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Trust and Commitment of Members Towards Gum Arabic Producers Associations (GAPAs) in the Central Gum Arabic Belt (Sudan)

ABSTRACT

This study examines the levels of trust and commitment among members of Gum Arabic Producers Associations (GAPAs) in the Central Gum Arabic Belt of Sudan. Primary data were collected through a social survey of 14 GAPAs, with 338 respondents randomly selected. Additional evidence was gathered from group discussions, in-depth interviews, field observations, and key informants' interviews. The findings indicate that trust is a key driver of member participation and long-term engagement in GAPAs, with important implications for their sustainability. However, trust and commitment are undermined by weak governance, poor communication, and limited member involvement, which often lead to exclusion from decision-making and low participation. In such contexts, members tend to rely on informal or kinship-based forms of trust; participation in leadership roles remains limited; and women's involvement is constrained by cultural barriers. Financial sustainability represents an additional major challenge, as most GAPAs rely heavily on external funding and lack well-defined mechanisms and incentives for member-based capital contributions.

KEY-WORDS

TRUST, COMMITMENT, AGRICULTURAL COOPERATIVES, GAPAS

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1. Introduction

Gum Arabic is a high-value non-wood forest product primarily extracted from *Senegalia senegal* (locally known as Hashab trees), which are widely distributed across the "Gum Arabic Belt" in central Sudan. It represents a key cash crop for smallholder farmers, who cultivate it on individual rain-fed farms (World Bank, 2007) and harvest it during the dry season (Hassan, 2008). Its value chain involves multiple actors, including producers (who represent the primary stakeholders), village traders, intermediaries, city merchants, gum processors, and exporters (Mahmoud et al., 2014; Adam, 2016). Transactions occurs through several channels, with producers typically delivering their output to village markets. From there, gum Arabic is either traded in urban markets or sold directly to processing companies. Prior to transportation to auction crop markets, city merchants perform value-adding activities such as cleaning, sorting, and grading to enhance product quality (Mahmoud et al., 2014). As an off-season product, gum Arabic contributes significantly to household income, accounting for approximately 38% of annual livelihoods (Elfadul et al., 2020).

In Sudan, Gum Arabic Producers' Associations (GAPAs) were established to improve production and marketing outcomes and reduce reliance on traditional credit systems (known as *Shail*). GAPAs can be broadly characterized as agricultural cooperatives, as they bring together smallholder farmers to collectively harvest and market gum Arabic, operating according to the core cooperative principle of collective action for shared economic benefit. Despite their potential, GAPAs face significant challenges. In particular, participation remains limited, as many producers continue to rely on village markets and individual sales (Elzubair, Sanjak and Ahmed, 2023). Existing studies have primarily focused on production and marketing performance (Taha, Bekele and Ahlam, 2013; Taha et al., 2015), while paying relatively little attention to key factors underlying GAPA success, namely members' trust and commitment.

Trust, understood as a willingness to cooperate based on positive expectations (Rousseau et al., 1998), is widely recognized as a key driver of collective action and member engagement in cooperatives (Ole Borgen, 2001; Belay, 2020; Awoke, 2021; Hao et al., 2024)[1]. It can also be viewed as an internal motivation that enhances members' participation in collective action and strengthens their commitment (Belay, 2020; Awoke, 2021; Hao et al., 2024). Member commitment reflects the extent to which individuals remain loyal to and actively support the cooperative, even when alternative opportunities arise. It captures members' preference to patronize a cooperative even when its price or service is less favorable than those offered by investor-owned enterprises (Fulton, 1999; Mowday, Porter and Steers, 2013; Awoke, 2021). A growing body of literature highlights a close relationship between trust and cooperative

[1] Trust is widely recognized as a key driver of social and economic performance (e.g., La Porta et al., 1997; Uslaner, 2000; Zak and Knack, 2001; Dincer and Uslaner, 2010), with low trust levels associated with reduced cooperation and economic stagnation (Bijlsma-Frankema, Sitkin and Weibel, 2015).

commitment (e.g., Barraud-Didier, Henninger and El Akremi, 2012; Bauer, Keusch and Kreuter, 2019; Belay, 2020; Awoke, 2021).

This paper addresses the following research questions: To what extent do members trust GAPAs, and how does this trust translate into commitment and participation? What economic, institutional, and social factors explain variations in trust and commitment among members? Under what conditions do GAPAs succeed in fostering sustained collective action and member engagement? The main objective of this study is therefore to examine the level and determinants of trust and commitment among members of GAPAs in the study area. More specifically, the paper aims to assess the extent to which members trust their associations and the degree of their commitment, both in attitudinal and behavioral terms. It further seeks to identify the key economic, governance, and social factors that shape trust and commitment[2], and to explore the mechanisms that foster genuine participation and sustained collective action within GAPAs.

This paper contributes to the literature by offering new empirical evidence on governance, trust, and cooperative performance in a developing-country context. It also offers policy-relevant insights for strengthening GAPAs and enhancing the sustainability of gum Arabic production systems. The analysis is guided by two main hypotheses: first, that members' trust in GAPAs is positively associated with their level of commitment; and second, that both trust and commitment are influenced by a combination of economic, institutional, and social factors.

Our finding shows that trust is a crucial driver of participation and long-term engagement in GAPAs, ultimately shaping their sustainability. However, weak governance, poor communication, and limited member involvement undermine trust and commitment. Many members feel excluded from decision-making processes, resulting in low participation, weak ownership, and reliance on informal or kinship-based trust. While some GAPAs benefit from external support and stronger market linkages, others remain inactive due to poor services and low member confidence. Overall, trust and commitment are influenced by governance quality, financial structures, and external support. These findings suggest that improving transparency, strengthening managerial capacity, and enhancing member participation are essential to increase cooperative performance.

The remainder of the paper is organized as follows. The next section presents the methodology and data. Section 3 reports and discusses our empirical results. Section 4 concludes and outlines policy implications.

[2] The literature shows that trust and member commitment are influenced by a range of factors, including education, investment levels, and participation in collective activities (e.g., Cechin et al., 2013; Verhees, Sergaki and Dijk, 2015; Gyau, Mbugua and Oduol, 2016; Donkor and Hejkrlik, 2021), as well as internal governance arrangements, particularly the extent of member involvement in decision-making (Cechin et al., 2013; Iliopoulos and Valentinov, 2022). Membership heterogeneity and property rights structures also significantly shape the level of member commitment (Cook, 1995; D'Amato et al., 2022).

2. Data and empirical strategy

The study focuses on three localities in Sudan: Sheikan (covering an area of 8,424 km^2 with a population of approximately 540,898) and Um Rawaba (with a population of 634,718 and an area of 11,727 km^2) in North Kordofan State, and Al Khiwai (covering approximately 9,177 km^2 with a population of 256,482) in West Kordofan State[3]. Both states have developed partnership with international institutions aimed at enhancing the production and marketing of gum Arabic (Elzubair, Sanjak and Ahmed, 2023).

The study adopts a mixed-methods approach, combining quantitative and qualitative data. Primary data were collected through structured questionnaires administered to household heads (HHHs) from 14 GAPAs. A total of 338 HHHs were selected using a simple random sampling technique based on a pre-existing membership list. In addition, 42 in-depth interviews were conducted with the GAPAs' boards of directors (BoDs) and executive committees (ECs). Group discussions involving 7-15 participants were held in each GAPA. Participatory observation and key informant interviews (e.g., individuals with specialized knowledge or experience related to gum Arabic, such as village and urban traders, forestry staff, and representative of gum producers' unions) were also conducted to complement and enrich the data.

Twelve GAPAs across the three localities were selected randomly, while two GAPAs from Um Rawaba locality were selected purposively due to their exposure to external support, which is expected to influence levels of members' commitment and trust. The questionnaire and interviews focused on several key dimensions, including members' trust in EC and BoDs, the reasons underlying trust levels, participation in GAPA activities, meeting attendance, involvements in governance, sources of working capital, and capital contributions by members.

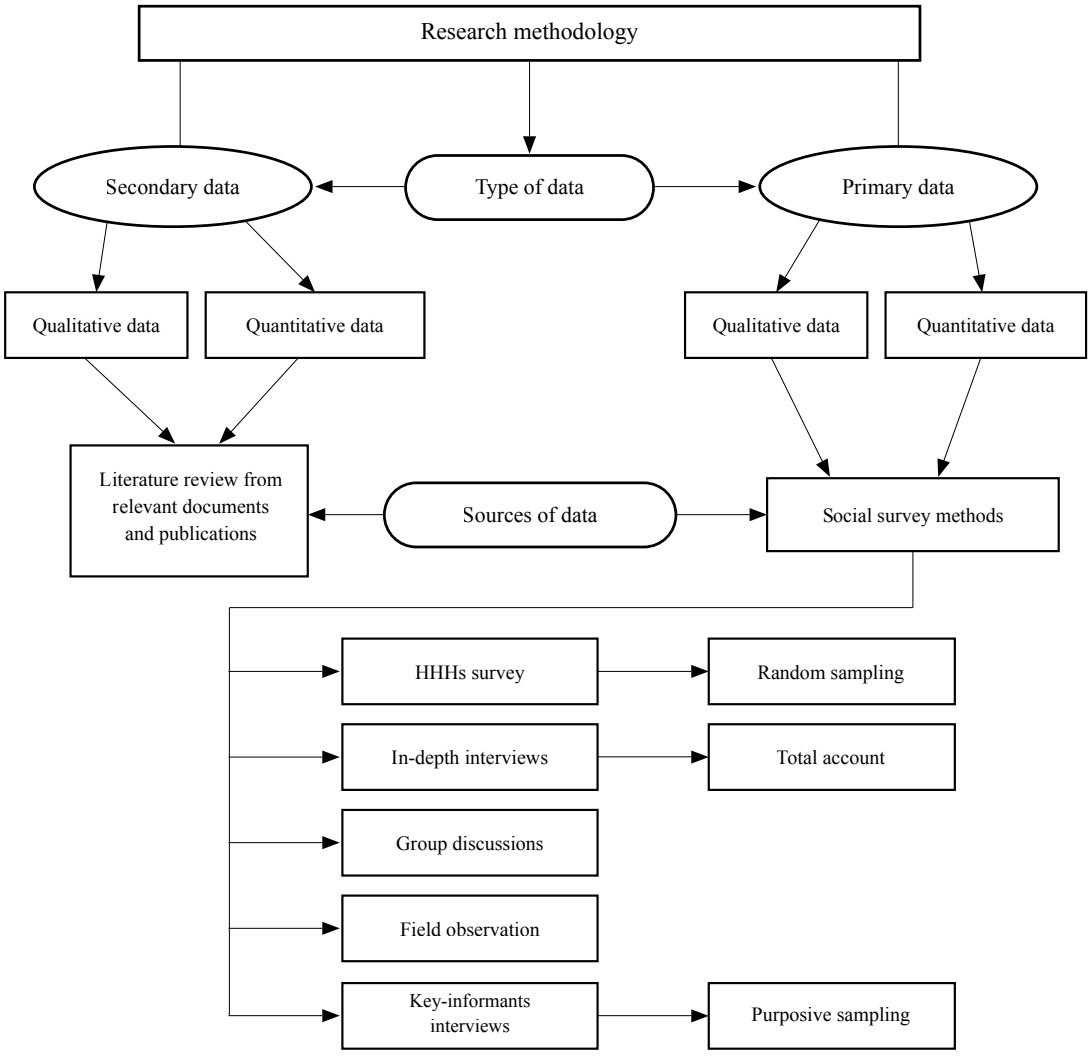
A summary of the methodology is presented in Figure 1.

Data were analyzed using SPSS (Version 24) and R software. Descriptive statistics, including frequencies, means and standard deviation, were employed to summarize the data (see Sections 3.1, 3.2 and 3.3). Regression analysis (in Section 3.4) was used to identify the factors influencing members' trust and commitment.

Members' commitment was measured through four behavioral indicators: (i) participation in meetings; (ii) involvement in GAPAs governance; (iii) reliance on GAPAs for marketing; and (iv) willingness to contribute to GAPA capital. Trust was measured through direct questions assessing members' confidence in ECs and BoDs, followed by questions exploring the reasons underlying these perceptions. Trust was also analyzed as a determinant of behavioral commitment.

[3] These areas in North Kordofan State are well known for the production of high-quality gum Arabic and for their relatively long history of GAPAs establishment compared to other regions (Tieguhong and Ndoye, 2004). GAPAs were formally established in North Kordofan State in 1992, and since 2005 this intervention has been expanded to all gum Arabic-producing states (Elzubair et al., 2024).

Figure 1. A summary of the data collection methods



Source: Authors' own elaboration.

GAPAs were classified into three groups based on their level of external support:

- Group A includes GAPAs without external support;
- Group B includes GAPAs receiving both physical and financial support;
- Group C includes GAPAs receiving only physical support (e.g., machinery, storage, facilities).

The empirical analysis compares these groups to assess how external support influences trust and commitment.

Based on the literature, a set of 28 variables potentially affecting trust and commitment was

identified. These include economic factors (e.g., income from gum Arabic, crop income, livestock income), financial conditions (e.g., access to credit, number of capital sources), governance-related factors (e.g., membership size, training availability), and socio-demographic characteristics (e.g., age, education, gender, family size). Additional variables include distance to markets, experience with GAPAs, and availability of infrastructure.

A multivariate regression model was used to examine the relationships between these 28 independent variables and the dependent variables (trust and commitment). The model is specified as follows:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \varepsilon \quad (1)$$

Where:

- Y_i represents the dependent variable (either trust or commitment);
- X_1 to X_n represent the explanatory variables;
- β_0 is the intercept;
- β_1 to β_n are the parameters to be estimated;
- ε is the error term, assumed to be normally distributed.

3. Results and discussion

3.1 Overview of GAPAs

Table 1 provides an overview of the number of GAPAs, their gender composition, and their type across the three identified groups (A, B and C). Small-size GAPAs (with 51 members as the minimum number required to be registered with the Cooperation Administrative Office, within the Ministry of Trade and Supply) are found in group A. Large-size GAPAs appear in groups B and C. Variation in GAPA membership is attributable to differences in activity levels and in their potential to develop relationships with external financial institutions, which in turn encourage farmers to join GAPAs. GAPAs with larger membership size have also attracted Gum Processing Companies to establish partnerships that facilitate the marketing of gum Arabic at higher producer prices. This result suggests that membership size has a positive impact on the cooperative's profit (Liang et al*.,* 2023). Furthermore, more profitable GAPAs tend to attract additional members seeking to benefit from the services provided. In group A, reliance on GAPAs for gum Arabic marketing is low, as members have not received technical or financial support since joining GAPAs. These results are consistent with Elzubair, Sanjak and Ahmed (2023), who report low dependence on GAPAs without external financial support for marketing activities.

Table 1 also shows that gender composition of GAPAs is predominantly male, with men leading most GAPAs activities. This pattern was confirmed during ECs meetings and group discussions. Although women actively participate in gum Arabic production, their membership in GAPAs remains

limited. In addition, female members often refrain from discussing GAPAs affairs in the presence of men due to social and cultural constraints. This was evident in group discussions and field observations, where none of the female members contributed to the conversation and instead tended to endorse views expressed by men. Key informants (forestry staff and local leaders) noted in interviews that "in conservative rural communities, women are not accustomed to speaking in the presence of men, as it is considered inappropriate or shameful". This finding is in line with Woldu and Tadesse (2015), who document the marginalization of women in agricultural cooperatives in Ethiopia.

Regarding the type of GAPAs, 68.9% of respondents asserted that GAPAs improved gum Arabic production, while 16.5% reported that GAPAs enhanced gum Arabic marketing and contributed to more active village markets. This supports the view that cooperatives facilitate market linkages (Agonmuo and Agbasi, 2023), enhance market power (Neupane, Paudel and He, 2023) and enable farmers to pool resources to increase their bargaining power in the market (Fulton and Hueth, 2009; Neupane, Paudel and He, 2023).

Table 1. Membership size, gender composition and types of selected GAPAs

GAPAs group	No. of GAPAs	Membership size	Members' composition (%)		GAPAs type (%)		
			Male	Female	Marketing	Production	Both
A	8	539	84.8	15.2	13.4	69.3	17.3
B	2	335	81.5	18.5	22.5	64.7	12.7
C	4	371	77.9	22.1	13.6	72.8	13.6
Mean	14	415	81.4	18.6	16.5	68.9	14.6

Source: Authors' own elaboration.

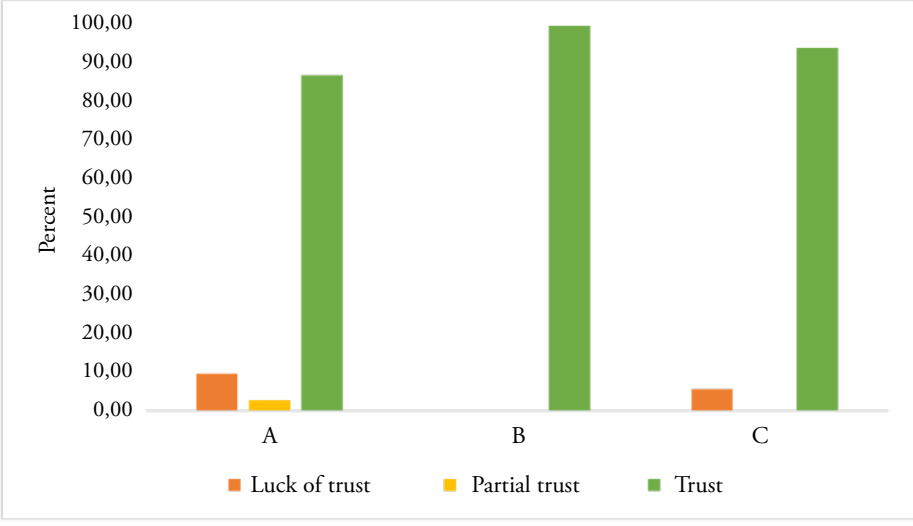
3.2 Members' trust

Figure 2 shows respondents' perceptions of trust in the ECs and BoDs of GAPAs. Most respondents (93.9%) reported confidence in the ECs' ability to manage GAPAs, indicating high levels of trust. This is consistent with the fact that EC members are typically selected through general consensus. Evidence from group discussions, key informant interviews, and field observations also suggests that trust in BoDs and ECs is partly rooted in kinship ties. By contrast, 9.8% and 5.6% of respondents in groups A and C, respectively, reported a lack of trust in ECs. The provision of services and benefits through collaboration with external partners appears to strengthen trust in GAPA managerial bodies, especially in group C. This finding aligns with Österberg and Nilsson (2009), who argue that trust increases when cooperatives meet members' needs.

Regarding the reasons undermining trust in ECs and BoDs, 70.1% of respondents pointed to the limited engagement of managerial committees, describing them as inactive and unable to fulfill

leadership responsibilities. This supports Messabia, Beauvoir and Kooli (2023) who emphasize the critical role of BoDs in enabling cooperative success. In addition, 13.4% of respondents attributed low trust to overall passivity of GAPAs. Conversely, 8.3% and 6.8% of respondents in groups A and C, respectively, attributed low trust to members' failure to fulfill their responsibilities. Evidence from group discussions and interviews suggests that some member join GAPAs primarily to access external support, while neglecting their responsibilities and obligations. Finally, 13.6% and 4.2% of the respondents in groups C and A, respectively, associated low trust with corruption within GAPAs. This is consistent with by Messabia, Beauvoir and Kooli (2023), who highlight the key role of effective governance for cooperative sustainability.

Figure 2. Level of members' trust in ECs and BoDs



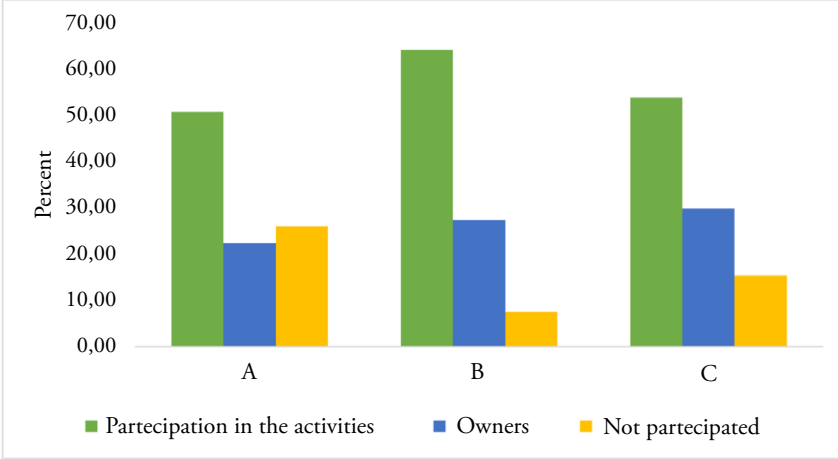
Source: Authors' own elaboration.

3.3 Members' commitment

3.3.1 Participation in GAPA activities

Figure 3 shows respondents' perception of participation in GAPAs activities. Most respondents across all GAPAs groups report willingness to participate, particularly in general assembly meetings for electing BoDs and regular meetings. However, participation is more limited in activities requiring collective action, financial contributions, management tasks, and the development of marketing strategies. These findings are consistent with Rajaratnam et al. (2010), who identify participation in annual general assembly meetings and the use of cooperative services as key dimensions of member engagement in cooperatives in Malaysia.

Figure 3. Participation of members in GAPAs activities



Source: Authors' own elaboration.

Members across all three groups reported exercising ownership through capital contributions and/or participation in decision-making. This suggests relatively strong commitment among active members as owners, potentially contributing to the economic and social stability of GAPAs. This finding, which highlights the role of ownership in strengthening member commitment, is consistent with Hao et al. (2019), Awoke (2021), and Lode, Coosemans and Camargo (2022). Nevertheless, 26.2% and 15.4% of respondents in groups A and C, respectively, reported low participation in GAPAs activities. This may reflect limited understanding of cooperative principles and values among both members and managers. Overall, many members remain passive, which may weaken behavioral commitment. This supports the view that participation depends on members' willingness to engage in cooperative activities (Swoboda et al., 2009; Sungkawati, 2018).

3.3.2 Participation in GAPA governance

Table 2 shows member participation in governance of GAPAs through roles in BoDs and ECs. About 6.4% and 1.3% of respondents in groups A and B, respectively, reported no involvement in decision-making process since the establishment of GAPAs (between 1995 and 2013). Low participation in decision-making is attributed to GAPAs' limited ability to meet members' needs or weak perceptions of ownership among GAPA members. This is consistent with Wassie, Kusakari and Sumimoto (2020), who highlight the role of positive perceptions in motivating participation.

None of the respondents of group C reported serving on management committees. Although members in this group contributed financially to support GAPAs, they showed limited involvement in their governance. Evidence from group discussions, observations and key informant interviews suggests that ECs have often dominated by influential and relatively wealthy individuals in the

village, including village traders and local leaders, since their establishment. Members in groups A and B reported participation in roles such as chairperson, secretary, and treasurer. The position of deputy chairperson was reported only in group B, and no respondents mentioned the presence of an auditor.

Table 2. Member participation in GAPA governance

GAPAs group	Member in EC groups (%)	Role in the EC (%)			
		Chairman	Secretary	Treasurer	Deputy chairman
A	6.4	27.3	45.5	27.3	0.0
B	1.3	0.0	0.0	0.0	100.0
C	0.0	-	-	-	-
Mean	2.6	13.6	22.7	13.6	50.0

Source: Authors' own elaboration.

3.3.3 Attendance at GAPAs meetings

Figure 4 shows the level of attendance at GAPAs meetings. Attendance is relatively low (72.3% reporting low attendance), particularly in group A, reflecting limited member motivation. GAPAs that hold regular meetings and provide financial support (e.g., through externally funded credit) tend to experience higher meeting attendance. This is consistent with Donkor and Hejkrlik (2021), who link commitment to the perceived value of their investment.

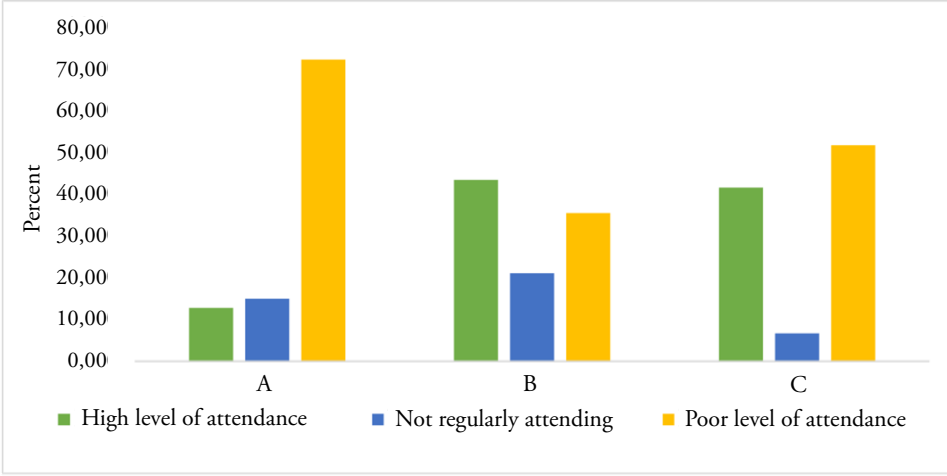
Approximately 43.4% and 41.6% of the respondents of groups B and C, respectively, reported regular attendance (three to four meetings for year), likely driven by incentives (either financial or in-kind) by external actors.

Non-attendance is attributed to several factors: lack of clear agendas and planning (38.8% in group A and 30.2% in group C), competing obligations (41.4 % in group B and 35.8% in group C), and weak communication between members and ECs. Meetings are often infrequent and fragmented with only one or two held per year.

These patterns suggest that both members and ECs may have a limited understanding of the principles of collective action, leading to an expectation of external support rather than internally driven coordination. This interpretation echoes Dhakal and Mueser (2023), who argue that a weak understanding of cooperative principles undermines effective participation.

Finally, about 8.2% of respondents stated that they do not attend meetings because they are not informed of meeting dates, locations and agendas.

Figure 4. Level of attendance at GAPAs meetings



Source: Authors' own elaboration.

3.3.4 Reliance on GAPAs for marketing activities

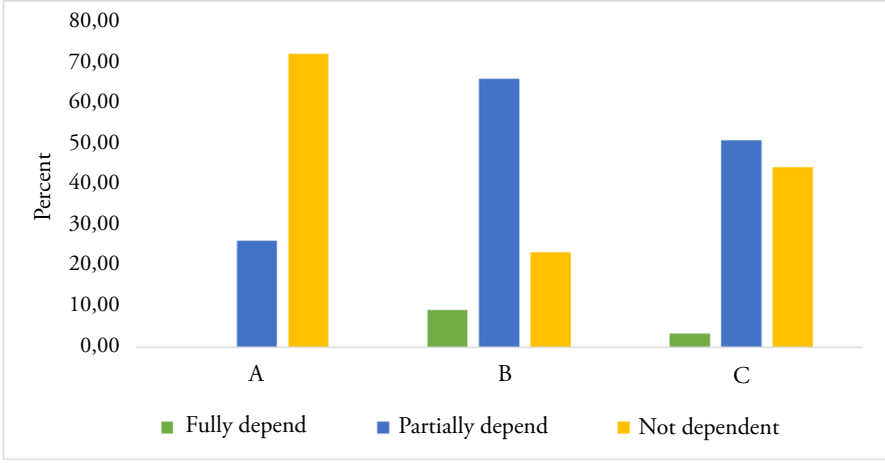
Figure 5 illustrates the degree of dependence on GAPAs for the gum Arabic marketing and input provision in the study area. The majority of respondents (73.4%) in group A reported that they are independent and do not rely on GAPAs for either production inputs or marketing. However, gum producers in groups B and C expressed a higher degree of reliance on GAPAs for marketing purposes. Some respondents (9.2% and 3.4% in groups B and C, respectively) stated that they are fully dependent on GAPAs for selling their gum products.

This dependence on GAPAs is largely attributed to external support provided by the Revitalizing Sudan Gum Arabic Production and Marketing (RSGAPMP) and Gum Processing Companies (GPC). Evidence from key informant interviews supports these findings: city markets and GPCs representatives confirmed that only a limited share of gum products is marketed through GAPAs, while most gum Arabic continues to be sold individually in village markets. This is in line with prior evidence showing that gum producers mainly rely on village markets and the *Shail* system for sales (Elzubair, Adam and Taha, 2014; Elzubair, Sanjak and Ahmed, 2023; Elzubair et al., 2024).

With regard to the target markets of GAPAs, most members who depend on GAPAs for selling their gum Arabic are found in group B (Table 3). Respondents indicated that GAPAs mainly channel gum through city traders and GPCs. However, none of the respondents reported that GAPAs have access to El Obeid Crops Market (the main marketplace for buying and selling crops in the Kordofan Region). Interviews with city traders, forestry personnel, and crop auction staff confirmed that GAPAs currently lack access to the crop auction. These results highlight the weak role of GAPAs in the gum Arabic value chain, wherein their main function appears

to be bypassing village-level traders rather than accessing higher-value market channels. Most respondents in groups A and C remain independent of GAPAs for marketing, consistent with Elzubair, Sanjak and Ahmed (2023).

Figure 5. Degree of dependence on GAPAs for marketing activities



Source: Authors' own elaboration.

Table 3. Target markets of GAPAs

GAPAs group	Targeted markets of GAPAs (%)		
	City traders	GPCs	None
A	5.3	0.0	94.7
B	47.8	18.9	33.3
C	20.4	18.4	61.2
Mean	24.5	12.4	

Source: Authors' own elaboration.

3.3.5 Contribution to financial capital

Table 4 shows the main sources of financial capital and the extent of member contribution in the study area. External sources, i.e., water fees (USD 11.43/month per household), tractor fees (USD 64.5 per year) and funds from RSGAPMP constitute the primary financial support for GAPAs. About 69.5% and 42.7% of respondents in groups A and C, respectively, reported the absence of any financial capital sources in their areas. In group A, respondents further noted that

working capital is very limited and consists mainly of membership registration fees.

This reflects the limited role of member-based contributions, which may be explained by the smallholder nature of gum Arabic production and the limited financial capacity of producers to invest in their GAPAs. This result contrasts with Develtere (2008), who notes that agricultural cooperatives after independence were characterized by stronger capital contributions or membership fees in exchange for cooperative services.

The situation differs in group B, where 87.3% of respondents reported that GAPAs primarily rely on RSGAPMP fund of and water fees. In this group, members contribute partially to capital due to external interventions that provide pre-financing during the gum production season. This finding supports Dhakal and Mueser (2023), who argue that modest improvements in cooperative performance are often driven by external support. This indicates persistent undercapitalization of GAPAs and a heavy reliance on external financing rather than member-based capital contributions (Elzubair, Sanjak and Ahmed, 2023).

Table 4. Source of financial capital in the study area

GAPAs group	Source of the financial capital (%)				
	Membership fees	**Water fees**	**Tractor fees**	**Project funds**	**No capital**
A	27.8	2.7	0.0	0.0	69.5
B	11.4	31.6	0.0	55.7	1.3
C	0.0	1.1	22.5	33.7	42.7
Mean	13.1	11.8	7.5	29.8	37.8

Source: Authors' own elaboration.

3.4 Regression analysis

3.4.1 Factors influencing members' trust

Table 5 presents regression results for factors influencing members' trust in the study area. Thirteen variables show statistically significant relationships with trust at the 1% level. These results are consistent with previous studies (Verhees, Sergaki and Van Dijk 2015; Gyau, Mbugua and Oduol 2016; Donkor and Hejkrlik, 2021). Notably, the price of gum Arabic exhibits a strong positive association with members' trust (coefficient = 22.9), indicating that higher prices of gum Arabic are associated with increased member confidence in GAPAs.

Table 5. Factors influencing members' trust

Variables	Coefficient	Std. error
Pre-financing	-8.2***	2.7
No change of financial status	-5.8***	1.2
GAPAs owned credit	4.2***	1.6
Livestock income	1.3***	0.4
No. of financial capital sources	1.9**	0.7
Gum Arabic price	22.9***	7.4
Membership size	8.3***	2.1
Increase in membership size	-8.4***	2.4
No change in membership size	-5.4***	1.9
Membership trend in the future	-9.3***	1.9
Encouragement of newcomers	4.6***	1.0
Male gender	3.6***	0.8
Gum garden area	-0.8***	0.3
Years of experience with GAPAs	-0.6*	0.3
Distance to nearby market	-0.4***	0.1

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively; specifically, $p < 0.10$, $p < 0.05$, and $p < 0.01$.

Source: Authors' own elaboration.

3.4.2 Factors influencing members' commitment

Tables 6A, 6B and 6C present the multivariate regression results for factors influencing active member commitment in the study area, captured by three dimensions: (i) participation in governance, proxied by members' involvement in formal decision-making bodies such as the BoD and EC (Table 6A); (ii) participation in planning activities, reflecting members' engagement in setting objectives and organizational strategies (Table 6B); and (iii) attendance at regular meetings, capturing routine involvement in collective discussions and information exchange (Table 6C).

Table 6A shows that participation in GAPA governance is significantly associated with a wide range of economic, institutional, and socio-demographic variables. Access to financial services plays a crucial role: pre-financing and GAPA-owned credit are positively and strongly associated with governance participation, while deteriorating or unchanged financial conditions are negatively

associated. Interestingly, higher income from gum Arabic is negatively associated with governance participation, whereas income from crops shows a positive effect, suggesting that more diversified or agriculture-oriented households may be more engaged in organizational roles.

Market-related variables also display mixed effects. While a higher gum Arabic price is negatively associated with governance participation, the number of urban markets has a positive and significant effect, indicating that broader market access may encourage member involvement. Institutional factors are particularly relevant: the existence of training programs shows a strong positive association, whereas the number of trainings is negatively associated, possibly reflecting diminishing returns or issues in training quality. Similarly, a larger membership size and the presence of penalties for exit reduce participation, pointing to potential governance inefficiencies or disincentives in larger or more rigid organizations.

Socio-demographic characteristics further shape participation. Education exhibits a strong and increasing positive effect, with coefficients rising significantly from *Khalwa* to university level (from 37.9 to 94.2), indicating that more educated members are substantially more likely to engage in governance. Age, gender (male), family size, and farm characteristics (gum garden area, distance to garden, and proximity to markets) are all positively associated with participation. In contrast, years of experience with GAPAs show a negative association, which may suggest declining engagement over time or dissatisfaction among longer-term members.

Table 6A. Factors influencing the GAPAs' governance through BoD and EC roles

Variables	Coefficient	Std. error
Pre-financing	65.6***	11.4
Gum Arabic income	-68.0***	1.4
No change of financial status	-131.9***	7.1
Financial status being worse	-107.5***	2.6
GAPAs owned credit	109.5***	4.9
Stable financial situation	55.0***	2.7
Unstable financial situation	-35.0***	1.4
Crops income	15.9***	0.9
Livestock income	-6.9***	0.2
Gum Arabic price	-191.5***	15.9
Afforestation	-12.8***	1.0
No change in membership size	-68.6***	2.2
Membership growth	23.8***	1.7
Encouragement of newcomers	-36.9***	0.7

Table 6A. Continued

Variables	Coefficient	Std. error
Penalties for leaving GAPAs	-117.8***	4.4
Membership size	-129.7***	17.1
Existence of training	258.7***	23.3
Number of training	-42.9***	5.3
Age	3.4***	0.5
Khalwa educational level	37.9***	6.1
Primary educational level	43.8***	5.9
Secondary educational level	66.4***	6.1
University educational level	94.2***	6.9
Male gender	12.9***	1.9
Family size	13.7***	0.5
Gum garden area	15.7***	0.7
Years of experience with GAPAs	-2.3***	0.7
Distance to garden	29.1***	0.8
Distance to nearby market	8.7***	2.0
Stocking density	-3.8***	0.3
Number of facilities	-55.5***	7.7
Number of urban markets	71.5***	1.0

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively; specifically, $p < 0.10$, $p < 0.05$, and $p < 0.01$.

Source: Authors' own elaboration.

Table 6B reports the determinants of participation in GAPA planning. The results indicate that higher gum Arabic prices, the encouragement of new members, and the availability of facilities are all positively and significantly associated with planning participation. This suggests that both economic incentives and organizational inclusiveness contribute to members' willingness to engage in forward-looking activities. These results are in line with those by Cechin et al. (2013) and Iliopoulos and Valentinov (2022).

Table 6B. Factors influencing members' participation in GAPA planning

Variables	Coefficient	Std. error
Gum Arabic price	0.7**	0.3
Encouragement of newcomers	1.0**	0.4
Number of facilities	0.6**	0.3

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively; specifically, $p < 0.10$, $p < 0.05$, and $p < 0.01$.

Source: Authors' own elaboration.

Finally, Table 6C shows that attendance at regular meetings is positively associated only with income from agricultural crops. This finding may indicate that households more integrated into agricultural production systems are also more embedded in collective organizational routines, although the limited number of significant variables suggests that meeting attendance may be driven by factors not fully captured in the model.

Table 6C. Factors influencing members' attendance at regular GAPA meetings

Variable	Coefficient	Std. error
Crops income	0.4**	0.2

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively; specifically, $p < 0.10$, $p < 0.05$, and $p < 0.01$.

Source: Authors' own elaboration.

Overall, the results highlight that member commitment in GAPAs is multidimensional and influenced by a combination of economic incentives, governance structures, and individual characteristics. These findings are broadly consistent with Cechin et al. (2013) and Iliopoulos and Valentinov (2022), emphasizing the central role of governance quality and member heterogeneity in shaping cooperative participation.

Tables 7A, 7B, and 7C present the factors influencing the commitment of member-owners in the study area, captured through three behavioral dimensions: (i) dependence on GAPAs for marketing, which reflects members' output-side commitment, i.e., the extent to which they channel their production through the cooperative rather than alternatives; (ii) contribution to shared capital, which captures financial commitment and ownership, as members invest their own resources in the cooperative; and (iii) borrowing from GAPAs for pre-financing, which represents input-side and financial reliance, indicating the extent to which members depend on the cooperative for liquidity and production financing.

Table 7A reports the determinants of members' dependence on GAPAs for marketing activities. Several variables are statistically significant. Stable and unstable financial conditions are both

positively associated with dependence on GAPAs, suggesting that members rely on the association as a marketing channel regardless of whether their financial situation is secure or uncertain. Afforestation and the encouragement of newcomers also exhibit positive and significant effects, indicating that more dynamic and growth-oriented associations tend to foster stronger marketing dependence. In contrast, penalties for leaving GAPAs are negatively associated with member commitment, suggesting that coercive or restrictive mechanisms may undermine voluntary engagement and reduce reliance on the cooperative. This finding points to the importance of incentive-based rather than sanction-based governance mechanisms.

Table 7A. Factor influencing members' dependence on GAPAs for marketing activities

Variables	Dependence on GAPAs for marketing	
	Coefficient	**Std. error**
Stable financial situation	2.6***	0.9
Unstable financial situation	2.9***	1.0
Afforestation	2.9***	0.7
Encouragement of newcomers	3.0**	1.2
Penalties for leaving GAPAs	-2.6***	1.0

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively; specifically, $p < 0.10$, $p < 0.05$, and $p < 0.01$.

Source: Authors' own elaboration.

Table 7B focuses on members' commitment through capital-sharing contributions. Higher gum Arabic income is negatively associated with capital contributions, possibly indicating that more commercially successful producers prefer to operate independently rather than reinvest in collective arrangements. In contrast, income from crops, the number of financial capital sources, and higher gum Arabic prices all positively influence contributions, suggesting that income diversification and favorable market conditions enhance members' capacity and willingness to invest in the cooperative. Institutional and market-related variables also play a role: increases in membership size, the availability of facilities, and access to urban markets are all positively associated with capital sharing. Gender (male) and stocking density show negative effects, pointing to heterogeneity in investment behavior across members and production systems.

Table 7B. Factor influencing members' commitment through capital sharing contributions

Variables	Contribution to sharing capital	
	Coefficient	**Std. error**
Gum Arabic income	-0.3***	0.1
Financial status being worse	-0.8**	0.4
Stable financial situation	1.0**	0.4
Unstable financial situation	0.9***	0.3
Crops income	0.5***	0.1
No. of financial capital sources	0.5***	0.2
Gum Arabic price	0.6***	0.2
Increase in membership size	1.2**	0.5
Male gender	-0.8***	0.3
Stocking density	-0.5***	0.1
Number of facilities	0.8***	0.2
Number of urban markets	0.7***	0.1

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively; specifically, $p < 0.10$, $p < 0.05$, and $p < 0.01$.

Source: Authors' own elaboration.

Table 7C presents the determinants of borrowing from GAPAs for pre-financing and reveals a complex set of relationships. Access to GAPA-owned credit, higher gum Arabic prices, afforestation, encouragement of newcomers, membership size, and the availability of facilities and urban markets all have strong positive effects on borrowing. These results suggest that both institutional capacity and market opportunities enhance the role of GAPAs as financial intermediaries. In contrast, adverse or uncertain financial conditions (no change, worse, or unstable status) are negatively associated with borrowing, as are higher income levels from gum Arabic, crops, and livestock. This may indicate that relatively better-off or more diversified households rely less on cooperative credit. Distance to gardens and markets also reduces borrowing, highlighting the importance of physical accessibility.

Socio-demographic factors further shape borrowing behavior. Age, family size, and farm size (gum garden area) are positively associated with borrowing, while years of experience with GAPAs show a negative effect, possibly reflecting declining trust or increased self-reliance over time. Education displays a strong positive gradient, particularly for lower and intermediate levels (*Khalwa* and primary), suggesting that even basic education enhances engagement with cooperative financial services. Male members are less likely to borrow, indicating potential gender differences in financial strategies within households.

Table 7C. Factor influencing members' borrowing from GAPAs for pre-financing

Variables	Borrow from GAPAs for per-financing		
	Coefficient	Std. error	P-value
Pre-financing	-9.6***	1.1	0.000*
Gum Arabic income	-1.8***	0.5	0.000*
No change of financial status	-32.8***	1.3	0.000*
Financial status being worse	-11.0***	2.1	0.001*
GAPAs owned credit	29.5***	1.6	0.000*
Stable financial situation	-50.8***	1.7	0.000*
Unstable financial situation	-95.8***	1.9	0.000*
Crops income	-0.7***	0.8	0.000*
Livestock income	-5.6***	0.9	0.000*
Gum Arabic price	47.0***	1.4	0.000*
Afforestation	53.0***	2.1	0.000*
Increase in membership size	-1.1***	2.1	0.000*
No change in membership size	17.6***	3.6	0.000*
Membership growth	-7.8***	2.9	0.000*
Encouragement of newcomers	207.2***	2.6	0.000*
Penalties for leaving GAPAs	-22.3***	3.5	0.007*
Membership size	107.1***	0.7	0.000*
Existence of training	-10.7***	4.2	0.000*
Number of training	7.0***	1.3	0.000*
Age	20.4**	0.2	0.011*
Illiterate educational level	54.7***	3.6	0.000*
Khalwa educational level	150.9***	3.7	0.000*
Primary educational level	75.8***	3.6	0.000*
Secondary educational level	60.1***	3.4	0.000*
University educational level	29.7***	4.3	0.000*
Male gender	-6.9***	0.5	0.000*
Family size	10.6***	0.1	0.000*
Gum garden area	7.5***	1.7	0.000*
Years of experience with GAPAs	-34.2***	0.3	0.000*

Table 7C. Continued

Variables	Borrow from GAPAs for per-financing		
	Coefficient	Std. error	P-value
Distance to garden	-10.3***	0.3	0.000*
Distance to nearby market	-4.9***	0.8	0.000*
Stocking density	50.1***	0.8	0.000*
Number of facilities	58.0***	1.0	0.000*
Number of urban markets	7.2***	0.6	0.000*

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively; specifically, $p < 0.10$, $p < 0.05$, and $p < 0.01$.

Source: Authors' own elaboration.

Overall, the results highlight that member commitment is driven by a combination of economic incentives, institutional arrangements, and individual characteristics. Financial inclusion mechanisms, market access, and organizational dynamism (e.g., membership growth and training) play a central role in strengthening commitment, while coercive mechanisms such as exit penalties tend to undermine it. These findings are consistent with Fulton and Giannakas (2001), Hidalgo-Fernández et al. (2020), and Zhang et al. (2022), emphasizing the importance of incentive alignment and governance quality in sustaining cooperative participation.

4. Conclusions and implications

Members' trust plays an important role in enhancing their willingness to participate in cooperative activities, both in the short and long term, and ultimately contributes to the sustainability of GAPAs. However, our findings indicated that many members of GAPAs are reluctant to continue engaging with GAPAs due to weak governance practices and limited communication. In particular, members often feel excluded from decision-making processes and insufficiently informed about cooperative activities. Meetings are frequently irregular, poorly organized, and lack clear agendas, which further undermines participation.

In contexts where GAPAs provide financial support, member participation tends to be higher. Nevertheless, overall satisfaction with the performance of ECs remains low, mainly due to the limited provision of services and benefits. As a result, trust in ECs and BoDs is often based on emotional ties and kinship relationships rather than on institutional performance.

Members join GAPAs primarily to improve their economic returns, particularly through better prices for gum Arabic. However, these objectives are not always achieved. Many producers continue to sell their products outside GAPA channels at lower prices offered in local markets. This behavior

reflects both insufficient communication between members and ECs and a lack of timely and effective coordination mechanisms within GAPAs.

Member commitment is a key indicator of the strength of the relationship between individuals and their cooperative. The results show that, in general, commitment remains weak, as participation is often limited to sporadic meeting attendance. GAPAs in groups B and C, characterized by stronger external linkages with actors such as GPCs and RSGAPMP, demonstrate better performance, enhanced marketing capabilities, and higher levels of trust among members. In contrast, GAPAs in group A remain largely inactive, due to weak external engagement, poor service provision, and limited reliance by members.

A major issue is the lack of member involvement in governance, which reduces the sense of ownership and discourages contributions to capital formation. Although some GAPAs, particularly in group B, show relatively stronger commitment through capital contributions and participation, overall governance engagement remains low. This is often associated with limited understanding of cooperative principles and a passive membership attitude, where individuals expect benefits without active participation.

Financial sustainability remains a critical challenge. Most GAPAs rely heavily on external funding, and insufficient internal capital generation has resulted in undercapitalization. The regression analysis further shows that trust, commitment, and engagement are significantly influenced by several factors, including external support, access to capital, membership size, gum prices, sources of working capital, and governance structures.

Based on these findings, the study recommends strengthening the institutional environment of trust within GAPAs by improving transparency, accountability, and communication. Capacity-building initiatives, including training and technical support for managerial committees, are essential to enhance governance quality. In addition, promoting members' understanding of cooperative principles and fostering a stronger sense of ownership can increase participation and long-term commitment. These measures are crucial to improving the effectiveness and sustainability of GAPAs and, more broadly, the development of the gum Arabic sector.

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