.
- More transparency in the distribution processes with involvement of local administrative leaders.
- Seedlings amount has to be increased and the precaution of irrigation at the field level before distribution has to be considered.
- Using seeds from locally adaptive sources.

Top priorities for the communities to improve Gum Arabic production and productivity:

- Increase the prices of Gum Arabic.
- Support the producers with tools, equipment's and other services such as water.
- Linking the producers with the private sector to cut the chain of middle men.
- Protection of Hashab trees from diseases, illegal cutting for horizontal expansion of agriculture and grazing.
- Raise the awareness around the economic and environmental importance of Hashab trees.
- Support of farmers in cash to encourage them to plant Hashab trees.
- Increase the area under agroforestry.
- Undertake extension program and training packages on tapping, sorting, storage and marketing.
- Protection of Hashab from the horizontal expansion of agriculture.
- Provide incentive to the farmers such as agriculture tools.

Fathi Mohamed's recommendations from the PDM assessment

The MEAL officer for Sudan, Fathi Mohamed (2021), provided a number of recommendations to improve the project's distribution of inputs and resources to its target beneficiaries:

- Seedlings, cash crops and agricultural inputs have to be received earlier (in June).
- Increase the awareness of beneficiaries around agroforestry practice, environmental and economic value of Hashab trees.
- Distributions of Hashab seeds and seedlings to the interested beneficiaries who own the lands then cash crops and agricultural tools comes later as incentives.
- Support the Gum Arabic producers with tools, equipment and other services such as water bags.
- Linking the producers with the private sector for marketing and improve of Gum Arabic Value Chains.
- Protection of Hashab trees from diseases, illegal cutting, horizontal expansion of agriculture and grazing.
- Capacity buildings of women around nutrition, hand crafts, alternative sources of energy.
- Support the beneficiaries (GAPAs) with hand equipment's to combat locust in Hashab areas.

Photos taken during FGD's for the PDM assessment are seen in Figure 16 below.



Figure 16 Focus Group Discussions for the PDM assessment for Sudan.
Source: FNS-REPRO Sudan, PDM assessment (Mohamed, 2021).

This concludes the literature review. The next chapters build upon this existing information and evidence and dives deeper into the GAVC, by providing the key findings from the Rapid Gum Arabic Value Chain Assessment in selected FNS-REPRO supported communities.

4 Key findings from the Rapid Gum Arabic Value Chain Assessments

Another key information source for the 2022 evidence-based and adaptive programming cycle was a rapid Gum Arabic value chain assessment (RVCA) that was undertaken in 4-8 June, 2022 in North and East Darfur States of Sudan. This was commissioned by WUR and undertaken by its partners Kordofan University (El Obeid) and El Fasher University (El Fasher). The assessment targeted four villages in the regions in which FNS-REPRO has been operational. The rapid value chain assessment was designed by WUR in collaboration with the WUR Learning Agenda Focal Points (LAFPs), who undertook the assessments with the assistance of technical staff from their universities.

4.1 Objective of the RVCA

The overall objective of the RVCA was to generate data and information for the FNS-REPRO sensemaking event in June 2022, through targeting communities along the Gum Arabic (GA) supply and value chain in North & East Darfur states.⁴ Detailed objectives for the RVCA include:

1. To map the changes along the Gum Arabic supply and value chain (GAVC) in selected FNS-REPRO areas (North and East Darfur).
2. To relate these changes in the GAVC to FNS-REPRO interventions and to other factors and actors.
3. To identify key gaps in the GAVC and opportunities to strengthen the GAVC in FNS-REPRO areas.

4.2 Data collection methods

One consultative workshop with key stakeholders in the GAVC and two focus group discussions were undertaken in each of the 2 program areas (North and East Darfur) to generate the data and information for the rapid GA VCA and stories of change. In addition key informant interviews and personal information generated additional information. For details see below and Table 11. Key data collection methods included:

- a. Consultative workshops (1 in each state) in El Fasher and Ed Daein.
- b. Focus group discussions (FGDs; 2 in each state) with communities in Lawabid, Sani Karao, Gabir and Jalabi, divided into the following groups:
 - o Natural resource management group
 - o Gum Arabic value chain group.
- c. Key informant interviews.
- d. Personal observations with the aid of digital devices (camera).

4.3 Geographic coverage and participants of the consultative workshops

Consultative workshops and focus group discussions were conducted⁵ in North Darfur and East Darfur States to generate the data and information for the rapid GAVC assessments and Stories of Change (Table 11).

⁴ Note: this RCVA build upon the Gum Arabic context analysis that was undertaken during the inception phase of FNS-REPRO (October 2019-March 2020) and was undertaken by the same consultant.

⁵ The following FNS-REPRO Learning Agenda Focal Points (and their assistants) attended the consultative workshops: Tarig Elsheikh Mahmoud (North Darfur); Ibrahim Ali Nour (North Darfur); Mohammed Hamed (East Darfur); Mohamed Osman (FNC, East Darfur); Yaseen Mohamed Ahmed (FNS-REPRO, Ed Daein Office).

Table 11 Consultative workshops and focus group discussions in Darfur.

Geographical coverage	Methods of data collection	Date	Participants		Total
			Male	Female	
Elfashir, North Darfur	Consultative workshop (CW)	June 5, 2022	18	7	25
Ed Daein, East Darfur	CW	June 6, 2022	25	9	34
Lawabid, North Darfur	Focus group discussion (FGD)	June 6, 2022	27	7	34
Sani Karao, North Darfur	FGD	June 7, 2022	22	18	40
Jalabi, East Darfur	FGD	June 7, 2022	9	5	14
Bakhiet, East Darfur	FGD	June 8, 2022	11	13	24
Total			112 (65%)	59 (35%)	171

Participants

A total of 171 persons (59 women and 112 men), attended the consultative workshops and participated in the focus group discussions in both North and East Darfur States (Table 11 above). These participants included State Ministers of Agriculture & Forestry, State Directors of the Forest National Corporation (FNC), representatives of state natural resources directorates & departments (crop production, plant protection, range, livestock, etc.), representatives of the Gum Arabic Producers Associations (GAPAs), FAO, traders, companies, native administrations and others. The full list of participants who attended the value chain consultative workshops is in Appendix 4.

4.3.1 North Darfur State

A. Consultative workshop (CW) at El Fasher Locality (05.06.2022)

North Darfur state has a total area of 292,000 km² with an estimated population of 2,827,000. The state comprises 18 localities namely; El Fasher, Umm Keddada, Kalamendo, Tweisha, Allait (project target areas), El Malha, Mellit, Sarf Omra, Alseraf, Kebkabiya, Kutum, Um Baro, Kornoi, Alkoma, Taweela, Alwaha and Dar-es-Salaam. El Fasher, where the consultative workshop took place, is the capital city of North Darfur. It is the largest city in the north-western part of Sudan. It serves as an agricultural marketing centre for cereal and fruits grown in the surrounding areas. It is linked by paved road with Eljenianah and Um Kaddadah and with another road to Ennuhud and Elobeid (FAO, 2021a).

B. Focus group discussion at Lawabid – El Fasher Locality (05.06.2022)

Lawabid village, where the first focus group discussion was conducted (Figure 17), is located in El Fasher rural locality. It is considered as an important Gum Arabic rural market that provides El Fasher with agricultural products (e.g. millet, sorghum, sesame) and vegetables. The area is fairly small and unfenced without any reliable administrative buildings.



Figure 17 Group photo, Lawabid community.

C. Focus group discussion at Sani Karao – Kalamendo Locality (07.06.2022)

The village of *Sani Karao*, where the second focus group discussion took place (Figure 18), is located in southeast of El Fasher city, and it belongs to the locality of *Kalamendo* and the administrative unit of *Sani Karao*. The main tribes in the region are *Mima*, *Berti*, and *Fallata*. Most of the population practice traditional agriculture as a main occupation and animal husbandry as a secondary one. The population produces many food and cash crops including millet, sorghum, groundnuts, sesame, hibiscus and melon seeds, and very few vegetables on the edges of valleys. According to the investigated native administration, the Kalamendo is famous of GA production, as it ranks first in this regard compared to all other localities in Darfur. There are many producers' associations (76), which include associations for men and women. The market is administered by a local village committee with one administrative officer and one market guard. Despite being a key rural market for Gum Arabic in North Darfur state, the market area is fairly small and unfenced without any reliable administrative buildings. Nevertheless, the market is inaccessible to most of Gum Arabic city traders and companies due to the harsh conditions and inappropriate feeder roads.



Figure 18 FGD with Sani Karao community.

4.3.2 East Darfur State

A. Consultative workshop at Ed Dein Locality (06.06.2022)

East Darfur State was established as part of the Doha Peace Agreement in 2012 with a population estimated at 1.7 million. The state is administratively divided into nine localities, which are Abu Jabra, Abu Karinka,

Adila, Assalaya, Baher Al Arab, Ed Daein, El Ferdous, Shia'ria and Yassin. Around sixteen per cent of the state's population are nomads (UNICEF, 2022).

B. Focus group discussion at Jalabi, Ed Daein Locality (07.06.2022)

Jalabi village is located 20 km east of Ed Daein, the capital of East Darfur State. A consultative forum was held with the Jalabi community on June 7, 2022, in the presence of 14 participants representing (local committee, local administration, women and youth. Jalabi village is divided into three councils according to population density (large, medium and small). Its population is about 31,000 persons including internally displaced persons (IDPs) and refugees from South Sudan. The area has 3 wells, 4 schools, a health center and a market, and it has 8 administrative *Sheikhs* (local leaders) in addition to the *Sheikhs* of the surrounding villages. During the forum, the discussion focused on project interventions, gaps to be covered and some individual stories of change.

C. Focus group discussion survey at Bakhiet, Abukarinka Locality (08.06.2022)

Bakhiet village is located 50 km east of Ed Daein. Villagers in practices agriculture (mainly groundnut, sesame, millet and water melon). The consultative forum was held with Bakhiet community on June 8, 2022, in the presence of 24 persons, mostly young people (men 11 and women 13). It appeared through the dialogue that the attendees were not able to clearly explain the project's interventions, because most of the members of the committee and the native administration participated in the peace workshop and the training course on making improved stoves (for women).

4.4 Key findings from the consultative workshops held in North Darfur

4.4.1 Key findings from stakeholder consultative workshop held in El Fasher, North Darfur (Group A)

Rehabilitation of water sources:

- Building resilient infrastructures and services represents the most significant outputs for any serious interventions in North Darfur, which is considered one of the most vulnerable states with regard to food insecurity, desertification, soil degradation and conflict over resources in the country. Based on that, rehabilitation of water sources constitutes one of most important interventions made by FNS-REPRO in the targeted localities.
- According to most of the workshop participants, the water stations in the targeted villages were rehabilitated by the project in a satisfactory manner.
- Despite this favourable estimate, the participants recommended *establishment of new water sources and rehabilitation of existing ones*, particularly in the areas allocated for production of food and cash crops (sorghum, millet, and groundnuts) and tapping and of the gum gardens (orchards).

Rehabilitation of pastures and rangelands:

- Rehabilitation of pastures and rangelands and dispersal of seeds constitute one of the most critical interventions for the project in targeted localities. This was also followed by opening fire lines, besides rehabilitation and demarcation of livestock corridors. Interventions by the project under this context were *to some extent satisfactory* according to the majority of the workshop participants.
- Most of the participants emphasised that rehabilitation of pastures by using *high quality and nutritive range species* will definitely support the nutrition and health indicators of livestock in the project area. The participants also ask for *more seed dispersal* to meet growing livestock requirement, which in turn will improve the food and nutrition security in the project area.
- Because most of the livestock corridors lack services, accordingly *provision of water sources and veterinary services across the livestock corridors* is also required to protect the herd and resolve conflict in the targeted areas.
- Fire lines are always either lately opened or not properly done in most of the project locations. Therefore, *early and proper opening of fire lines are needed* to cover large areas and to protect pastures and forests.

Peace and conflict resolution over natural resources

- In the field of peace and conflict resolution over natural resources, the project has mediated peace building dialogues between different segments of society including pastoralists, farmers and native administrations. The workshop participants realized that these dialogues are necessary to move towards understanding different points of views and building peace within communities that have experienced conflicts. Accordingly, dialogue has been recognized as a powerful tool for peacebuilding and conflict resolution in the targeted area.
- The project tried to involve/integrate women and youth in this process to achieve community peace building and reach sustainable management of natural resources. Most of the participants agreed that these interventions were satisfactory but their coverage is to some extent limited to some targeted areas.
- Accordingly, more and diverse peace building mechanisms (dialogue, communication networks, technical and capacity building programs, and spirit of teamwork) are still needed, to resolve conflicts over resources, maintain peace, and to raise community awareness under this context.
- A number of community-based committees have been established and trained by the project. These are mainly intended to empower the local community groups and their institutions by giving them direct control over natural resources, and existing infrastructures and services besides their inclusive participation on the management and sustainability of the project interventions. In this regard, the most important committees are: Natural Resource Management Committee, Water Management Committees, Dispute Resolution Committee. The participants indicated that the role and performance of these committees were satisfactory. Despite that, more training, capacity building and information access should be provided to these committees.

Forest restoration and rehabilitation:

- Restoration (and rehabilitation) of the forest sector (especially Acacia Senegal) in the project targeted localities is to some extent limited according to the workshop participants. They also mentioned some challenges under this context such as: delay in seedlings distribution; seeds viability and quality are sometimes questionable (responsibility of the FNC). Therefore, distribution of seedlings (e.g. Acacia Senegal) should be sufficient and should come in early time.
- Seeds viability should be tested and brought from well-known sources (e.g. seed propagation units in Kordofan).

Inclusion of women

- Women's associations received moderate attention by the project. They have been trained in many aspects related to food and nutritional security, but they are still suffering from some weaknesses that might hinder their role in the project area such as: insufficient finance; social barriers such as inability of women to own land; limited participation in committees and in the decision-making processes.

Capacity development

- Most of the workshop participants indicated that the training of the local extensionists in the project targeted areas is limited and sometimes below aspiration despite its important role in natural resource management and sustainability of the project interventions. Accordingly, all participants emphasised the need for more capacity building and training programs in this regard. They also ask for exchange visits for the representatives of their local committees to some nearby states (North and West Kordofan states) to improve their knowledge, particularly on Gum Arabic production and business.

Key challenges faced by Gum Arabic value chain actors

According to the feedback of the participants, there are so many problems and challenges facing Gum Arabic dealers (producers, local traders and companies) in the project area. The key challenges identified (in order of severity) include:

1. Security unrest. Land disputes, ethnic conflicts, conflict between pastoralists and farmers, but also poverty and poor governance are mentioned most often as the main sources of instability in North Darfur.
2. Lack of water sources. particularly in Gum Arabic production areas.
3. Poor infrastructure (unpaved roads) and services.
4. Pests and diseases.
5. Unavailability of pre-finance.
6. Poor prices of agricultural products.

Opportunities for improvement

Partnerships with the private sector

- The project has initiated a contract farming model between some private companies represented by Foga and Afritec Gum Arabic companies and the Gum Arabic producers on the basis of win-win. Despite the good coordination and linkage made by the project in this respect, this model is still in its early stages and more companies are needed to realize the achievement of concrete partnerships. The workshop participants emphasized that these partnerships will definitely improve the Gum Arabic prices in rural markets and enhance the quality standards of the commodity.

Customary land tenure systems

- Customary land tenure systems sometimes create problems between land users. For this reason it is necessary to intensify community awareness programs and open dialogues between the different segments of society.

Food culture

- In terms of food culture, most of the participants indicated that it is a big challenge in the rural areas of North Darfur. This can be seen in the food consumed, where millet and sorghum are consumed as main and staple food (diet) in form of Aseeda. Aseeda is a food eaten at most meals and is often combined with a stew or curry containing okra. Although it may be considered as a good source of energy for the tedious agricultural work which is the backbone of farmers in the region, it is necessary to raise community awareness on food diversification. Food diversification can be understood as a wider presence of food variety over time to enhance the household access on food security dimensions. This could be achieved also through cultivation of other nutritive trees such as baobab, nubag (*Ziziphus spina-christi* plant) and gudem (*Grewia tenax*) to improve household income and raise nutritional security indicators.

Income generating activities

- As for the entrepreneurship programs initiated by the project, women associations always receive high attention. They got training on how to run and manage small scale business enterprises that are expected to contribute significantly to their income and livelihood.
- Also, a business development consultant was hired by the project to train the farmers and local communities.
- A mechanism must be found to implement income-generating services and programs for workers in the pastoral sector.

4.4.2 Feedback on the project interventions with regards to Gum Arabic value chain in North Darfur (Stakeholder consultative workshop in El Fasher - Group B)

A stakeholder consultative workshop held in El Fasher produced a variety of different feedback on project interventions with regards to the development of the Gum Arabic VC in North Darfur. The main feedback from the FGD's (Figure 19) is summarized below.

Reduced areas for Gum Arabic due to insecurity & war

- Historically, North Darfur state was considered as an important source of high-quality Gum Arabic commodity from *Acacia Senegal*, particularly in Kalamendo locality. Due to security unrest and war for the last 15 years, the areas allocated to Gum Arabic orchards (gardens) were substantially reduced.

Protective function of forests

- Forests in the area play important roles in protecting the environment, going above and beyond their productive value. All trees, shrubs and herbs in the various agroecological zones have significant protective functions.

Agricultural activities based on food and cash crops

- The agricultural activities are often based on multi-crops (e.g. sorghum and millet, sesame, groundnuts, watermelon seeds) farming system, in which food and cash crops are mostly rotated to *Acacia Senegal* trees.

Gum Arabic value chain and related practices

- Gum Arabic tapping starts on mid-October and continues for 45 days (beginning of December) to get the first picking. Collection of Gum Arabic continues up to April every year. All these practices reveal existence of good levels of indigenous knowledge and technical experience among Gum Arabic producers for a long time, and prior to the project interventions.
- *Tapping tools*: for a long time and before the project interventions, the Gum Arabic producers used *Sonki* (recommended tool) and traditional axe for tapping Gum Arabic trees and *Kortala* (locally) to collect their harvest. After the project intervention the adoption of Sonki increased and its advantages over axe were realized, but this tool was not distributed to the trained Gum Arabic producers and for this reason some people are still using the axe.
- *Inadequate finance*: Before the project interventions, the Gum Arabic producers and other supply and value chain actors in the targeted areas depend mainly on self-finance (or sometimes assisted by their relatives) and few of them get *Murabaha* or *Musharaka* (formal credit) but no *Salam* or *Sheil* systems were practised in the area. This situation is still going on, even after the project intervention.
- *Inadequate contract farming*: Contract farming agreements between the private companies and the GA producers or producer cooperatives didn't exist before the project interventions and now the project is trying to initiate some business models that could enhance this partnership in the near future.
- *Tree cutting*: Due to the lack of energy sources, overcutting of Gum Arabic and other trees in the project area is a well-known phenomenon before the project intervention.

More capacity development needed:

- *Inadequate extension services* are found before and after the project interventions, according to so many that gave feedback. Restoration of the Gum Arabic belt in the project area is always there since but the project interventions emphasized the importance of forest protection and supported the rehabilitation of nurseries to produce seedlings. Accordingly, more extension services are still needed.
- In terms of training and capacity building, it became clear that the Gum Arabic producers and other upstream value chain actors had received adequate training programs, while there were *no training programs on marketing, post-harvest operations and technologies*.
- *Inadequate water facilities*: Most participants agreed that water facilities are to some extent available in the project area, but still more interventions are needed to satisfy the need for the local community.
- *Inadequate storage & transport facilities*: There were no reliable storage facilities and/or warehouses. Because Gum Arabic is always produced in vast areas, which requires good transportation and storage facilities. Transportation of the commodity from the forests to the rural markets is always done by animals, cart and/or on foot.

Weak markets, dominated by brokers and middlemen:

- The production of Gum Arabic always takes place in rural remote areas, collected from mobile markets (Umdawarwar markets) and driven to urban centers and/or auction markets. Accordingly, this long channel justifies the presence of a large number of brokers and middlemen.
- The rural markets act as small assembly markets, which receive and aggregate the Gum Arabic commodity from the peripheral and nearby markets. These rural markets are operating on a weekly basis (one or two days per week). Most of these markets are located in vicinity of the production sites.
- Producers always receive low prices or supplies lower in value compared to their gum harvest. Brokers and middlemen tend to underestimate the producer prices. Accordingly, empowering GAPAs, women and youth groups could solve this problem.
- Because credit facilities are not available for the Gum Arabic producers, most of them are forced to sell their product immediately after harvest. Accordingly, pre-finance or any other mechanisms (e.g., contract farming) will improve the producers' bargaining power on the market price and protect them against brokers and middlemen.
- Most of the participants indicated that the Arabic commodity rural and urban market in area lack appropriate infrastructure & services, quality management, specifications and auctions.

Gum Arabic production and productivity

- The average percentage of gum tapping in most of the project area is about 20% of the existing Gum Arabic orchards and two third of the tapped areas are always collected.

- The productivity per tree before the project intervention was one pound per picking and up to eight pounds per season.

Weak value addition

- The producers sometimes clean the gum, and rarely dry it without sorting or grading. Accordingly, the Gum Arabic commodity is always driven to the rural and urban markets as raw gum (part of the quantity is sold as a hand-picked selected gum - H.P.S).
- Plastic bags/ sacs are always used by the producers to bring their product from their garden to the market. Although this keeps the moisture content of produced gum and increases its weight, it adversely affects the gum quality in the market (green gum, clotting gum).

Improved livelihoods from Gum Arabic production

- The Gum Arabic contribute significantly (40%) to household income, food security, health and other livelihood aspects for Gum Arabic producers in some rural areas (North Darfur). This contribution has slightly increased after the project intervention.



Figure 19 FGD during El Fasher consultative workshop.

4.4.3 Feedback on project interventions obtained from consultative FGD held in Sani Karao, Northern Darfur

Problems with installed water sources

- The main interventions of the project in the field of water resources included the maintenance of the water station, which was provided with a solar system, submersible pump and inverter, as well as the construction of a fence around the water station (wall built with cement and stones etc.). There is need for some items to complete the water stations such as energy storage batteries (10 pieces) and water reservoir.
- The community mentioned that the installation of the solar energy system was not good, which led to some cells being broken. Furthermore, the fence is incomplete and part of it fell down. The project also committed to separate animals from humans in terms of drinking water, but did not do so. The spaces between water troughs fill with water and mud due to breaking of the water pipe, and the spaces need to be filled with gravel, stones and cement. The accumulation of this water negatively affected the health of the environment. The existing water resources in the area are insufficient and cover only 60% of the population's needs because the neighboring communities and the pastoralists also use the same water

sources. They mentioned that there is a technical defect in the work of the contractor responsible for fencing and installing of the solar energy cells as a result of poor follow-up by the Natural resources and water committee.

Problems with rangeland and pasture restoration and rehabilitation

- The project's interventions in the pasture program included opening of fire lines, broadcasting of improved pasture seeds, and opening and demarcating the animal routes crossing the project area. The community mentioned that the fire line was opened for a long time after the end of the rainy season, after the fires destroyed large areas of natural pastures and Hashab gardens. The improved pasture seeds were broadcasted, but also at a late time and without protection, being exposed to early grazing and destruction by fire.
- The animal route is far from the area and it does not have veterinary and water services. Therefore the pastoralists leave the route looking for these services, especially drinking water which leads to the entry of animals in the agriculture farms and destruction of hashab trees, which leads to dispute and conflicts between the pastoralists and the farmers. In addition to this, there are camels grazing on hashab trees which reduces production of Gum Arabic.

Inadequate distribution of agricultural inputs (improved seeds, donkey cart and ploughs, etc.)

- 36 donkey carts were distributed, but they were not provided with animals (donkey or horse) and there was lack of transparency in their distribution, because some members of the society, including women, were not considered or included during the distribution as mentioned. Also, a few seeds of food crops (sorghum and millet) and cash crops (groundnuts and sesame) were distributed, very late and after starting of the rainy season. The community claimed that the number of carts and donkey ploughs distributed were not enough compared to the size of the community.
- All the participants agreed that the farmers did not benefit from the provision of inputs because they were few and distributed very late.

Women and youth inclusion

- According to the community, women and youth are not always considered and consulted in the project activities, especially in the field of Gum Arabic. On the other hand, the results indicated the existence of some purely women committees for Gum Arabic activities. However, most of these committees are inactive or in need of training especially in the field of income-generating activities. They should be given special consideration when distributing subsidies provided by the project, such as carts and agricultural inputs.

Camels and pests reducing Gum Arabic production

- The participants in the group discussion said that the Sani Karao region is considered the first among the five Darfur states in Gum Arabic production. The evidence for this is the quantity of gum that comes to the area during market days, estimated at about 800-900 Gontar (one Gontar is equivalent to 100 Sudanese pound). But despite that, Gum Arabic production is considered weak as a result of pests such as locusts and because grazing of trees by camels. Protection must be provided for Hashab trees from grazing camels at the time of the talaq (the period after crop harvesting) and pest control in an appropriate time.

Problems with seedlings

More than 1000 Hashab seedlings were transported from El Fasher to the Sani Karao area, but it was too late and the community was not able to distribute these seedlings to the producers for planting, and they were left near the nursery until they all died. Some of the community members mentioned that they were willing to cultivate these seedlings but they were unable to plant them for the following reasons:

- The arrival of seedlings to the area was very late, as the producers and farmers were busy with cultivating their farms.
- The lack of capacities of farmers to transfer these seedlings from the village to their farms, which made them turn a blind eye to them. They said that it is better to transport seedlings at the beginning of the season and help farmers and producers to transport them to the area of cultivation.
- There are no companies in the area to buy Gum Arabic, but there are representatives of companies coming to the area. There are no auction markets, and it is the merchant who sets the price, and the producer has no role in that, which encourages smuggling of Gum Arabic.

4.4.4 Feedback obtained from Lawabid consultative FGD

A focus group discussion was held with the community of the Lawabid village on 6/6/2022, attended by more than 34 people, including all segments of the community, including men, women, youth, local administration, representatives of associations and grassroots committees. The objective of this meeting was to identify the interventions of FNS-REPRO, to identify and enhance the positives and to identify and weaken the negatives. Below the main issues raised by the community are described.

Water sources – hafirs rehabilitated but solar system not working

- The main water sources in Lawabid area are the boreholes, which cover about 40% of the human and animal needs for water. After the intervention of the project rehabilitation of two hafirs in the area was done, dedicated to drinking water for animals only. The solar energy system was installed in one of the water stations but without batteries and inverter.

Range and pasture – fire lines and pastures seeds too late and unprotected broadcasted areas; lack of services along animal route leading to conflict

- The condition of the pasture is medium in the area, where the fire lines were opened in the previous year, but it was late, after the fires broke out in the pastures in the area. The seeds of some good quality pasture plants were broadcasted, but it was late and the grass was also exposed to early grazing. The broadcasted areas should be protected until these species complete their life cycle and produce seed.
- There is an animal route that pastoralists use in their movement from north to south and vis-versa, but this along this route there are no services provided such as water sources and animal health services. This makes the pastoralists leave the animal route in search of these services which then leads to animals entering farms and to the destruction of the Gum Arabic gardens, which results in friction between pastoralists and farmers. A good example of this was one of the beneficiaries who was also a participant in the workshop. He had a broken hand as a result of the conflict between him and one of the pastoralists as herders were stealing gum and camels had been feeding on his hashab trees (see also the first story of change in 6.1).

Agricultural inputs (seeds, cart, ploughs, etc.) – late & insufficient seed distribution; insufficient donkey carts; improved agroforestry practices

- Seeds distributed included cereal crops (millet and sorghum) and cash crops (groundnuts and sesame), but these seeds were distributed very late and the quantities were insufficient. In the past, the main crops grown in the area were millet, sorghum and sesame, but after the intervention of the project, the groundnuts were added as a cash crop in the area. The production of groundnut was good, which encouraged farmers to adopt its cultivation in the area.
- Some 25 donkey carts were distributed, which is not enough, and this leads to creating problems among the community members. Also, very few traditional donkey ploughs were distributed, which are not enough. These inputs were distributed without draft animals such as donkeys and horses.
- Community members were also trained on planting Hashab trees in the same place with the crops (agroforestry). After the project intervention, the communities' awareness was raised and trained on planting crops with trees. This encouraged the farmers to planting groundnuts inside the hashab gardens.

Women and youth engagement in committees; need for improved engagement in GA production

- Women and youth are represented in all committees together with men, and they also have their own committees, such as the Women's Committee and the Youth Committee. Women do not have a clear role in some committees, and also the role of the two groups in Hashab tapping is weak. This gap must be filled by the project through training women and youth in the operations of Hashab tapping, Gum Arabic collection and others.

Committees in place but need further training

- All the committees are present in the area, such as Natural resources, services, water, women and youth committees etc.... But these committees need more training and awareness raising. However, the local administration has been trained in peace building and conflict resolution. Joint associations have been formed with the Brooch Locality in North Darfur for the purpose of exchanging experiences, but they need to be activated and trained.

Gum Arabic production stimulated by FNS-REPRO

- There is a high density of Acacia trees in the area, especially in the northern and southern part of the village, where a number of seedlings were planted as a belt in the north of the village with support from the state government. Before the project intervention, Acacia trees were available in the area, but there was no tapping to produce Gum Arabic, but after starting of FNS-REPRO, the community was encouraged a lot in the process of producing Gum Arabic.



Figure 20 Tapping tools Axe (1), Makmak (2) and Sonki⁵.

Gum Arabic tapping and collection – Sonki adopted; increased tapping & agroforestry; women not trained; hashab gardens not protected

- In the past, producers used Ax (Farrar) in the hashab tapping, but after the intervention of the project and training them on the use of the Sonki and its benefits, producers resorted to using the Sonki instead of Farrar in the tapping operations. They mentioned that the use of the Sonki is easier and more effective than the use of *Farrar*, and that the Sonki helps the producers to reach the far and high branches of the tree which cannot be reached when using the Farrar (Figure 20 above).
- For the Gum Arabic collection, the producers claimed that there are no aids from the project, as people use the basket (*Kortala*) for the Gum Arabic collection.
- In the past, there was tree tapping in the area, but it stopped a long time ago. However, after the intervention of the project, people returned to tapping Hashab and also to the cultivation of food and cash crops along with Hashab trees without cutting them as before. They mentioned that this is very useful.
- The Hashab tapping is carried out by men and young people, because women have not been trained in tapping and the production of Gum Arabic.
- There is an encroachment of animals and grazing on the hashab gardens, because there is no protection, which affects the growth of the planted seedlings and reduces the production of trees producing Gum Arabic.

GA production increased due to FNS-REPRO, improving food and nutrition; need to engage companies

- The participants in the group discussion agreed that the main meal for the majority of the population is porridge throughout the week, except for a few community members who change the meal only on the market day (once a week) where they add meat and a few vegetables and fruits to the meal. Some mentioned that Gum Arabic contributes to this in addition to assisting the family in meeting the education entitlements for their children, as well as providing for health, clothing, and other needs.
- One of the producers mentioned that in the past, there was a process of producing Gum Arabic, but it stopped for a long time. However, people started to tap the Hashab after the intervention of the project.

⁵ The first and third tools are used for tapping *Acacia senegal* and the second tool is used for tapping *Acacia Seyal Varseyal*.

They hope that the project staff and the Gum Arabic Council will encourage companies to enter the region and encourage the development of GA production.

Key problems and challenges:

- Destroying of the hashab trees around the village by animals.
- Lack of drinking water in remote productive areas.
- Elimination of pests and fires on acacia trees and other crops.
- There is no storage space in the area.
- The production of Gum Arabic and other crops is weak due to pests, lack of soil fertility and shortage of rain in some cases.
- Malnutrition, especially children.

4.5 Key findings from the stakeholder consultative workshops held in East Darfur

4.5.1 Feedback from stakeholder consultative workshops held in Ed Daein, East Darfur

The below key findings are based on feedback received by participants during the stakeholder consultative workshops held in Ed Daein, East Darfur. In Ed Daein, the stakeholder consultative workshop was organised around a number of key questions. These questions and related responses are provided below.

Did the project activities achieve the purpose from your point of view?

- The project activities achieved the purpose of distributing agricultural equipment, but did not achieve the purpose of increasing production and planting Acacia Senegal (Hashab seedlings). The main purpose of the project is to target Gum Arabic producers and increase the agricultural area of the hashab tree.

Did the project's interventions support the production of Gum Arabic?

- The project's interventions did not support Gum Arabic production and food and nutrition security because the community is still concerned with groundnut cultivation rather than Hashab.
- What are the main gaps that the project missed?
 - The project has failed to select the real producers of Gum Arabic in compliance with the Gum Arabic producers associations.
 - Absence of major markets for Gum Arabic, absence of stores for Gum Arabic (GA), lack of financing for GA producers, lack of pest control, and low prices of Gum Arabic.

What are the challenges related to implementation of project activities?

- Having Hashab gardens abundantly and lacking of drinking water.
- Lack of seeds and agricultural equipment provided by the project. Need for more.
- Selection of a large number of target group (beneficiaries), which leads to the difficulty of dealing with them.
- Provision of improved crop seeds for agricultural production, at an inappropriate time.
- Excessive cutting, fires, and lack of transportation means.

What are the opportunities for the success and continuity of the project?

- Choose the real producers through the Gum Arabic producers associations.
- Reduce the number of beneficiaries.
- Grant each producer a sufficient amount of seeds and equipment (e.g. cart, Sonki for tapping Hashab....).
- Provide incentives for farmers who already have Hashab gardens to start gum production, this will attract other farmers to do the same.
- Establishment of auction market to determine the market price.
- Establishment of good sorting, packaging and storage centres.
- Training of producers in pre- and post-harvest techniques.
- Provide financing for all stages (tapping to harvest) of Gum Arabic production.
- Form real associations that own Hashab gardens.

- Provide drinking water in production areas.
- Protection from fire, overgrazing and over-cutting.
- Provide means of transportation.
- Provide health services in production areas.
- Involve the beneficiaries in the planning of activities and let them identify their needs.
- Test the seeds and bring them at an appropriate time.
- Training and qualification of beneficiaries and implementers at all stages of the project.
- Exchange of experiences of beneficiaries among GA producing states (e.g. North Kordofan).

What are the interventions and services provided by other parties that contributed to the development of Gum Arabic?

- Other projects are also working in the area but they are focusing on groundnut production.

What are your suggestions for developing the situation in the remainder of the project's life?

- Increase the life of the project until 2027 because the investment in forestry is long and needs a long period of time.
- Make a demonstration farm to apply all technologies (agroforestry and tungia).
- Work through associations; their support should be direct; and coordinate with the Presidency of Producers.
- Identify an exit strategy of FNS-REPRO to ensure the sustainability of the project's interventions.
- Provision of seeds from high yielding gum trees.
- Create a digital network to connect GA producers to auction markets and gradually to the international markets.

4.5.2 Community feedback from Jalabi village

Jalabi village is located 20 km east of Ed Daein, the capital of East Darfur State. A consultative forum was held with the Jalabi community on June 7, 2022, in the presence of 14 participants representing local committee, local administration, women and youth. Key findings from the feedback received from community members is summarized below:

Water point rehabilitated by the project

The main sources of drinking water in Jalabi are the 3 wells, of which only two are working. The project rehabilitated one well, fenced it with fixed fence, and provided it with solar energy and its accessories, except for the batteries and the transformer. The nice thing done by the project, is the separation of places where humans drink from the places where animals drink.

Rangeland – grass seeds provided; grass collected

The condition of the pasture before the intervention of the project was poor, but now it has become a medium condition, as the (nomadic) paths (locally *Masarat*), the drains and the trays were marked with signs. The seeds of some good plants (e.g. Baghel, Abu, Sabai and Difra) were dispersed around the area. The effect of this is that people gather grass (straw) around the village unlike before project interventions as they collect grasses from remote areas and also animals graze close to the village.

Agricultural inputs (seeds, agricultural equipment) provided and useful but inadequate quantities and seeds were distributed late

Before project intervention, groundnut production was weak compared to now, as the production has been increased and diversified. Improved seeds for food crops such as millet and maize and cash crops such as groundnut and sesame were distributed by the project, but they are in few quantities (10 kg per person), besides the late distribution to beneficiaries. Carts, plows and other utensils were also distributed by the village committee to the poor persons in the village, but the number is small, as only 9 carts were distributed in 202 and 36 in 2021. Despite that, they helped those who received these in bringing water from the well and watering the *Hashab* seedlings.

Gum Arabic production increased somewhat with provision of seeds and seedlings, but lack of funding and animals destroying seedlings and Hashab trees

At the beginning of the project in 2020 the Hashab seedlings were distributed and planted in the north and south direction of the village in 10-15 farms, and their success rate is good despite the loss of part of them. As for the seeds, they were distributed and planted, but did not germinate. With regard to funding, the participants mentioned that there is no funding received from any other part, and there are also no companies or markets for gum. Before project intervention, they did not have any value for the acacia and gum, and now production has started with some farmers and the gum entered the market, but in small quantities. It is packed in bags at a price of 500 SDG per pound. It is sold in Jalabi market or Ed Daein market. That is why most of the farmers have weak interest to invest in gum. A small number of people practice Hashab tapping with Sonki (the recommended tool for tapping Hashab), but the encroachment of animals and grazing on young seedlings and existing Hashab gardens affects the growth of planted seedlings and reduces gum production.

Agroforestry practiced with groundnut and Hashab, increasing production

Since 2020, the groundnut has been planted in the middle of the Hashab (mixed), but sesame is planted alone. The increase in production and benefit from the hashab tree is noted.

Women supported with growing sesame, acacia, nutrition education and improved stoves

Before project intervention, the citizens used to grow millet, and groundnut as a source of income. After 2020, the project supported women, as sesame and acacia were introduced. In the field of food, women have been trained in food culture and improved stoves to reduce the consumption of wood and charcoal.

Training in Peace and Conflict Resolution helped resolving conflicts

Since 2020, the project has been working with Jalabi community, where 3 training workshops were held, during which the civil administrations (5) and some citizens (5 youth and 5 women) were trained in conflict resolution and dialogue skills. These training workshops have positively affected peace in the Jalabi area. Before the project intervention, problems/conflicts were resolved by traditional inherited methods, but now the problems are solved through modern methods of dialogue, where practical training was conducted in the dialogue between the animal owners and the farmers. The Jalabi area is considered one of the most stable areas at the state level, although it contains more than 23 tribes, in addition to the displaced and refugees from South Sudan, and this indicates the awareness and understanding of the community and the indigenous administration.

Other parties: The organization World Vision works on improved stoves, and another project works on enhancing resilience.

Photos taken during the community consultative workshops held in Jalabi village is presented in Figures 21, 22, 23 and 24 below.



Figure 21 Members from the Jalabi Community.



Figure 22 Training women on making improved stoves in Jalabi village.



Figure 23 Solar water powered pump, Jalabi village.



Figure 24 Carts waiting for water, Jalabi village.

4.5.3 Community feedback from Bakhiet village, Abu Karinka locality

Bakhiet village is located 50 km east of Ed Daein, where the consultative forum was held with the Bakhiet community on June 8, 2022, in the presence of 24 persons, mostly young people (11 men 11 and 13 women) (Figure 25). Key findings from the feedback received from community members is summarized below:

Water point rehabilitated by the project

The main source of drinking water in Bakhiet village is a well and this has been rehabilitated the project and provided with solar energy.

Rangeland – grass seeds provided

Seeds of valuable plant species were dispersed.

Agricultural inputs (seeds, carts and ploughs) provided

Maize/millet/groundnut/sesame seeds were distributed to the beneficiaries (2 sacks per person = 15kg). This amount was considered insufficient according to the recipients. In addition to the seedlings, 24 carts, ploughs and utensils were also distributed.

Committees include women but need capacity development of women in nutrition & manufacturing improved stoves; local administration trained in peace building and conflict resolution

Women and youth are represented in the village committee, and women receive training courses in nutrition and the manufacturing of improved stoves. All committees are present in the village, such as the committees of natural resources, services, water, women and youth, etc. However, these committees need training and capacity development in all fields. Local administration has been trained in the field of peace building and conflict resolution.

Gum Arabic production is small due to no market and converting to groundnut cultivation

The participants noted the deterioration of the vegetation cover due to conversion of Hashab areas to groundnut cultivation. The gum is collected and sold in small bags at 1,000 SDG/lb. There is little interest in cultivation and managing Hashab trees, due to the lack of traders (no market).

Training and capacity building

Some beneficiaries have been trained in raising Hashab seedlings and gum production but there are only a small number who perform tapping using Sonki. Other training workshops were also conducted in the field of:

- Agroforestry.
- Food and nutrition culture including knowledge of malnutrition symptoms, in addition to methods of food preservation and use at a time of scarcity.
- Improved stoves.



Figure 25 Community members from the Bakhiet community.

4.5.4 Key challenges identified by the communities

A number of key challenges were identified during the consultative workshops held with community members from both the Jalabi and Bakhiet. These are summarized in Table 12.

Table 12 Key challenges identified by Jalabi and Bakhiet communities.

Jalabi community	Bakhiet community
<ul style="list-style-type: none"> • Animals grazing on the Hashab trees around the village • Lack of drinking water in remote areas • Pests and wild fires • Loss of seedlings during transporting to farms far from the village • Low production of Gum Arabic due to the absence of market 	<ul style="list-style-type: none"> • After filling out the form at the beginning of the project, many residents of the village believe that there are in-kind items that should be distributed to them. • Late arrival of seeds • The distribution of seedlings did not coincide with the distribution of seeds, so many apologized for receiving and planting seedlings. • Some converted the areas of Hashab to the cultivation of groundnut, due to the absence of markets for gum. • The spread of locusts • Spread of seasonal fires • In the case of farm trees, the land renter cuts down the Hashab trees • Lack of water

4.5.5 Recommendations made by the communities in East Darfur

Below you can find a range of recommendations for improvement from the 2 different communities that were included in the RVCA in East Darfur in Table 13.

Table 13 Recommendations made by Jalabi and Bakhiet communities.

Jalabi community	Bakhiet community
<ul style="list-style-type: none"> • Maintenance of two water stations (2 donkeys). • Increasing the quantity of distributed seeds - the distributed quantity is only 10 kg, and Mukhamas (1 Mukhamas = 1.72 feddan) needs around 8-10 Malwa (1 Malwa= 2.7 kg) peeled groundnuts. • Increasing the number of carts. • Girls' High School Building. • Providing a means (a donkey) to pull the cart. • Protecting the Hashab tree by appointing individuals from Hilla as forest guards to assist the native administration and forests in protection. • Continuity of training workshops because of their role in raising awareness among citizens (climate change). • Providing marketing for the Gum Arabic product and other crops. • Receiving seeds and seedlings at an early time. • Providing solar energy to store medicines in the center. • Connecting companies to the product to maximize gum production. • Building a fixed storeroom with specifications. • Forming and supporting associations to collect and market Gum Arabic from producers. • Owning a three wheel motorcycle to transport water and water the seedlings. • Finding partnerships with producers (the experience of Darfood in contract farming can be benefited from). 	<ul style="list-style-type: none"> • Controlling insects (such as watermelon bugs) by providing spray pumps. • Increasing the number of plows and carts. • Provision of draught animals. • Early seed delivery (seeds should be delivered earlier and at the right time).

4.6 Summary of key recommendations emerging from the Rapid Value Chain Assessments

Below you can find a summary of recommendations that emerge from the RVCA undertaken in selected communities and with selected stakeholders in North and East Darfur. They are categorized in different topics.

- *Capacity development:*
 - a. Raise awareness of Gum Arabic producers to improve the quantity and quality of Gum Arabic products;
 - b. Stimulate good practices and approved technology produced by the research centres and academic institutions (e.g. Agricultural Research Corporation, Gum Arabic Research Institute) to the concerned producers and their institutions;
 - c. Ensure capacity development on entrepreneurship;
 - d. Conduct training in the supply and value chain for the actors in power (for all dealers);
 - e. Intensify awareness on advantages of the agroforestry system;
 - f. Train women and youth on tapping and collection of GA;
 - g. Organise exchange visits of Gum Arabic value chain actors among producing states (e.g. North and West Kordofan);
 - h. Raise community awareness on food diversification for healthier diets;
 - i. Suggest income generating activities & find best mechanisms to address pastoral communities;
 - j. More training, capacity building & access to information are needed for GA producers and community members;
 - k. More training, capacity building, exchange visits and access to information are needed for local extensionists;
 - l. Intensify community awareness programs and peace dialogue to resolve problems of customary land tenure systems.
- *Protection and natural resource management:*
 - a. Ensure protection measures to mitigate the effects of overgrazing and overcutting of GA trees and encroachment by animals and stealing by humans:
 - i. Open fire lines timely (early before the grass dries up; September-October) and try to cover large areas;
 - ii. Complete demarcation of livestock corridors;
 - iii. Raise the awareness of communities;
 - iv. Activate the role of native administrations and enforce (by-) laws;
 - v. Provide social fencing coupled with voluntary forests guards from villagers to protect forest stands.
 - b. Continue rehabilitation of existing range/pastures with high quality/nutritive species.
- *Pests and diseases:* enhance pest and disease control activities.
- *Infrastructure:*
 - a. Improve access to water:
 - i. Continue rehabilitation of existing water sources;
 - ii. Establish new water sources in areas of field crops & gum gardens;
 - iii. Provide water along livestock corridors.
 - b. Improve other infrastructure: storage facilities, transportation means, feeder roads.
- *Producer organisation & market linkages:*
 - a. Build producer associations and link them to financial institutions, companies and employers;
 - b. Create Gum Arabic portfolios to provide an easy and timely financing service for producers and other actors;
 - c. Encourage smart-partnerships.
- *Inputs:*
 - Provide (and distribute early) more fertilizers, improved seeds, and donkey ploughs;
 - Provide more Sonki tools with related training packages;
 - Provide Hashab seedlings and seeds to producers (early) from well-known sources;
 - Establish home/village nurseries.

-
- *Services:*
 - Provide water & veterinary services and animal health care (include fridge for vaccines powered by solar cell in each locality) along livestock corridor;
 - Ensure market related services.
 - *Enabling environment:*
 - Ensure provision of preferential policies (finance, taxes, alms) to support an enabling environment in the production sites;
 - Mitigate market distortions and rationalize policy intervention measures to control and defeat smugglings;
 - Adopt high quality and specification measures through all stages of the GAVC activities;
 - Encourage micro-financing institutions to enter the area;
 - Establishment of an auction market and stock exchanges in the state.
 - *Conflict:*
 - Generalize and recognize dialogue as a powerful tool for peacebuilding and conflict resolution;
 - Engage women and youth in peace dialogues;
 - Diversify peacebuilding mechanisms (communication networks, consensus, Judia, etc.);
 - Intensify community awareness programs and peace dialogue to resolve problems of customary land tenure systems.
 - *Women and youth:* business development consultant should focus on integration and development of entrepreneurship with regards to women and youth.
 - *Research:*
 - Establish a Gum Arabic Research Centre in North Darfur State (Al Fashir University and Agricultural Research Corporation);
 - Conduct a study in order to find the best way to finance associations to ensure their sustainability.
 - *Scaling:* work to expand the project's umbrella and its activities in the future in the other states of Darfur.

4.6.1 Concluding remarks

From the viewpoint of the FNS-REPRO Learning Agenda Focal Points (LAFPs), the following suggestions are to be considered for the remainder of the program:

1. Support an enabling environment on the production sites and rural markets;
2. Ensure empowerment of GAPAs & involve more youth and women in the GA business (production, micro-processing and trade activities);
3. Encourage adoption of innovative intermediate technologies for GA producers (e.g., model bag);
4. Ensure endorsement of smart partnerships between GA value chain actors on the basis of win-win & fair-trade mechanisms;
5. Ensure adoption of good practices that improve post-harvest activities and promote value addition across Gum Arabic supply value chain.

5 Key findings from Stories of Change

The stories of change dive into impacts of FNS-REPRO in its target areas. These may be positive and / or negative as well as intended and / or unintended impacts. The goal is to understand what FNS-REPRO has contributed to at a local level and what is still required to do in order to be successful in achieving its goals in the final year of implementation. Furthermore, important lessons and insights can be drawn from this process, informing actors on how to engage in areas of protracted crises when aiming to improve food and nutrition security through improving performance of selected value chains. Below are the key findings of the stories of change obtained from different FNS-REPRO supported communities in North and East Darfur.

5.1 Stories of Change from North Darfur

Box 1 Story of Abdelrahman Dawalbait from Um Harazak village, North Darfur

Story of Abdelrahman Dawalbait from Um Harazak village – “The Gum Arabic business has contributed significantly to my income and covered my family expenses and I married a second wife.”

“My name is Abdelrahman Dawalbait. I’m a Gum Arabic producer from the village of Um Harazah (belongs to Lawabid), located 65 km east of El Fasher town in North Darfur. I own about 300 trees in the vicinity of Lawabid village. I gained my experience in Gum Arabic production from my frequent visits and work in some remote states such as West Kordofan (En Nuhud). I intensified the rate of Gum Arabic tapping and collection after the intervention of the project in 2020 and the encouragement I received from it.”

“The Gum Arabic business has contributed significantly to my income and covered my family expenses. I married a second wife because my income from Gum Arabic business has increased significantly.”

“Due to the exposure of my garden to attack of locust last season, I reduced the number of tapped trees to minimal (200 trees). I’m now suffering from labour shortage compared to the vast areas that I owned. Gum Arabic production is not an attractive business to the youth in my family. I’m also suffering on how to protect my Gum Arabic product during collection. It is always stolen by school children and others.”

“The importance of Gum Arabic for me and my family is more than only income, as we always use it directly as food and medicine.”

Box 2 Story of Suleiman Muhammed Ali Hammouda from Um Harazah village, North Darfur

Story of Suleiman Muhammed Ali Hammouda from Um Harazah village – “My income from Gum Arabic production is increasing annually.”

“My name is Suleiman Muhammad Ali Hammouda. I’m a Gum Arabic producer from the village of Um Harazah (belongs to Lawabid), located 65 km east of El Fasher town in North Darfur. Because of the prevailing security unrest and instability in our region, I experienced very harsh conditions (poverty, unemployment, etc.) in my locality. I decided to leave my village and migrate to one of the big cities to find employment covering my expenses and supporting my livelihood.”

“We, as a family, own a Gum Arabic orchard (garden) in the vicinity of the village. We use it mainly for cultivation of traditional field crops but without any benefits from the existing Acacia stands. I got the idea to discuss this issue with my father as he has very extensive experience with gum production. He welcomed the idea and explained to me the right time for tapping Gum Arabic trees. He said tapping always starts in Daroota time or at the beginning of “Kasrat al-Surarr”, by that he meant mid-October.”

“He taught me to make sure that the garden is not attacked by locusts. He showed me the signs of tree maturity and readiness for tapping such as dryness, greyish colour, and shedding leaves. Then, I decided to stay and to practice Gum Arabic production. From that time (8 years ago) onwards, my income from Gum Arabic production is increasing annually. I’m now totally depending on Gum Arabic production to cover my daily family expenses (2 wives and eight children) and also to pay for education, health and other services.”

“After the project, I feel much better and see many producers starting to deal with Gum Arabic production and to intensify tapping of the trees in Lawabid region. In this region, we are facing some problems. As you can see, I’m now suffering from a broken hand due to the assault by some herders, whom I found stealing my gum product and destroying my garden by their camels. What is needed from this project is to connect us with some companies and to help our state to establish an auction market in El Fasher town.”



Figure 26 Suleiman Muhammed Ali Hammouda.



Figure 27 Gum Arabic tree.



Figure 28 Camels in Lawabid.



Figure 29 Water point in Lawabid.

5.2 Stories of Change from East Darfur

Box 3 Story of Essam Mohamed Issa from Jalabi village

Story of Essam Mohamed Issa from Jalabi village

"With regards to Hashab, I planted Hashab in addition to the existing one, so I produce gum, and I have Hashab that produces one to two pounds (lb). I have a gum garden with many trees, I do not know how many. To tap trees I use Sonki. Only few people are using it. But I got training within the project activities. Trees in my garden produce gum but there is a problem of passing of animals. That is why the amount of collected gums is small and I have no ability to protect the garden. I used to collect 1-3 Quintars and pack it in small sacks (lb) to sell it by 500 SDG/sack in Jalabi Market or in Ed Daein. When I planted Hashab I discovered its benefits such as belt defence for controlling desert from our village, bringing rainfall and improving the soil."

6 Recommendations from the sensemaking event

This report has presented valuable information and knowledge generated by FNS-REPRO assessments including a Literature Review (Chapter 4), the Rapid Value Chain Assessments (Chapter 4) and the Stories of Change (Chapter 6). These assessments provide useful insights into the key challenges and opportunities along the Gum Arabic value chain in target areas of Sudan. The critical insights generated in this report were reflected upon during the annual sensemaking event and planning meetings held in Khartoum on the 27-28 June, 2022, with key partners and stakeholders. Whilst there is progress in terms of the work done by FNS-REPRO, there are still many challenges to build resilient food systems, strengthen the Gum Arabic value chain etc. Some suggestions for improvement are indicated in the next section. Final conclusions and recommendations are captured in the summary chapter.

One of the FNS-REPRO key principles is flexible and adaptive programming. This means that the programme can change over time to increase fit with day-to-day and longer-term realities faced by communities on the ground. Given the complex and protracted crisis context of the programme's target areas, there is a need to be able to identify emerging issues and adapt to changes and negative impacts that affect beneficiaries and the FNS-REPRO outcome and objectives. This makes FNS-REPRO more effective, efficient, and relevant for its beneficiaries.

With the above in mind, this report and the subsequent suggestions for improvement provided below which stem from the sensemaking event (and related workshop report)⁶, are intended to support the evidence-based decision making and adaptive programming cycle of FNS-REPRO in its final year of implementation and can also be useful for other stakeholders that hope to strengthen resilience of communities in protracted crises.

During the sensemaking event a few topics were discussed more in detail so as to better understand the issue and also come up with suggestions that could be included in the next, final annual plan. For Sudan the following key topics for discussion were included:

- Address key challenges along the GA value chain. This includes improving production & post-harvest activities (finance, cleaning, drying, packaging, storing etc), transporting, negotiating/business development;
- Improve access to the Gum Arabic market: smart partnerships with the private sector (fair prices and contract farming);
- Improve MEAL & evidence: here issues that came up during the sensemaking event are noted. More detailed discussions on MEAL and evidence were discussed during the subsequent planning meeting led by FAO on the next day.

Furthermore, in between the group discussions a range of other challenges have been identified to some of which suggestions to address these challenges have been developed. This was discussed and noted down during the FAO review and planning day, subsequent to the sensemaking event and is shared in a separate brief report by FAO.

6.1 Address key challenges along the Gum Arabic (GA) value chain

During discussions in the sensemaking event it became clear that there was need to review key challenges along the GA value chain and think about how these challenges could be addressed so as to strengthen the GA value chain, and contribute to improved income, livelihoods and food and nutrition security. This includes

⁶ ⁶ To read the 2022 sensemaking event workshop report for Sudan: [FNS-REPRO Sensemaking workshop report Sudan \(wur.nl\)](#)

a.o. improving production & post-harvest activities (finance, cleaning, drying, packaging, storing etc), transporting, negotiating/business development. Key issues along the GA value chain and suggested ways to improve these are provided below.

1. Seeds for pasture; GA seedlings, resource base, drivers:

a. *Protection of hashab itself:*

- i. Role of FNC & native administration: enforcement of laws & legislation to protect the trees. Regulations are there but there is relaxation in enforcement. Needs strong political will.
- ii. Creating awareness from community on protection of hashab trees.
- iii. Social fencing, protection by community.

b. *Deforestation* - there is overcutting of trees for various reasons:

- expansion of agricultural land and at the expense of forest land;
- expansion of urban cities at expense of forest (1 forest completely disappeared);
- nomadic behaviour - IDPs are in camps without support and they go to the forest.
- i. Proposed suggestions include:
 - Enforcement: There is a law regarding expansion of land but communities don't follow rules & regulations. Needs to be enforced by Min of Agriculture.
 - Awareness raising.
 - Fencing & rehabilitation of rangeland (pasture seeds needed) then less need to go to hashab trees. Project needs to have a fenced area to produce pasture seeds.
 - Pasture seed and GA seedlings:
 - a. Have pasture seed distribution for open & closed rangeland. Make use of research units to provide these seeds. GA seedlings: locally adapted, high quality - delivery at suitable time.
 - b. Establish community nurseries.
 - c. Training on caring for seedlings at field level.
 - d. Source of seed should be well known - seed propagation unit. High adaptability.
 - e. Community nursery needs capacity building (including also water harvesting etc).
 - Provision of water.

2. GA production (tree ready for tapping): protection of trees, capacities, locust, tapping, access to water, agro-silvo-pastoral/agro-forestry system etc.

- a. *Tools for tapping*: right tapping time, tool, intensity and age. These influence high yield and preserve the tree from being stressed. This needs training. FFS June - December will handle production of agro-forestry. Extend the technologies of production.
- b. Early tapping requires *pre-financing*:
 - i. Pre-finance is fundamental to ensure that tapping happens timely and at scale – need to engage micro-finance institutions. State Ministry of Agriculture can provide collateral in collaboration with e.g. FAO. Maybe engage the multi-finance institution that focuses only on chemicals? Smart partnership.
 - ii. All producers are competing for credit with the Animal Resources Bank. Why don't we have a GA bank to avoid competition with animal producers? Government should have a role in this.
- c. *Provide a model bag for GA collection* (within smart partnership), including: plastic container for water; plastic sheet to collect GA and prevent GA from falling on the ground; tapping tool; protective clothing (thorns, harsh conditions), shoes, cap etc; torch; primary health care; solar radio to get messages.

3. Pre-harvest activities. After tapping there is collection of the gum, so it does not fall on the ground. Gum is to be collected after maturity otherwise there is clothing or green gum (comes after 1 month). Have the first picking after 45 days.

4. Post-harvest value creation (e.g. cleaning, drying, packaging, aggregation, storage, transportation, building warehouses, other value addition). Comments and suggestions included:

- a. *Improve value addition* (to increase quality and price): drying, cleaning, sorting, packaging (in bags), processing (as powder - but complicated).
- b. *Awareness raising*: Transportation from field to market and from rural to urban area is a problem. Raising awareness is needed:

-
- i. Avoiding to collect GA in plastic sacs. Distribute jute sacks instead of plastic sacks.
 - ii. Developing a manual on GAPs in post-harvesting: how to dry, clean, sort, store and package GA and send from rural to urban market and use group transportation.
 - c. Improve storage:
 - i. Ensure warehouses at village level to collect GA, next to warehouses at state level so as to fetch higher prices. Can engage the private sector. At Darfur states there are no markets for GA.
 - ii. Instead of conventional storage - GAPAs to collect GA from producers and keep GA in store until the price is improved. Smart partnership can provide seed money to build a portfolio for producers to have a smart partnership with the private sector. Store is linked to smart partnership. Producers need money in November - December when the banks don't provide loans. Producers collectively contribute and the rest can be provided by a private sector partner.
 - d. *Empower GAPA's*: Empower GAPA's to play a role in group marketing, collection etc. And to avoid dealing with many middlemen. And to deal with many challenges (e.g. protection against locust, marketing etc).
5. Marketing relations & sales (including access to market, business development, etc) and uptake/use of GA (middlemen, auctions, etc):
- a. *Capacity building of GA producers*:
 - i. Organise exchange visits from producer to market (e.g. auction so they also know the market). If you want to auction your gum you need a minimum of 100 Sudanese Pound (SDG) -> network approach needed.
 - ii. Improve the spirit of business in producers.
 - iii. Bring the standards and qualification of the urban market to the rural areas, to GA producers.
 - b. *Organise GA producers in GAPA's* so they can enter the auction market.
 - c. *Strengthen market information system* - provide messages on the prices in the main auction market - need real time information on the market prices.
 - d. *Ensure smart partnerships*: engage agencies to assemble the gum so as to access the largest GA market. Smart partnerships depend on having adequate quantity of GA.
 - e. *Engage the government – auction market*: there are 3 levels of GA marketing, rural, urban and auction market, but there is no auction market in the project area. Encourage the government to have an auction market.
 - f. *Engage the private sector*:
 - i. How to attract 'big names'?
 - ii. CSR in GA: important for the product that is being exported. Engage big groups (e.g. Nexira and Alain & Robbert) that export GA in this. Infrastructure like storage, feeder roads, water points - they can contribute.
6. Enabling environment (e.g. policies, strategies & enforcement; formal & informal business environment) - lack of government support, lack of access to finance: these issues have been integrated in previous sections.

6.2 Improve access to the GA market: smart partnerships with the private sector

A critical aspect for the success of FNS-REPRO is to guarantee a stable and reliable market for small-scale producers engaged in the Gum Arabic value chain. This is key to the programme's sustainability as well: if beneficiaries realize there is clear benefit and a viable business, they will more likely continue the work. In addition, private sector collaboration and investment are likely an important element of new Dutch foreign policy, and private sector development has always been a focus for the Dutch embassy. FNS-REPRO should therefore strengthen partnerships with the private sector (to close the supply/demand gap), as part of the final annual plan.

During the adaptive programming workshops, a beginning was made with the development of a strategy to strengthen the collaboration with the private sector – centered around “*Smart Partnerships*” between GAPAs and Gum Arabic companies, drawing from successful smart partnership arrangements in other areas of Sudan where Gum Arabic production is well established. The following issues were identified as being essential to making smart partnerships work, with at least two of such partnerships to be signed in each state, as well as the action that FNS-REPRO can take. Key suggestions for these smart partnerships are presented in Table 14 below.

Table 14 Key suggestions for smart partnerships.

How do we make smart partnerships work?	
Requirements from GAPAs	Needs from the private sector
<ul style="list-style-type: none"> • Need to be well-organized (with bank accounts, records, active membership, etc.) and serious about potential partnership • Need to have sufficient area under Hashab • Need to strictly follow the protocol agreed with the company • Be willing to sign a guarantee check against pre-finance and pay back pre-finance in agreed instalments • Commitment to sell Gum Arabic produced to the partner, with no side selling! • Any agreement with the private sector to be signed by the head of community (Umda) (who can represent a group of GAPAs), or directly by GAPA in presence of Umda (local tribe leaders in the villages) 	<ul style="list-style-type: none"> • Needs baseline information from potential GAPAs, i.e. production potential, seriousness of GAPA, land under production, records and financial capacity • Signing of agreement with GAPAs, which includes: <ul style="list-style-type: none"> ◦ Pre-finance (10-20%) of expected harvest ◦ Clear protocol, that includes the supply of materials and agreement on harvesting, collection, storage, etc. (to ensure quality) ◦ Agreed price, with 10% on top of market rate ◦ Provision of some Corporate Social Responsibility initiatives as part of agreement with GAPA
Suggested actions by FNS-REPRO	
At the GAPA level	At the private sector partner level
<ul style="list-style-type: none"> • Provide extension support to ensure Gum Arabic produced is of good quality • Raise awareness on the benefit of smart partnerships • Bring community, local leaders and GAPAs together • Organize exchange visits to successful smart partnerships in Kordofan, jointly with the private sector. 	<ul style="list-style-type: none"> • Develop a baseline with all relevant info at the GAPA level (expected production, quality, seriousness, area under production, etc.) • Facilitate linkage with GAPAs that have potential • Provide “comfort” and take away risks where possible, including: <ul style="list-style-type: none"> • Mediate in case of issues • Ensure GAPAs don’t misuse pre-finance • As much as possible, ensure GAPAs don’t sell to middlemen or other actors

Ultimately, to be successful FNS-REPRO will need to show that smart partnerships can work in Darfur. Once a few good practices have been established, with clear benefits for both producers and companies, it is likely that other partnerships will follow. This will then also take away some of the barriers that exist in Darfur compared to Kordofan, where smart partnerships are common practice, as in Darfur:

- Gum Arabic production is lower;
- Insecurity leads to lower accessibility;
- There is a knowledge gap at beneficiary and GAPA level;
- There is no auction market, or Gum Arabic board;
- The distance to the main markets is larger;
- There is a lack of awareness around the importance and value of Hashab trees and Gum Arabic.

Nonetheless, the sensemaking event has facilitated a discussion by FNS-REPRO actors in Sudan and a private sector actor that showed willingness and interest to explore smart partnership arrangements with good performing GAPA’s that FNS-REPRO works with in North and East Darfur. This would hopefully be a first step towards linking the Darfur states to the markets, improving overall Gum Arabic value chain performance in Darfur.

References

- Adam, Y. O., 2016. *Gum Talha (Acacia Seyal) Value Chain Analysis in East Darfur, Sudan*: FAO.
- Agence Française de Développement (AFD), 2021. The EU and AFD are supporting Sudan to foster and improve the Gum Arabic industry.
- Devaux, A., Torero, M., Donovan, J. and Horton, D. (2018), "Agricultural innovation and inclusive value-chain development: a review", *Journal of Agribusiness in Developing and Emerging Economies*, Vol. 8 No. 1, pp. 99-123. <https://doi.org/10.1108/JADEE-06-2017-0065>
- FAO, 2020a. Resilience Index Measurement and Analysis (RIMA) baseline report for Sudan. Rome.
- FAO. 2021a. Food and Nutrition Security Resilience Programme: Multidimensional context analysis in the North and East Darfur States, the Sudan. Rome. <https://doi.org/10.4060/cb7032en>
- FAO, 2021b. FNS-REPRO Annual Plan (October 2021 – September 2022). Nairobi.
- FAO, 2021c. Food and Nutrition Security Resilience Programme Newsletter. 1st Quarter, 2021 – Issue 1. Rome.
- FNS-REPRO annual progress report. 2021. January – December 2021. Building food system resilience in protracted crises.
- Hassan, A., Muneer, E., Mohamed E., Abdelateif, I., Osman, A., Zeinab, H., Awad Elkarim, Khalifa., Tarig, M., Mohamed, E., Hatim, E., Mohamed, T., and Gerald, K. 2017. Management of Gum Arabic Production Potentialities in the Gum Belt in Kordofan, Sudan. *International Journal of Environmental Planning and Management*.
- Hassan, Y. 2017. Gum Arabic in Sudan: An Analysis of the Value Chain.
- Kusters, C.S.L., E. Boerema, T.E. Mahmoud, M.H. Mohammed, I.A.E. Abdalla, A.O. Kardash, F.I.O. Mohamed, N. Kivuva, N., K.L. Joosten, 2022. FNS-REPRO Sensemaking workshop report Sudan; Report of a sensemaking workshop held on 27-28 July 2022 with FNS REPRO and key partners and stakeholders. Wageningen Centre for Development Innovation, Wageningen University & Research. Report WCDI-22-229. Wageningen.
- Mahmoud, T.E., Maruod, M., Khiery, M., El Naim, A. & Zaid, M. 2014. Competitiveness of Gum Arabic marketing system at El Obeid crop market, North Kordofan State, Sudan. *World Journal of Agricultural Research* 2(5):252–256.
- Mahmoud, M., 2016. Potentials of Non-wood forest products (NWFP) for value chain development, value addition and development of NWFP-based rural microenterprises in Sudan. FAO. Khartoum.
- Mariod, A., 2018. Gum Arabic: structure, properties, application and economics. Academic Press.
- Mohamed, F., 2021. Post Distribution Monitoring (PDM), conflict drivers on peace and conflict dynamics in the Programme's interventions for North and East Darfur. FNS-REPRO. Sudan.
- OECD, 2021. The Observatory of Economic Complexity. Gum Arabic in Sudan. Available online: <https://oec.world/en/profile/bilateral-product/gum-arabic/reporter/sdn?redirect=true>

Porter, M. E. (2001). The value chain and competitive advantage. Understanding Business Processes. Routledge.

UN Geospatial. 2021. [Online] Available at: <https://www.un.org/geospatial/content/sudan>

UNCTAD, 2018. *Gum Arabic: growing demand means new opportunities for African producers*. [Online] Available at: <https://unctad.org/news/gum-arabic-growing-demand-means-new-opportunities-african-producers> [Accessed 15 April 2022].

UNCTAD, 2018a. Commodities at a glance: Special issue on Gum Arabic.

UNICEF, 2022. State profile - East Darfur. Available at: <https://www.unicef.org/sudan/documents/state-profile-east-darfur>

Vermeulen, S., Woodhill, J., Proctor, F.J. and Delnoye, R, 2008. Chain-wide learning for inclusive agri-food market development: a guide to multi-stakeholder processes for linking small-scale producers with modern markets. International Institute for Environment and Development, London, UK, and Wageningen University and Research Centre, Wageningen, the Netherlands.

World Bank, 2019. South Sudan: Linking the Agriculture and Food Sector to the Job Creation Agenda. Agriculture Global Practice East and Southern Africa Unit.

Appendix 1 Key activities under Output 2 – Gum Arabic production

Output 2. Improved livelihood and income opportunities along the Gum Arabic Value Chain

1. Capacity building for producers along the Gum Arabic Value Chain

- 1.1 Undertake two training for 20 extension officers and lead farmers on sustainable mechanization through ToT.
- 1.2 Develop capacity of local institutions (Forest National Corporation, Rangeland Administration, Agriculture Research, and Ministry of Agriculture) to scale up the agro-silvo-pastoral system and develop strategies for institutionalizing its research for development.
- 1.3 Produce a training manual on leadership and entrepreneurship for Gum Arabic Value Chain actors and others.
- 1.4 Develop capacities of 60 value chain actors (GAPAs, traders and lead farmers) as well as youth and women on leadership and entrepreneurship through a ToT.
- 1.5 Develop capacities of 200 Gum Arabic Value Chain actors through a training on good post-harvest and micro-processing practices.

2. Improve capacity and support GAPAs

- 1.6 Enhancing and activate the existing 20 Gum Arabic Producers Associations (GAPAs).
- 1.7 Prepare a strategy for smart partnership between private sector and GAPAs.
- 1.8 Develop 2 smart partnerships between GAPAs & private sector companies encompassing production, processing, and value addition.
- 1.9 Establishment of 2 Gum Arabic collection centers and 2 micro-processing units at rural/urban village market level.
- 1.10 Establish a rural micro-finance funds with specific criteria/training programs to access these funds for Gum Arabic farmers.
- 1.11 Facilitate 2 multi-stakeholders round table discussion/meetings includes GAPAs, FNC, private sector gum buyers, micro-finance banks, research institution and others stakeholders to increase quality standards of Gum Arabic, improve farm gate prices and grantee sustainable access to rural finance and good quality inputs.
- 1.12 Develop capacity building programs for administrative personnel to endorse quality control process for Gum Arabic and routine monitoring for conventional balance.

3. Increase access to locally adapted seed and seedlings

- 1.13 Distribution of 420,000 Acacia Senegal seedlings to 10,000 farmers.
- 1.14 Distribution of improved cash crops seeds to 10,000 farmers.
- 1.15 Distribution of agricultural tools to 10,000 farmers.
- 1.16 Develop capacities of Gum Arabic Value Chain actors on good post-harvesting and micro-processing practices.
- 1.17 Undertake post distribution monitoring (PDM).
- 1.18 Undertake training on agroforestry for new project beneficiaries.
- 1.19 Establish/ rehabilitate community nurseries at community/ locality level (linked to output 1).

4. Support establishment of Farmer Field Schools and Demonstration Farms

- 1.20 Select farmers field school members and 11 school sites with specific criteria of selection.
- 1.21 Undertake ToT training on Farmer Field School concept and curriculum development.
- 1.22 Establish one demonstration farm per village.
- 1.23 Support weekly meeting of Farmer Field Schools (zagzag training, Eco System Analysis (ESA), special topics) supported by subject matters specialists.
- 1.24 Undertake two field days for established Farmer Field Schools, one each in North and East Darfur State.
- 1.25 Undertake two exchange visits to other states to understand and learn from the success of established FFS by others FAO/ SPCRP Programme.
- 1.26 Undertake training in IPPM for 25 FFS coordinators/facilitators.
- 1.27 Undertake ToT training on communication and facilitation skills and Participatory Rapid Appraisal (PRA) for FFS Coordinators and Facilitators.

Source: FNS-REPRO annual progress report (2021).

Appendix 2 Post Distribution Monitoring (PDM)

The following table surmises the total amount of inputs planned to be distributed to the beneficiaries segregated by States, Localities and Villages for East and North Darfur.

State	Locality	Village	Item					
			Seeds\MT	Seedlings\NO	Ground nuts\ MT	Sessme\ MT	Donkey Cart	Donkey Plough
ND	Rural Elfasher	Lawabid	0.2	16,800	4	0.4	24	36
	Um Kaddada	Brouch	0.2	16,800	4	0.4	24	36
	Kalimando	Sani Karo	0.3	25,200	6	0.6	36	54
		Gusa Jamat	0.3	25,200	6	0.6	36	54
	Twisha	Gabir	0.4	33,600	8	0.8	48	72
		Eyal Amin	0.3	25,200	6	0.6	36	54
	Ellaiat	Abusufyan	0.3	25200	6	0.6	36	54
Sub Total ND			2	168,000	40	4	240	360
	AD Daein	Jalabi	0.3	25200	6	0.6	36	54
	Abukarinka	Bakhiet	0.2	16800	4	0.4	24	36
	Adeela	Adeela	0.3	25200	6	0.6	36	54
		Sharif	0.2	16800	4	0.4	24	36
Sub Total ED			1	84000	20	2	120	180
Total Grand			3	252,000	60	6	360	540

Source: FNS-REPRO Sudan, PDM assessment (Mohamed, 2021).

The following table surmises the actual number of inputs distributed to the beneficiaries segregated by States, Localities and Villages for East Darfur.

State	Locality	Village	Item					
			Seeds\MT	Seedlings\NO	Ground nuts\ MT	Sessme\ MT	Donkey Cart	Donkey Plough
ND	Rural Elfasher	Lawabid	0.2	12,000	4	0.4	24	36
	Um Kaddada	Brouch	0.2	11,800	4	0.4	24	36
	Kalimando	Sani Karo	0.3	15,000	6	0.6	0	54
		Gusa Jamat	0.3	11,000	6	0.6	0	54
	Twisha	Gabir	0.4	20,000	8	0.8	0	72
		Eyal Amin	0.3	9,000	6	0.6	0	54
	Ellaiat	Abusufyan	0.3	16,000	6	0.6	0	54
Sub Total ND			2	94,800	40	4	48	360
	AD Daein	Jalabi	0.3	14,400	6	0.6	0	54
	Abukarinka	Bakhiet	0.2	10,000	4	0.4	0	36
	Adeela	Adeela	0.3	12,000	6	0.6	0	54
		Sharif	0.2	15,000	4	0.4	0	36
Sub Total ED			1	51,400	20	2	0	180
Total Grand			3	146,200	60	6	48	540

Source: FNS-REPRO Sudan, PDM assessment (Mohamed, 2021).

Appendix 3 MEAL monitoring data

What is the total area of your Hashab trees holding?

TYPE: "DECIMAL". 28 out of 28 respondents answered this question. (0 were without data.)

Mean	Median	Mode	Standard deviation
545.18	35.00	10.00	1899.29

Do you tap your Gum Arabic (Hashab) trees?

TYPE: "SELECT_ONE". 28 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (0 WERE WITHOUT DATA.)

Value	Frequency	Percentage
Yes	23	82.14
No	5	17.86

If you don't tap your Gum Arabic trees what is the reason?

TYPE: "TEXT". 6 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (22 WERE WITHOUT DATA.)

Value	Frequency	Percentage
Not yet due	3	10.71
The grazing hazards need protection prices are not encourage tapping	1	3.57
The area are planted with cash crops, locust hazards	1	3.57
In the first period due to the desert locust The second period not yet due	1	3.57

What is Aver. Yield kg \ tree?

TYPE: "DECIMAL". 28 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (0 WERE WITHOUT DATA.)

Mean	Median	Mode	Standard deviation
5.41	4.00	3.00	5.47

What is Aver. No. of trees\ feddan?

TYPE: "INTEGER". 28 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (0 WERE WITHOUT DATA.)

Mean	Median	Mode	Standard deviation
41.36	35.00	*	23.51

What is Aver yield kg\ ha?

TYPE: "DECIMAL". 27 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (1 WERE WITHOUT DATA.)

Mean	Median	Mode	Standard deviation
213.44	126.00	120.00	247.79

Where do you sell your Gum Arabic production ?

TYPE: "TEXT". 28 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (0 WERE WITHOUT DATA.)

Value	Frequency	Percentage
local market	26	92.86
Town market	2	7.14

What is Gum Arabic price received by producers in SDG\kantar?

TYPE: "DECIMAL". 28 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (0 WERE WITHOUT DATA.)

Mean	Median	Mode	Standard deviation
13607.14	10500.00	10000.00	8029.29

What is the revenue received by small producer for his actual yield?

TYPE: "DECIMAL". 28 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (0 WERE WITHOUT DATA.)

Mean	Median	Mode	Standard deviation
415035.71	120000.00	0.00	706950.01

What is the average food in SDG season?

TYPE: "DECIMAL". 28 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (0 WERE WITHOUT DATA.)

Mean	Median	Mode	Standard deviation
97775.00	23500.00	0.00	165164.57

What is the average cost water in SDG season?

TYPE: "DECIMAL". 28 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (0 WERE WITHOUT DATA.)

Mean	Median	Mode	Standard deviation
32817.86	3000.00	0.00	60924.00

What is the Average cost of plastic sacks in SDG?

TYPE: "DECIMAL". 28 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (0 WERE WITHOUT DATA.)

Mean	Median	Mode	Standard deviation
15310.71	6000.00	10000.00	24542.92

What is the Average costs in SDG in season 001?

TYPE: "DECIMAL". 28 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (0 WERE WITHOUT DATA.)

Mean	Median	Mode	Standard deviation
24692.86	3000.00	0.00	67003.74

What is the Share of rental value of one hectare in SDG?

TYPE: "DECIMAL". 28 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (0 WERE WITHOUT DATA.)

Mean	Median	Mode	Standard deviation
1396.25	0.00	0.00	4075.30

What is the Cost of drying in SDG kantar?

TYPE: "DECIMAL". 28 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (0 WERE WITHOUT DATA.)

Mean	Median	Mode	Standard deviation
321.43	0.00	0.00	1090.48

What is the Cost of storage in SDG/season?

TYPE: "DECIMAL". 28 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (0 WERE WITHOUT DATA.)

Mean	Median	Mode	Standard deviation
4571.43	0.00	0.00	10860.83

What are the Losses to physical impurities?

TYPE: "DECIMAL". 26 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (2 WERE WITHOUT DATA.)

Mean	Median	Mode	Standard deviation
1.04	0.00	0.00	1.84

What are the Losses to moisture content?

TYPE: "DECIMAL". 27 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (1 WERE WITHOUT DATA.)

Mean	Median	Mode	Standard deviation
14.59	20.00	20.00	8.28

What is the Total costs encountered by producers at rural market?

TYPE: "DECIMAL". 24 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (4 WERE WITHOUT DATA.)

Mean	Median	Mode	Standard deviation
5083.33	3000.00	0.00	8282.60

What is the Profit received by producers for the actual production (SDG)?

TYPE: "DECIMAL". 24 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (4 WERE WITHOUT DATA.)

Mean	Median	Mode	Standard deviation
116541.67	5000.00	0.00	240795.96

What is the Profit received by a village trader per SDG\ kantar of GA in SDG?

TYPE: "DECIMAL". 23 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (5 WERE WITHOUT DATA.)

Mean	Median	Mode	Standard deviation
4326.43	3000.00	0.00	4775.88

What is the Total cost at the city market?

TYPE: "DECIMAL". 23 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (5 WERE WITHOUT DATA.)

Mean	Median	Mode	Standard deviation
14217.39	13000.00	0.00	12090.40

What is the profit received by an urban trader per kantar of GA in SDG?

TYPE: "DECIMAL". 23 OUT OF 28 RESPONDENTS ANSWERED THIS QUESTION. (5 WERE WITHOUT DATA.)

Mean	Median	Mode	Standard deviation
5456.52	5000.00	0.00	4797.99

Wageningen Centre for Development
Innovation
Wageningen University & Research
P.O. Box 88
6700 AB Wageningen
The Netherlands
T +31 (0)317 48 68 00
wur.eu/cdi

Report WCDI-23-244



Wageningen Centre for Development Innovation supports value creation by strengthening capacities for sustainable development. As the international expertise and capacity building institute of Wageningen University & Research we bring knowledge into action, with the aim to explore the potential of nature to improve the quality of life. With approximately 30 locations, 7,200 members (6,400 fte) of staff and 13,200 students, Wageningen University & Research is a world leader in its domain. An integral way of working, and cooperation between the exact sciences and the technological and social disciplines are key to its approach.

To explore
the potential
of nature to
improve the
quality of life



Wageningen Centre for Development Innovation
Wageningen University & Research
P.O. Box 88
6700 AB Wageningen
The Netherlands
T +31 (0) 317 48 68 00
wur.eu/wdci

Report WCDI-23-244

The mission of Wageningen University & Research is "To explore the potential of nature to improve the quality of life". Under the banner Wageningen University & Research, Wageningen University and the specialised research institutes of the Wageningen Research Foundation have joined forces in contributing to finding solutions to important questions in the domain of healthy food and living environment. With its roughly 30 branches, 7,200 employees (6,400 fte) and 13,200 students and over 150,000 participants to WUR's Life Long Learning, Wageningen University & Research is one of the leading organisations in its domain. The unique Wageningen approach lies in its integrated approach to issues and the collaboration between different disciplines.

