THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING

VOL. 5 NO. 2 - AUGUST 2024

E-ISSN: 2722-0842 | P-ISSN: 2721-8309

Available online at
journal.pusbindiklatren.bappenas.go.id

Research Paper

The Role of Informal Cooperation to Improve the Agricultural Practices: Case of *El-Nafir* in South Kordofan State, Sudan

Asma E.M. Elzubair[1*] and Amal A. Murad[2]

[1,2] *Department of Forest Management, Faculty of Forestry, University of Khartoum, Khartoum 321, Sudan.*

***)Correspondence author:** asmaelyas687@gmail.com*

Abstract

El-Nafir is an informal cooperation form practiced in Sudan to accomplish various daily activities. Despite the important role of *El-Nafir,* especially in offering labours to farmers, no studies have been conducted to highlight its importance. Therefore, this study aimed to investigate the role of *El-Nafir* in improving agricultural practices in Abu Jubahyah Locality, South Kordofan State, Sudan. Heads of household (HHHs) questionnaires and field observations were used for primary data, where 75 HHHs were selected randomly. Descriptive analysis, T-test, and correlation analysis were performed using SPSS. The results showed that *El-Nafir* has contributed to improving agricultural production. The findings indicated that implementation per Feddan (4200 m²) is cost-effective and time-efficient. Implementing agricultural activities per Feddan via *El-Nafir* was low cost (18.01 US$) compared to hired labourers (42.89 US$). The study found that lack of financial support, shortage of skilled labours, lack of collective action awareness, war, and insecurity are the factors that influenced the success of *El-Nafir's* strategy. The study concluded that *El-Nafir's* strategy improved agricultural practices inside and outside the farms, including cultivation, crop harvesting, protection, and cleaning of the harvested crops. The study recommends the adoption of *El-Nafir* to enhance the agricultural production and marketing.

Keywords: Informal cooperation; labours exchange; *El-Nafir*; agricultural practices.

ARTICLE INFO
Received: March 14, 2024
Received in revised form: June 28, 2024
Accepted: August 25, 2024

doi: 10.46456/jisdep.v5i2.557

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING
Published by Centre for Planners' Development, Education, and Training (Pusbindiklatren), Ministry of National Development Planning/National Development Planning Agency (Bappenas), Republic of Indonesia

Address: Jalan Proklamasi 70, Central Jakarta, Indonesia 10320
Phone: +62 21 31928280/31928285
Fax: +62 21 31928281
E-mail: journal.pusbindiklatren@bappenas.go.id

Supported by Indonesian Development Planners Association (PPPI)

Please cite this article in APA Style as:
Elzubair, A.E.M & Murad, A.A. (2024). The Role of Informal Cooperation to Improve the Agricultural Practices: Case of *El-Nafir* in South Kordofan State, Sudan. *The Journal of Indonesia Sustainable Development Planning, 5*(2), (101—116). https://doi.org/10.46456/jisdep.v5i2.557

1. Introduction

Cooperation is a well-known approach that producers use in both developed and developing countries (Gibson, 2020). It takes place in various circumstances, including informal cooperation or formal production co-operatives, transportation, marketing, and selling. Cooperation refers to the pursuit of agreed goals that align with a common understanding of contributions and payoffs (Gulati *et al.,* 2012). Collaboration plays an important role in empowering farmers, particularly in low socioeconomic status areas (Brunori *et al.,* 2011; Serra & Poli, 2015; Dania *et al.,* 2018), and it is considered a requirement in developing, applying, and establishing new innovative ideas and practices (Schiefer *et al.,* 2015). It is also linked to the socioeconomic and ecological sustainability of the agri-food sector (Sutherland *et al.,* 2014). Farmers cooperate not only with one another but also with consumers and institutions (Renting *et al.,* 2012; Anderson *et al.,* 2014; Schermer, 2015; Elzubair *et al.,* 2023), and cooperation between farmers and other stakeholders has been recognized as an important strategy for sustainable agriculture (Velten *et al.,* 2015; Lutz *et al.,* 2017; Velten *et al.,* 2021).

Informal cooperation has always been important, especially for small family farms to run their farms (Möllers *et al.,* 2018; Dessie *et al.,* 2019; Ortiz-Miranda *et al.,* 2022). Informal cooperation is similar to mutual aid between siblings, relatives, and neighbours (Cialdella *et al.,* 2009; Ajates, 2020; Elzubair *et al.,* 2024). In agricultural societies, farmers cooperate to satisfy their social and economic needs (Markelova *et al.,* 2009; Elzubair *et al.,* 2015; Elzubair *et al.,* 2024). The informal farmers' cooperation includes sharing machinery agricultural knowledge and assisting each other during heavy workloads (Cialdella *et al.,* 2009; Vansant *et al.,* 2022). Sharing can also provide other benefits, such as increased access to skilled labours, reduced risk, and the exchange of ideas among peer groups of like-minded individuals (Artz & Naeve, 2016). It also minimizes transaction costs, facilitates cost avoidance, develops a shared vision, initiates learning processes, and enables smallholder farmers to increase their impact on the agri-food sector (Erku¸s-Öztürk & Eraydın, 2010). Previous studies argued the theory of labour exchange and emphasized that there are two arguments. The first argument is that labour exchange would vanish from peasant societies due to market growth, and agriculture would become more commercialized (Erasmus, 1956; Moore, 1975). On the other hand, the second group argued that labour exchange would coexist with formal labour markets and does not exhibit signs of disappearing (Chibnik & de Jong, 1989; Kranton, 1996; Stone, 1996). Therefore, this study assessed labour exchange as an informal cooperation form in Sudan and confirmed and supported one of these arguments.

Agricultural production practices in Sudan are categorized into three main systems: small-scale farming through the traditional rain-fed system, irrigated farming systems, and mechanized rain-fed systems (Osman *et al.,* 2023). Although the two main production systems practiced in South Kordofan state are the semi-mechanized rain-fed system and the traditional rain-fed system, the traditional system is the main and common system practiced in the state (ELTahir *et al.,* 2016). Small-scale family farms characterize the traditional rain-fed systems and mainly rely on manual tools and, in some areas, use animals to cultivate the land (Osman *et al.,* 2023). The productivity in the system is characterized as low, and the main agricultural products in this system are sorghum, sesame, millet, roselle, groundnuts, watermelon, livestock (Bereir *et al.,* 2022) and gum Arabic (Elzubair *et al.,* 2024). There is a shortage of hired labours in this sector, and it is characterized by very high costs (Bereir *et al.,* 2022). Therefore, due to the small land size and low productivity, the production in this sector relied on the family members to provide the labours. To cover the shortage in labours during the peak of the production season, relatives and neighbours rely on pooling their efforts and working together to implement agricultural activities on time, especially to accomplish activities related to land preparation, cultivation, and crop harvesting (Elzubair *et al.,* 2015; Elzubair *et al.,* 2024), and without pooling their efforts, they might miss the production season. Enhancing agricultural production and marketing through labours exchange positively contributes to achieving sustainable development goals such as reducing poverty (SDG 1), ending hunger, and food security and nutrition (SDG 2). In addition to that, it promotes sustainable agriculture (SDG 2) and thus leads to raising well-being and offering better health conditions (SDG 3), as well as its contribution to achieving SDGs 8 and 12.

Sudanese communities strengthen their social cooperation as Islam encourages the support of people with low incomes and helps others with their needs (Mahdi, 2010; Elzubair *et al.,* 2024). Sudan has long-rooted and indigenous forms of traditional cooperation that rely on communal work and practiced to provide and offer help and support on certain occasions (during times of hardship or need and at the happiness events). These forms include *El-Nafir,* "labours exchange" in daily life activities, and

Fazaa, "an old cooperation system aimed to protect village life and properties during attacks, robbery, and natural disasters" (Elzubair *et al.,* 2015; Elzubair *et al.,* 2024), *Sandoug* or *Katta* "collecting of small amount of money on rotating base among the members", *Judia* "traditional conflict resolution mechanism", *Kashif* and *Mujib* "are donations for social events ", and *Sadagah* "individual donations or endowments for various services" (Elzubair *et al.,* 2024). The traditional cooperation forms can be implemented simultaneously or separately, as each one has its own characteristics and purposes (Elzubair *et al.,* 2024). Collective work, locally known as *El-Nafir,* is an informal form of cooperation practiced in Sudan to accomplish many activities in people's daily lives, especially in rural areas (Mahdi, 2010; Mahé, 2018). However, it seems to be strongly rooted in the western part of the country (Pratten, 1996). *El-Nafir* plays an important role in all activities related to the management and utilization of natural resources, and its importance is mainly due to its economic, social, and environmental benefits (Mahdi, 2010; Elzubair *et al.,* 2015; Elzubair *et al.,* 2024). *El-Nafir's* contributions to the agricultural practices of the family farms have had a fundamental impact on improving the production and productivity of local people's farms. It is mainly reflected in improving small-scale farmers' lives and living standards (Mahdi, 2010).

Most of the previous studies highlighted the contributions of formal cooperation forms (such as co-operatives, farmers' organizations, and associations) in terms of structure, socioeconomic and environmental impacts, performance, and factors that influence the performances of these organizations. On the other hand, limited studies focus on informal cooperation (such as labours exchange). Although informal cooperation has an important role in the livelihood of many people, especially in developing countries, there is a clear gap in research that tackles the issue of labour exchanges similar to formal cooperation research. Also, systematic, well-organized, and updated literature on informal cooperation is scarce. Literature review shows that many studies have been conducted to assess the role of informal forms of cooperation in enhancing agricultural production in many countries (Gilligan, 2004; Takasaki *et al.,* 2014; Vasco, 2014; Keishing, 2019; Marewo, 2023 and Tshotsho *et al.,* 2023). *El-Nafir,* as a traditional mutual labours exchange, has been practiced all over Sudan in agriculture, natural crises, and social events (Abd al-Halim, 2007; Eltahir, 2009; Elzubair *et al.,* 2024). Despite the important role that *El-Nafir* as an informal form of cooperation played in improving agricultural practices, especially for the smallholding farms in Sudan, no studies have been carried out to highlight its importance. There are also gaps in the documentation on formal and informal cooperation forms because of a lack of smooth flow of information from lower to higher government levels and misplacement of documents on cooperation in Sudan. Studying *El-Nafir* as an indigenous form of informal cooperation would be a new trend that encourages researchers to find and develop innovative practices of cooperation in Sudan. Due to that, this study was conducted to assess *El-Nafir's* role in enhancing the production and marketing of agricultural products in Sudan. Therefore, the broad objective of this study was to investigate the roles and contributions of *El-Nafir* activities in enhancing agricultural production in Sudan. More specifically, the study aimed to; i) determine the informal cooperation patterns that are practiced to enhance agricultural production in the study area; ii) identify the local community's mechanism for implementing *El-Nafir* activity in the study area; iii) analyze the efficiency of *El-Nafir* activity in the study area; iv) compare the efficiency of *El-Nafir* and hired labours on performing of agricultural activities in the study area; and v) determine the factors that influence the success of *El-Nafir* activity in the study area.

2. Methods

2.1 Study area

The study was conducted in Abu Jubahyah Locality, which is located in the southeast of South Kordofan State, Sudan. The study area lies in the rich Savannah zone between latitudes 11° 21′ 02″ N and 11° 31′ 23″ N and longitudes 031° 06′ 47″ E and 031°17′ 20″ E (Figure 1). Most of the soil is cracked clay soil, which is suitable for agriculture, interspersed with *gardoud* soil and mountains. The annual rainfall at this location ranges between 600 and 800 mm, and it occurs from June to September, and the relative humidity is between 24-26%. The daily mean minimum and maximum temperatures are 20° C and 40° C, respectively. A wide range of trees, shrubs, weeds, and different herbs from various plant families are found in Abu Jubayhah Locality. It contains large areas of agricultural projects. The

economic activities in the locality vary from agriculture and livestock herding to small industries and retail trade.

South Kordofan State was selected to carry out this study because the traditional rain-fed agricultural production system is mainly practiced and considered as a source of livelihood for local communities in the state. In addition, limited studies have been conducted in the state due to its remoteness and insecurity, which constrain and hinder reaching the state. The Abu Jubayhah Locality was chosen to conduct this study due to its richness in natural agricultural resources and its long history with traditional agricultural practices. Besides that, since the second author is from the area, she knows the community's social structure and can easily access it and deal with local communities. Moreover, the selection of the locality allows for the saving of time, effort, and resources that were invested in conducting the study.

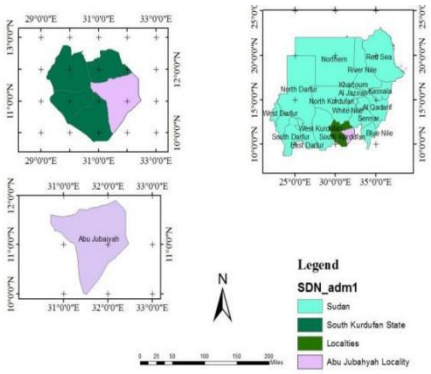

Figure 1: Map of the study area.

2.2 Data collection methods and sampling technique

In this research, two types of data were used to gather the necessary information: primary and secondary data. The primary data sources include a social survey structural questionnaire targeting heads of households (HHHs) and field observations. The secondary data sources were documents, archives, annual reports of governmental institutions, Forests National Corporation (FNC) and non-governmental organizations (NGOs), articles, and publications from all relevant sources. The primary data were collected via questionnaires with open and closed-end questions from local communities in the study area. Both quantitative and qualitative data were collected. Hired labours costs were calculated based on the labours wages in the village. In contrast, the costs of implementing *El-Nafir* activity were calculated using the costs of food, drinks, equipment, and other costs. The research relied on probability methods using a simple random sampling technique to select the respondents without consideration of any gender or age group characteristics. The sampling procedure applied to choose the respondents was based on a pre-hand list of HHHs in the study area. The sampling strategy to select the respondents was based on a list of household heads obtained from the locality Administrative Office, and the list was digitalize. Then, a random selection was made using an Excel sheet to select the respondents. The primary data collection was conducted in the field during September 2021 using face-to-face interviews with 75 HHHs respondents selected to conduct this study. The main topics of the questionnaire include the types of informal cooperation practices that are used to enhance agricultural production, the responsible and control bodies of the implementation of *El-Nafir* activity, the constraints that hindered the implementation of *El-Nafir* activity in the study area, the costs of implementing *El-Nafir* activity, Hired labours costs and efficiency of the *El-Nafir* activity.

2.3 Data analysis

The data in cost analysis of implementing *El-Nafir* activity and hired labour relied upon smallholder farmers' heads of households' survey and from the market. The researcher asked the farmers directly whether they rely on *El-Nafir* to implement the agricultural practices or hired labours, the wage of hired labours, the time required to accomplish the task per Feddan (1 Feddan equals 4200 m^2), the costs to

do the task via *El-Nafir per* Feddan (food and drinks and other costs if any). As the second author from the area, this allows her to validate the collected data using her knowledge and observation. The total cost of hired labours used to produce from one unit area (Feddan) was calculated by multiplying the wage of the labour per hour by the average number of working hours required to accomplish a specific task per Feddan or by the number of hired labours needed to do the same task in Feddan. However, the cost of completing the same task using *El-Nafir* was calculated based on the cost of food and drinks services, transport, and renting agricultural tools (as an opportunity cost for the tools provided by the participants). Equation 1 shows the calculation of hired labours, while Equation 2 presents the formula used to calculate the implementation costs using *El-Nafir.*

$$LC = W\ per\ h \times N\ of\ Hs \quad (1)$$

Where

LC ≡ labours cost

W per h ≡ Wage per hour

N of H ≡ Number of hours needed to accomplish the task.

$$El\text{-}Nafir\ Cost = CF + CD + TC + CRT \quad (2)$$

Where

CF ≡ Costs of foods

CD ≡ Costs of drinks

TC ≡ Transportation cost

CRT ≡ Costs of renting traditional tools (this was calculated using the price of renting the tools per hour × Number of hours required to accomplish the activity in Feddan).

Both qualitative and quantitative analyses were employed to analyze the collected data using Statistical Package for Social Science (SPSS) Version 25, where Deceptive analysis was used to describe and analyze the study variables. A t-test (Independent t-test) was employed to show whether there is a variation in *El-Nafir* and the hired labours costs among the genders. The assumption is that there is no change in the dependent variables (the costs of implementing *El-Nafir* activity and the hired labours costs) to implement the same activity among the independent variable (gender; male and female). In addition to that, correlation analysis at the 0.01 level (2-tailed) was conducted to determine if there is any relation between the costs of implementing *El-Nafir* activity and the cost of hired labour in the study area. The original Sudanese pounds (SDG) costs were converted into the international measure (US$).

3. Results and Discussion

3.1 Socioeconomic characteristics of farmers

The socioeconomic characteristics of the respondents are presented in Figure 2. The majority of respondents ranged between 18 and 50 years old (Fig. 2A), with only 2.9% of the males under 18 years. The results also indicated that most of the respondents were married (Fig. 2B). As shown in Figure 2C, most of the respondents had family members of 3-9 persons. This result supported the previous report stating the vital contribution that family size has played in the availability of family labours for small-scale farm production (Sibhatu & Quim, 2017). Although the majority of the male and female respondents (64.7% and 84.6%, respectively) had secondary and university certificates, 11.8% and 7.7% of the male and female respondents, respectively, were illiterate (Fig. 2D). Informal education was mentioned by 8.8% of the males' respondents as they attended *Khalawa* level (informal Islamic learning for Holy Quran). These findings mean that illiteracy is still a challenge in rural areas of Sudan. In Figure

2E, most females (69.2%) are employees either in governmental jobs or the private sector as they are well educated. Males preferred to rely on agriculture and business as sources of their livelihood.

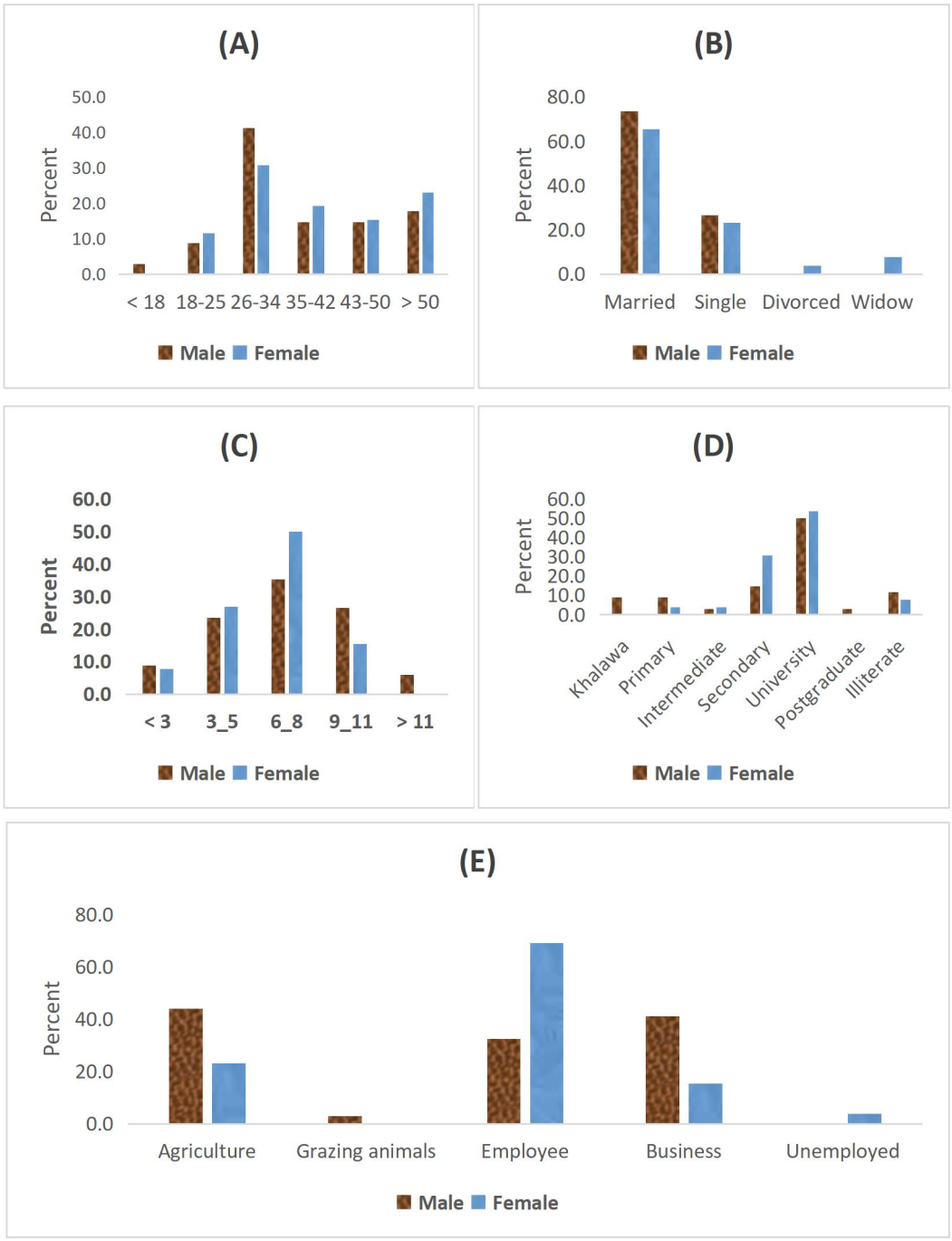

Figure 2: Socioeconomic characteristics of respondents in the study area: (A) Age groups, (B) Martial status, (C) Family size, (D) Education level, (E) Income sources.

3.2 Informal cooperation forms in agricultural practices

Most respondents asserted that *El-Nafir's "* Mutual labours exchange" is adopted to improve the agricultural practices in the study area (Figure 3). The result confirmed that small-scale farmers practiced traditional cooperation and reciprocity arrangements to overcome labours shortages in agricultural activities (Bezabih, 2009; Jackson *et al.,* 2012; Marewo, 2023). However, 27.3% of the females and 22.7% of the males confirmed that they relied on *Sandoug,* which is a rotating savings system that individuals in Sudan practiced to accumulate periodic savings and has been distributed to its members based on their needs in a rotational basis (Elzubair *et al.,* 2024) to enhance agricultural

productivity. Only an average of 9.8% of the respondents mentioned other activities such as farmers' associations, endowment, donations, and support from family members; this result emphasizes the role of Islam in social cohesion and supporting each other as supported by the previous studies by Bagasra (2021) and Elzubair *et al.* (2024). This result indicated that individual households relied on traditional cooperation and reciprocity arrangements to improve the informal economy, as Develtere *et al.* (2008) stated.

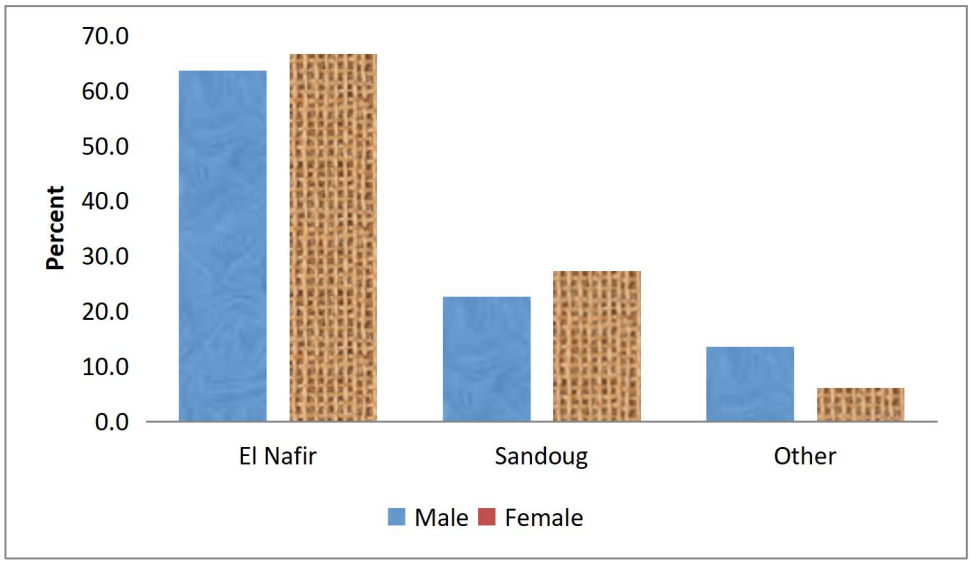

Figure 3: Informal cooperation forms in agricultural practices.

3.3 Implementation of *El-Nafir* Strategy

Based on the respondents' perception, they generally followed two scenarios as techniques for implementing *El-Nafir* strategy in the study area. Followed by the preparation of all required equipment. In the first scenario, the local people identify a suitable time to conduct the activities and then inform the individuals interested in participating in the activities, particularly in the neighborhood area. In the final stage, the participants involved in *El-Nafir's* activity provide their own equipment to implement the activity. The success of this scenario relies on the work owner's commitment to participate in the others' activities. This agrees with the statement that the participants are guaranteed that the activity will be carried out on their farm or house later (Wilson, 2001; Gibson, 2020). The respondents confirmed that this scenario is considered the most popular technique and that steps are followed to implement *El-Nafir* strategy in the study area. The second scenario starts by determining the type of work required for *El-Nafir*, such as cultivation, crop harvesting, repair and construction of houses or public service buildings (schools, mosques, health care, and water), and environmental awareness. Then, develop a plan for implementing the activities, including time, date, equipment, and other requirements to ensure the activity's success. Finally, the individuals prospectively willing to participate and implement the activities should be announced; these findings agree with those reported by Kirinya *et al.* (2013) and Gibson (2020). The difference between the two scenarios is that the second scenario is well organized as the work owner suggests a plan for the activities before informing the participants to ensure that all the required equipment is available and foods and drinks are listed and prepared.

Table 1 presents the participants in the study area using *El-Nafir* strategy. Most of the respondents asserted that the participants in *El-Nafir* activity are mainly neighbours in their district to enhance agricultural production. This agrees with what was reported by Kesonga Nsele *et al.* (2023), who stated that framers relied on mutual aid to ensure the production cycle of vegetables in Congo. None of the female respondents stated the participation of relatives in *El-Nafir* activity because its practices in the neighbourhood's boundary. The results supported the previous study showing that regardless of the origin of the community members, reciprocal labour has been practiced to assist a community member or household (Gibson, 2020).

The absence of institutions that contributed to *El-Nafir* in the study area was mentioned by 61.8% and 57.7% of male and female respondents, respectively. The respondents attributed this result to the nature of the work, which was mainly individual-owned. The participation of the institutions that supported the implementation of *El-Nafir* strategy has been shown in Table 1. Charities organizations are leading and have a distinguished role in supporting *El-Nafir's* strategy, as confirmed by 58.3% and 45.5% of the male and female respondents, respectively. Government institutions in the administrative units have made little and no direct contributions to enhancing agricultural production. Providing some tools and equipment required to implement the agricultural activities is mainly the responsibility of the individuals willing to participate in implementing *El-Nafir* activity. In general, the findings indicate that sometimes government and non-governmental institutions, due to their role in rural development, become the initiators of *El-Nafir* activity through their indirect role in the provision of production inputs (such as improved seed, fertilizers, and others) with reduce cost, and provide technical training that contributes to enhancing the capacity of the farmers to produce more products from their farms. In addition, extensionists play an important role by helping local communities find solutions to problems and constraints that face agricultural production. The present findings supported the previous one, stating that the local community is the main group that organizes traditional mutual activities with the support of NGO and government institutions (Ghate & Mehra, 2004).

Regarding the responsible bodies that control the adoption and implementation of *El-Nafir* strategy, Table 1 shows the perception of the respondents on the responsible bodies. Most respondents declared that the owners of the work and the individuals are the main people responsible for controlling the implementation of the activities. It is not common for the communal committees in the district to take the shoulder of *El-Nafir* activities. The findings also reflect the high level of social structure and strong networking where the involved members participate in the management and the implementation of *El-Nafir* activities, as was shown previously (Marewo, 2023; Tshotsho *et al.,* 2023).

Table 1: Participants, institutions, and control of *El-Nafir* strategy in the study area

Attributes		Variables	Male	Female	Mean
Participants in *El-Nafir* (%)	Local communities	Family members	14.7	15.4	15
		Neighbors	73.5	84.6	78.3
		Relatives	11.8	0	6.7
	Institutions	Administrative units	16.7	27.3	21.7
		Communal community organizations	25	27.2	26.1
		Charities organizations	58.3	45.5	52.2
Control of the implementation of *El-Nafir* (%)		Communal committee	11.7	11.5	11.7
		Owner of the work	47.1	50	48.3
		Members in the area	41.2	38.5	40

Table 2 presents the needs and criteria used to classify the community into working groups and gender roles in implementing *El-Nafir* activities. Most of the respondents in the study area clarified that the community needs to be classified into working groups. An average of 75.0% mentioned that they relied on both gender and age as criteria to divide the community into groups. The results mean that groups to conduct special work are selected and organized based on the nature of the work, society's culture, familiarity, age, and gender of participants. Previously, some authors reported similar statements (Moore, 1975; Sirianni & Friedland, 1998).

With regard to the gender roles in the implementation of the activities, most of the respondents verified that women and men conducted the planting and harvesting crops tasks similarly. Also, both men and women participate in agricultural crop production (Lambrecht *et al.,* 2018; Mensah & Fosu-Mensah, 2020). Besides that, women prepare food and drinks for the participants in the activities as a part of the Sudanese norms and culture.

Table 2: Needs and criteria for dividing the community into groups for *El-Nafir* activity

Gender	Needs to classify the community into groups (%)	Criteria for dividing into groups (%)			Women and men sharing the tasks (%)
		Gender	Age	Gender and age	
Male	73.5	29.4	8.8	61.8	97.1
Female	88.5	3.8	3.8	92.3	100.0
Mean	80.0	18.3	6.7	75.0	98.3

3.4 Practices of Agricultural Improvement through *El-Nafir*

Table 3 shows the practices used by *El-Nafir* to improve agricultural production in Abu Jubahyah Locality. Crop cultivation is the main practice that relies on *El-Nafir,* followed by protection and cleaning of the crops. In general, the present findings confirmed that there are many practices where *El-Nafir* can be used in and out of the farms with more focus on agricultural practices (cultivation, protection, and crop harvesting) with agricultural tools exchange to cultivate the land (Wilson, 2001; Lutz *et al.,* 2017; Kesonga Nsele *et al.,* 2023). This finding also shows the low level of cooperation of the farms in the marketing and value-added process, in which the income of agricultural products can be increased and consequently raise the standard level of the farmers. These results may be attributed to the lack of trust in relying on each other to trade their agricultural products on their behalf, as supported by Muriqi *et al.* (2019). Besides that, it is observed that *El-Nafir* has been used to accomplish many activities in daily life, such as construction or repairing houses and public buildings rather than only agricultural practices; this shows the role of cooperation in daily life (Develtere *et al.,* 2008; Gibson *et al.,* 2017).

Table 3: Activities that used *El-Nafir* to improve agricultural production

Gender	Activities practices to improve the agricultural production (%)					
	Cultivation	Protection	Crops cleaning	Harvesting	Marketing	Packaging
Male	43.2	15.9	22.7	9.1	4.5	4.5
Female	40.5	27.0	18.9	8.1	5.4	0.0
Mean	41.9	21.5	20.8	8.6	5.0	2.3

3.5 Efficiency level of *El-Nafir* strategy

Figure 4 illustrates the efficiency level of implemented activities to improve agricultural production through *El-Nafir* strategy . About 55.9% and 50% of the male and female respondents describe *El-Nafir* as an excellent strategy to promote agricultural production. These findings reflect mutual labourers' efficiency in promoting small-scale farmers' agrarian productivity (Cobbinah *et al.,* 2023). The positive perception of the respondents on the efficiency of the cooperation forms is mainly due to the exchange of benefits, where the farmers relied on each other as a mutual exchange of labours regularly to accomplish their activities (Karanth, 2002; Lutz *et al.,* 2017; Tshotsho *et al.,* 2023). A few male respondents stated the low-efficiency role of *El-Nafir* strategy in improving the agricultural production. Meanwhile, 3.8% of the female respondents reported the inefficiency of *El-Nafir.* The low or inefficient role of *El-Nafir* strategy is mainly attributed to the fact that those respondents are not participating in *El-Nafir* with others. Therefore, in their *El-Nafir* activities, they have fewer participants to accomplish the specific task, resulting in low-quality work. This agrees with the statement, “If the framer did not help, the others would not support him in his activities” (Natcher *et al.,* 2018).

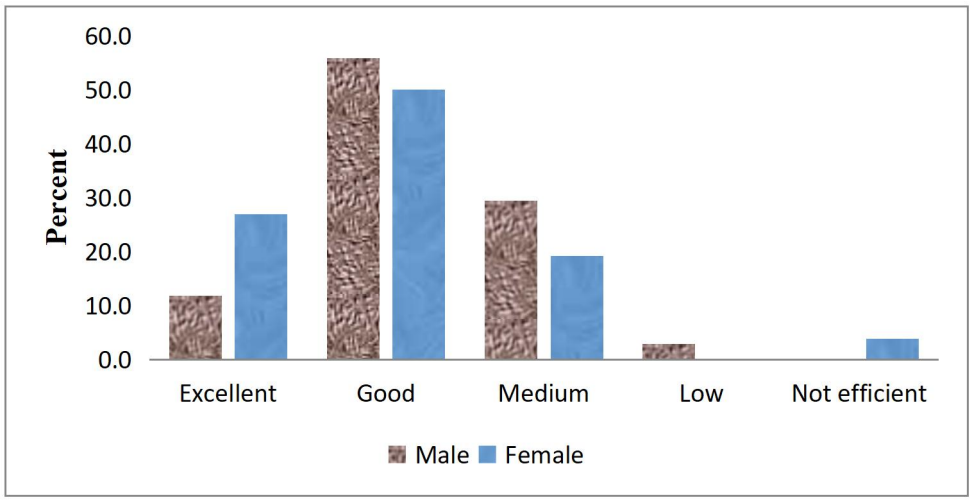

Figure 4: Efficiency level of *El-Nafir* strategy.

3.6 Comparison between *El-Nafir's* strategy and hired labourers

The entire respondents confirmed that *El-Nafir* has expenditures for the implementation. The work owner pays the costs that required to implement *El-Nafir*, as asserted by 64.7% and 53.8% of the male and female respondents, respectively, in the forms of food and drinks and sometimes equipment, while rewarding the participants by reciprocation. This result supported Wilson (2001) and Gibson (2020), who stated that participation is a form of return insurance. However, 46.2% and 35.5% of the female and male respondents mentioned sharing the cost by the participants as a part of the cooperation strategy to pay the cost of implementing *El-Nafir* activity. The results agree with Wilson (2001), who stated that a family member or material (food) would be sent as a sharing contribution if someone were absent. Figure 5 compares the mean costs of agricultural production activities per Feddan per US$ using *El-Nafir* and hired labourers in Abu Jubahyah Locality. An average of 40% of the respondents asserted that the hired labourer's costs were less than 40 US$%, 50% stated that it ranged between 40-100 US$, and 10% confirmed the labours' costs were more than 100 US$. Regarding the costs of implementing the activities via *El-Nafir*, The majority of the respondents (average of 83.%) mentioned it cost less than 40 US$, while 16.7% asserted that the costs exceeded 100 US$.

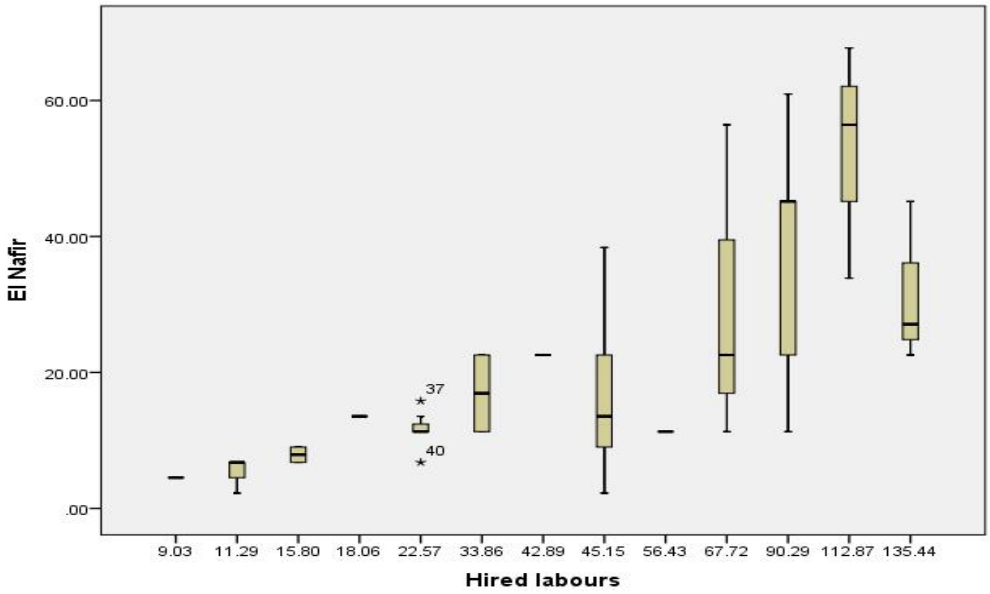

Figure 5: Comparison of the mean costs of agricultural work performed using *El-Nafir* and hired labours.
I Dollar = 443 SDG in March 2022

However, the majority of the respondents (an average of 83.3%) clarified that the cost of implementation of *El-Nafir* is just less than 40 US$. About 25% of them mentioned that the cost to implement *El-Nafir* is less than 10 US$ (Fig. 5). The variation in the costs of the activities within using the same type of labours could be attributed to the type of work, the total targeted area, the distance to the houses and the quantity and quality of foods and drinks that provided. Generally, the costs of mutual labours exchange are not high compared to the hired labours. This finding confirmed the statement that cooperation could reduce the costs of implementation of the task; the result agrees with the previous statement that cooperation reduce the cost (Cox & Fafchamps, 2007; Souza *et al.,* 2020; Zhou, 2021) and consequently increases the household's income (Larsén, 2008; Oliver *et al.,* 2013).

Table 4 presents the T-Test of the costs to implement *El-Nafir* and the hired labours costs to implement the same activity among the genders per Feddan in Abu Jubahyah Locality. The findings indicated significant variations in using *El-Nafir* and hired labours among the genders.

Table 4: T-Test of *El-Nafir* and the hired labour costs among the gender per US$ per Feddan

Attributes	F	P-Value	T	P-Value (2-tailed)
Hired labours	3.082	0.084	-0.735	0.465
El-Nafir	0.327	0.57	-0.839	0.405

Table 5 shows the correlations between the costs of implementing *El-Nafir* and the costs of hired labours in the study area at the 0.01 significance level (2-tailed). The present findings showed a significant positive correlation at 0.001 (R= 0.694). This indicates that although *El-Nafir* is of lower cost compared to hired labours, each increment of hired labours is followed by increasing *El-Nafir* costs.

Table 5: Correlations between the costs of *El-Nafir* and hired labourers to implement the activities in 1 Feddan per USD

Correlations of the costs	Correlations	*El-Nafir*	Hired labours
El-Nafir	Pearson Correlation	1	
	Sig. (2-tailed)		
Hired labours	Pearson Correlation	0.694**	1
	Sig. (2-tailed)	0.000	

**. Correlation is significant at the 0.01 level (2-tailed).

Regarding the time required to accomplish the task, most respondents stated that 2 and 3 days are needed to achieve a specific task, relying on hired labours, as stated by 61.7% and 33.3% of the respondents, respectively. At the same time, the rest mentioned that it reaches four days. However, only one day is needed to use *El-Nafir,* as stated by the respondents. This indicates that *El-Nafir* plays a significant role in reducing the time required to accomplish the activities as it pooling human force and good skills practices; the results are in line with that by Zhou (2021); Cobbinah *et al.* (2023) and Tshotsho *et al.* (2023).

3.7 Factors influencing the success of *El-Nafir* strategy

The findings in Table 6 indicated that various factors influence the success of *El-Nafir's* strategy in the Abu Jubahyah Locality. About 25.8% and 22.9% of the respondents stated that the low number of participants and lack of financial support, respectively, were the main factors that influenced the success of *El-Nafir*. However, 25.6% mentioned other factors such as a shortage of labours, lack of awareness of the cooperation concept, war and insecurity situations, absent of governmental support, and poor infrastructure. The results also highlighted that socioeconomic characteristics had influenced the drivers that hindered the participation of local communities in cooperation activities, as was stated previously (Lutz *et al.,* 2017; Muriqi *et al.,* 2019; Cobbinah *et al.,* 2023 and Kesonga Nsele *et al.,* 2023)

Table 6: Factors influencing the success of *El-Nafir* strategy in performing agricultural activities

Gender	Factors influence the success of *El-Nafir* (%)					
	Lack of coordination	Lack of financial support	*El-Nafir* did not achieve its goals	Low number of participants	Absent of communication facilities	Other
Male	8.9	20.0	6.7	35.6	6.7	22.2
Female	19.4	25.8	6.5	16.1	3.2	29.0
Mean	14.1	22.9	6.6	25.8	4.9	25.6

Conclusion

El-Nafir's is the main strategy used to improve agricultural production in Sudan, particularly in rural areas. Neighbours and relatives who settled in the same neighborhood area are the main participants in *El-Nafir*. Both gender and age are criteria used to divide the community into working groups. Although the owners of the work are the main actors responsible for *El-Nafir* strategy through identifying the type of activities time and preparing the tools and equipment, the participants, in most cases, come to participate using the tools that are required to implement the activity, especially the traditional agricultural tools that used in cultivation (such as; Axe and Digging hoe) and crops harvesting (such as; Sickle and Knife). Also, *El-Nafir* participants participate in the management and implementation of the activity through the provision of ideas and sharing their knowledge. The gender roles show women sharing the implementation of the agricultural activities via *El-Nafir* with men; females are also responsible for preparing food and drinks for participants. The findings revealed that *El-Nafir* is more efficient than hired labourers in implementing agricultural activities, reducing the money invested and the time required. However, the correlation results show a positive relation between the cost of hired labours and the cost of *El-Nafir*, where both costs are influenced by market price and economic status. The study emphasizes the important role that *El-Nafir* has played in improving agricultural practices in terms of cost and time, as it allows farmers not to miss the production season. Many demographic and economic factors influence the success of *El-Nafir* strategy, such as a low number of participants, lack of financial support, lack of coordination, absence of communication facilities, shortage of labours, war, and insecurity situation. The study recommended that local communities should encourage to adopt *El-Nafir* as a mechanism to reduce the costs and efforts of agricultural production. Governments and non-government institutions should encourage local people to rely on cooperation to improve agricultural production and enhance agribusiness by raising awareness and providing technical support.

Limitation

The study faced many limitations, including adequate funding and time constraints that affected the sample size and methodology. Also, the study was limited by remote areas and the insecurity due to army conflict in many areas of the state. To overcome the previously mentioned limitations, we predict that the demographic characteristics of the households in the study area are similar. Also, they mainly practice agricultural production for their livelihoods using the same approaches and techniques. Therefore, we have chosen the Abu Jubahyah Locality to represent South Kordofan State. Besides that, field observations and secondary data were used to validate the findings.

Acknowledgments

The authors would like to express their thanks to the local communities in Abu Abujabiha Locality who participated without hesitation in filling in the questionnaire.

References

Abd al-Halim, H. (2007). Reforming civil society organizations. The Sudanese Human Rights Quarterly, 24 (June): 25-29.

Ajates, R. (2020). An integrated conceptual framework for the study of agricultural co-operatives: from repolarisation to co-operative sustainability. Journal of Rural Studies, 78, 467-479. https://doi.org/10.1016/j.jrurstud.2020.06.019.

Anderson, C., Brushett, L., Gray, T., & Renting, H. (2014). Working together to build cooperative food systems. Journal of Agriculture, Food Systems, and Community Development, 3(4): 3-9. https://doi.org/10.5304/jafscd.2014.043.017.

Artz, G., & Naeve, L. (2016). The benefits and challenges of machinery sharing among small-scale fruit and vegetable growers. Journal of Agriculture, Food Systems, and Community Development, 6(3): 19-35. http://dx.doi.org/10.5304/jafscd.2016.063.003.

Bagasra, A. (2021). Socially engaged Islam: Applying social psychological principles to social justice, faith-based activism, and altruism in Muslim communities. Toward a Positive Psychology of Islam and Muslims: Spirituality, struggle, and social justice, 29-49. https://doi.org/10.1007/978-3-030-72606-5_2.

Bereir, A., Abdalla, A., & Elfadil, A. (2022). Farmers adoption of agricultural mechanization in rain fed sector, Gedarif State, Sudan. Middle East Journal of Agriculture Research, 11(02): 556-562. DOI: 10.36632/mejar/2022.11.2.35.

Bezabih, E. (2009). Co-operatives: A path to economic and social empowerment in Ethiopia. Coop. AFRICA working paper, 9, 1 & 26. Retrieved from https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/---coop/documents/publication/wcms_672876.pdf. Accessed on May 13, 2022.

Brunori, G., Rossi, A., & Malandrin, V. (2011). Co-producing transition: Innovation processes in farms adhering to solidarity-based purchase groups (GAS) in Tuscany, Italy. The International Journal of Sociology of Agriculture and Food, 18(1): 28-53. https://doi.org/10.48416/ijsaf.v18i1.257.

Chibnik, M., & de Jong, W. (1989). Agricultural labour organization in ribereño communities of the Peruvian Amazon. Ethnology, 28(1):75-95. https://doi.org/10.2307/3773643.

Cialdella, N., Dobremez, L., & Madelrieux, S. (2009). Livestock farming systems in urban mountain regions: Differentiated paths to remain in time. Outlook on Agriculture, 38(2): 127-135. DOI: 10.5367/000000009788632412.

Cobbinah, M.T., Danso-Abbeam, G., & Ogundeji, A.A. (2023). Access to mutual labour support in agriculture: Implications for maize productivity and efficiency of farmers in northern Ghana. Agrekon, 62(1): 61-79. https://doi.org/10.1080/03031853.2022.2156898.

Cox, D., & Fafchamps, M. (2007). Extended family and kinship networks: Economic insights and evolutionary directions. Handbook of Development Economics, 4: 3711-3784. https://doi.org/10.1016/S1573-4471(07)04058-2.

Dania, W.A.P., Xing, K., & Amer, Y. (2018). Collabouration behavioral factors for sustainable agri-food supply chains: A systematic review. Journal of Cleaner Production, 186, 851-864. DOI: 10.1016/j.jclepro.2018.03.148.

Dessie, A.B., Abtew, A.A., & Koye, A.D. (2019). Analysis of smallholder farmers' cooperation in eucalyptus woodlot production in Wegera District, Northern Ethiopia. Small-scale Forestry, 18, 291-308. https://doi.org/10.1007/s11842-019-09418-4.

Develtere, P., Pollet, I., & Wanyama, F. (2008). Cooperating out of poverty. The renaissance of the African cooperating movement. International Labour Organization. World Bank.Retrieved from https://www.ilo.org/global/topics/cooperatives/publications/WCMS_735490/lang--en/index.htm. Accessed on January 17, 2023.

ELTahir, M.U. (2009). Community participation in housing and urban development in poor urban

communities: Case study of Umbadda, Khartoum. FES Journal of Engineering Sciences, 4(1): 71-81. DOI: https://doi.org/10.52981/fjes.v4i1.46.

ELTahir, O.B., Aziz, H.H.A., & Abaker, A.A. (2016). Evaluation of groundnut production technical efficiency in mechanized and traditional rain-fed agricultural sub-Sectors in South Kordofan, Sudan. University of Kordofan Journal of Natural Resources and Environmental Studies, 1(2): 60-69.

Elzubair, A.E.M., Adam, Y.O., & Taha, M.E. (2015). An overview on associations of gum Arabic producers in Sudan: Problems and challenges. Value Chains – Welcome to Africa. Proceedings of the summer-school workshop, 10–21 March 2014, Wondo Genet/ Addis Ababa, Ethiopia. Scientific Cooperation Network on Climate Change Adaptation in Eastern Africa. ISBN 978–3-942934–05-3. www.tu-dresden.de/forst /w2a.

Elzubair, A.E.M., Sanjak E., & Dafa Alla M.D. (2023). Members and consumer' satisfaction with agricultural co-operatives: Case of Gum Arabic Producers Associations (GAPAs) in the Central gum Arabic Belt, Sudan. Agriculture and Forestry Journal, 7(1): 27-34. https://doi.org/10.46325/afj.v7i1.103.

Elzubair, A.E.M., Sanjak E., Dafa Alla M.D., & Darr, D. (2024). An overview of the development of agricultural co-operatives in Sudan over decade s with special emphasis on Gum Arabic Producers' Associations (GAPAs). Journal of Co-operative Organization and Management, 12(1): 100217. https://doi.org/10.1016/j.jcom.2023.100217.

Erasmus, C. (1956). Culture, structure, and process: The occurrence and disappearance of reciprocal farm labour. Southwestern Journal of Anthropology 12(4): 444-469. https://doi.org/10.1086/soutjanth.12.4.3629069.

Erkuş-Öztürk, H., & Eraydın, A. (2010). Environmental governance for sustainable tourism development: Collaborative networks and organization building in the Antalya tourism region. Tourism Management, 31(1): 113-124. https://doi.org/10.1016/j.tourman.2009.01.002.

Ghate, R., & Nagendra, H. (2004). Ensuring collective action in participatory forest management. Conference paper presented in the Commons in an Age of Global Transition: Challenges, Risks and Opportunities, the 10th Biennial Conference of the International Association for the Study of Common Property, Oaxaca, Mexico, August 9-13. UIR: https://hdl.handle.net/10535/575.

Gibson, K. (2020). Collectively performed reciprocal labour: Reading for possibility, Chapters, in: J. K. Gibson-Graham & Kelly Dombroski (ed.), The Handbook of Diverse Economies, chapter 18, pages 170-178, Edward Elgar Publishing. https://doi.org/10.4337/9781788119962.00027.

Gibson, K., Hill, A., & Law, L. (2017). Community economies in Southeast Asia: A hidden economic geography. In Macgregor, A., Law, L., & Miller, F. (1steds.), Routledge handbook of Southeast Asian development, London: Routledge, pp 131-141.

Gilligan, D.O. (2004). The economics of agricultural labour exchange with evidence from Indonesia. PhD Dissertation, University of Maryland, College Park.

Gulati, R., Wohlgezogen, F., & Zhelyazkov, P. (2012). The two facets of collabouration: Cooperation and coordination in strategic alliances. Academy of Management Annals, 6(1): 531-583. https://doi.org/10.5465/19416520.2012.691646.

Jackson, M.O., Rodriguez-Barraquer, T., & Tan, X. (2012). Social capital and social quilts: Network patterns of favor exchange. American Economic Review, 102(5): 1857-1897. https://doi.org/10.1257/aer.102.5.1857.

Karanth, G.K. (2002). Mutual exchange labour in a changing agrarian economy. Sociological Bulletin, 51(2): 217-242. https://doi.org/10.1177/0038022920020204.

Keishing, N. (2019). Labour exchange in shifting cultivation: The case of the Tangkhul Naga Tribe in Manipur. Labour. Research Review International Journal of Multidisciplinary, 4(4): 456-462. https://rrjournals.com/index.php/rrijm.

Kesonga Nsele, M., Dogot, T., & Maréchal, K. (2023). Unraveling the role of informal mutual aid networks in maintaining urban farms in Lubumbashi, Democratic Republic of Congo. Frontiers in

Sustainable Food Systems, 7. https://doi.org/10.3389/fsufs.2023.1248937.

Kirinya, J., Taylor, D.B., Kyamanywa, S., Karungi, J., Erbaugh, J.M., & Bonabana-Wabbi, J. (2013). Adoption of integrated pest management (IPM) technologies in Uganda: Review of economic studies. International Journal of Advanced Research, 1(6): 401-420.

Kranton, R.E. (1996) Reciprocal exchange: A self-sustaining system. The American Economic Review, 86(4): 830–851. http://www.jstor.org/ stable/2118307.

Lambrecht, I., Schuster, M., Asare Samwini, S., & Pelleriaux, L. (2018). Changing gender roles in agriculture? Evidence from 20 years of data in Ghana. Agricultural Economics, 49(6): 691-710. https://doi.org/10.1111/agec.12453.

Larsén, K. (2008). Economic consequences of collabourative arrangements in the agricultural firm. Doctoral thesis, Department of Economics, Swedish University of Agricultural Sciences: Uppsala, Sweden. Retrieved from https://core.ac.uk/download/pdf/11695275.pdf.

Lutz, J., Smetschka, B., & Grima, N. (2017). Farmer cooperation as a means for creating local food systems-potentials and challenges. Sustainability, 9(6): 925. https://doi.org/10.3390/su9060925.

Mahdi. S. (2010). Co-operative's weakness for attracting consumers in Sudan. Submitted to: ICA Research Conference. Co-operatives Contributions to a Plural Economy. 2-4 September, Lyon, France.

Mahé, A.L. (2018). A tradition co-opted: Participatory development and authoritarian rule in Sudan. Canadian Journal of Political Science, 51(2): 233-252. doi:10.1017/S0008423917000993.

Marewo, M.K. (2023). Belonging and agrarian labour exchanges in Zimbabwe: Navigating between communal areas and fast track villagised settlements. Africa Spectrum, 58(2): 113-131. https://doi.org/10.1177/00020397231173709.

Markelova, H., Meinzen-Dick, R., Hellin, J., & Dohrn, S. (2009). Collective action for smallholder market access. Food Policy, 34(1): 1–7. https://doi.org/10.1016/j.foodpol.2008.10.001.

Mensah, M., & Fosu-Mensah, B.Y. (2020). Agriculture and gender roles in the semi-arid region of Ghana. West African Journal of Applied Ecology, 28(1): 144 – 157.

Möllers, J., Traikova, D., Bîrhală, B.A.M., & Wolz, A. (2018). Why (not) cooperate? A cognitive model of farmers' intention to join producer groups in Romania. Post-Communist Economies, 30(1): 56-77. https://doi.org/10.1080/14631377.2017.1361697.

Moore, M.P. (1975). Co-operative labour in peasant agriculture. The Journal of Peasant Studies, 2(3): 270-291. https://doi.org/10.1080/03066157508437936.

Muriqi, S., Fekete-Farkas, M., & Baranyai, Z. (2019). Drivers of cooperation activity in Kosovo's agriculture. Agriculture, 9(5): 96. https://doi.org/10.3390/agriculture9050096.

Natcher, D., Bachmann, E., Baco, M.N., Kulshreshtha, S., Pittman, J., & Peak, D. (2018). Transitions in co-operative labour and the constraints to the adoption and scaling-up of labour intensive agricultural technologies. Sustainable Agriculture Research, 7(526-2020-485), 71-80. https://doi.org/10.22004/ag.econ.301829.

Oliver, J.M., Jagim, A.R., Sanchez, A.C., Mardock, M.A., Kelly, K.A., Meredit, H.J., Smith, G.L., Greenwood, M., Parker, J.L., Riechman, S.E., Fluckey, J.D., Crouse, S.F., & Kreider, R.B. (2013). Greater gains in strength and power with intraset rest intervals in hypertrophic training. Journal of Strength and Conditioning Research, 27(11): 3116-31. DOI:10.1519/JSC.0b013e3182891672.

Ortiz-Miranda, D., Moreno-Pérez, O., Arnalte-Mur, L., Cerrada-Serra, P., Martinez-Gomez, V., Adolph, B., Atela, J., Ayambila, S., Baptista, I., Barbu, R., & Bjørkhaug, H. (2022). The future of small farms and small food businesses as actors in regional food security: A participatory scenario analysis from Europe and Africa. Journal of Rural Studies, 95: 326-335. https://doi.org/10.1016/j.jrurstud.2022.09.006.

Osman, I.M., Acar, R., Babiker, E.S.N., & Direk, M. (2023). Agricultural production systems in Sudan. Eurasian Journal of Agricultural Economics (EJAE), 3(1): 46-56.

Pratten, D. (1996). Return to the roots? Migration, local institutions and development in Sudan, London/ Khartoum, SOS Sahel International/Al Fanar Centre for Development Services.

Renting, H., Schermer, M., & Rossi, A. (2012). Building food democracy: Exploring civic food networks and newly emerging forms of food citizenship. The International Journal of Sociology of Agriculture and Food, 19(3): 289-307. https://doi.org/10.48416/ijsaf.v19i3.206.

Schermer, M. (2015). From "Food from nowhere" to "Food from here:" changing producer–consumer relations in Austria. Agriculture and Human Values, 32: 121-132. https://doi.org/10.1007/s10460-014-9529-z.

Schiefer, J., Lair, G.J., & Blum, W.E. (2015). Indicators for the definition of land quality as a basis for the sustainable intensification of agricultural production. International Soil and Water Conservation Research, 3(1): 42-49. https://doi.org/10.1016/j.iswcr.2015.03.003.

Serra, T., & Poli, E. (2015). Shadow prices of social capital in rural India, a non-parametric approach. European Journal of Operational Research, 240(3): 892-903. https://doi.org/10.1016/j.ejor.2014.08.019.

Sibhatu, K.T., & Qaim, M. (2017). Rural food security, subsistence agriculture, and seasonality. PloS One, 12(10): e0186406. https://doi.org/10.1371/journal.pone.0186406.

Sirianni, C., & Friedland, L. (1998). Social capital. Civic practices network. University of California Press.

Souza, A.B.D., Fornazier, A., & Delgrossi, M.E. (2020). Local food systems: Potential for new market connections for family farming. Ambiente & Sociedade, 23, e02482. https://doi.org/10.1590/1809-4422asoc20180248r2vu2020L5AO.

Sutherland, L.A., Darnhofer, I., Wilson, G., & Zagata, L. (2014). Transition pathways towards sustainability in agriculture: Case studies from Europe; CABI: Wallingford, UK; ISBN 978-1-78064-219-2.

Takasaki, Y., Coomes, O.T., Abizaid, C., & Brisson, S. (2014). An efficient non-market institution under imperfect markets: labour sharing for tropical forest clearing. American Journal of Agricultural Economics, 96(3): 711-732. https://doi.org/10.1093/ajae/aat102.

Tshotsho, Lippert, C., & Feuerbacher, A. (2023). Organic agriculture, labour exchange, and social networks: A case study of smallholder farming in Bhutan. Organic Agriculture, 13(1): 83-98. https://doi.org/10.1007/s13165-022-00416-z.

Stone, G.D. (1996). Settlement ecology: The social and spatial organization of Kofyar agriculture. University of Arizona Press.

Vansant, E.C., Bezner Kerr, R., Sørensen, H., Phiri, I., & Westengen, O.T. (2022). Exchange and experimentation: Community seed banks strengthen farmers' seed systems in Northern Malawi. International Journal of Agricultural Sustainability, 20(7): 1415-1436. https://doi.org/10.1080/14735903.2022.2122254.

Vasco, C. (2014). Reciprocal and wage labour in rural Ecuador. A quantitative analysis. Journal of Agriculture and Rural Development in the Tropics and Subtropics, 115(1): 23-30. urn:nbn:de:hebis:34-2014020344866.

Velten, S., Jager, N.W., & Newig, J. (2021). Success of collabouration for sustainable agriculture: A case study meta-analysis. Environment, Development and Sustainability, 23: 14619-14641. https://doi.org/10.1007/s10668-021-01261-y.

Velten, S., Leventon, J., Jager, N.W., & Newig, J. (2015). What is sustainable agriculture? A systematic review. Sustainability, 7(6): 7833-7865. https://doi.org/10.3390/su7067833.

Wilson, C.A. (2001). Reciprocal work bees and the meaning of neighbourhood. Canadian Historical Review, 82(3): 431-464. DOI:10.3138/CHR.82.3.431.

Zhou, G. (2021). The mutual-support model of elderly care for aged farmers in Shandong province. In 6thAnnual International Conference on Social Science and Contemporary Humanity Development (SSCHD 2020) (pp. 973-978). Atlantis Press. DOI: 10.2991/assehr.k.210121.189.