

# Interrelation of Agricultural Value Chain Finance and Socioeconomic Factors of Farmers in the Rahad Agricultural Scheme of Sudan

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**Abstract:-** This paper aimed to assess financing of agricultural value chain with emphasis in mechanization in relation to farmers' socioeconomic factors. Primary and secondary data were collected from Rahad Irrigated Scheme by structured questionnaire. Stratified random sampling, descriptive statistical analysis and chi-square test to examine the association between variables were followed. The results showed that finance was the main obstacle to adopt recommended technical packages for 53.4% of the surveyed farmers. Informal sector was more prevailing than formal one. There was a significant relationship ( $p=0.03$ ) between technical package used and finance source. There was a very high significant relation ( $p=0.009$ ) between gender and finance source. It was a highly significant relationship ( $p=0.01$ ) between additional job and the annual income. There was a significant relationship ( $p= 0.03$ ) between gender and finance mode and Murabahah which is an Islamic commercial mode was dominant in financing.

**Keywords:-** Agricultural Value Chain, Finance, Mechanization, Rahad Scheme, Informal Sector.

## I. INTRODUCTION

Finance is a field that deals with the allocation of assets and liabilities over time under conditions of certainty and uncertainty. Finance can be broken into three different sub-categories: public finance, corporate finance and personal finance (Wikipedia, the free encyclopedia, 25 March 2015). Moreover, "credit may not always be the most suitable financial service. Safe deposits, leasing or insurance may be more appropriate" (Balkenhol, 1995). Without finance, enterprises cannot be created or sustained. All businesses whether they either large or small, are engaged in manufacturing or trade, located in the countryside or in the city, owner-managed companies or public corporations need access to regular and adequate financing for production, sales and distribution. Even informal income-generating activities need financial resources for working capital and investment purposes, as well as the know-how required to manage such resources".

Agricultural finance refers to financial services ranging from short-, medium- and long-term loans, leasing, crop and livestock insurance, covering the entire agricultural value

chain - input supply, production, harvesting and post-harvest techniques including processing, marketing and distribution. Agricultural financial services are provided by financial institutions as well as through financial arrangements within the agricultural value chain. While the majority of Africa's population lives in rural areas and depends on agricultural production, the supply of financial services to the sector is inadequate, with, on average, a mere 5 percent of domestic resources being allocated to the agricultural sector. Reasons for the lack of access to finance in rural areas and in the agricultural value chains are numerous. They can be found in the slow and uneven entry of formal financial institutions into rural areas, which leads to rural clients often remaining beyond the reach of financial outlets, to the reluctance of financial institutions to provide financial services to agricultural and rural activities, whose risk profile is frequently not fully understood and which are often informal in nature. Factors such as poor infrastructure and widely dispersed populations in rural areas raise transaction and information costs, thus further hindering the spread of financial services. In addition, title and property rights can be difficult to verify in rural areas, posing problems in the use of collateral. Farmers and agricultural companies typically face seasonal income and long maturation periods and are exposed to considerable risks. Seasonality requires specifically tailored financial services and conditions, such as longer repayment and grace periods, less frequent repayments, or leasing products. Agricultural risks to be considered include price fluctuations for inputs and products or crop failure due to pests and diseases, temperature or variable rainfall. A major problem facing farmers in the LDCs is the unavailability of inputs on a timely basis or the quantity required. This constraint is largely linked to the lack of credit, difficulties in obtaining foreign exchange, the lack of risk management and price formation mechanisms, the seasonality of agricultural input requirements, spatial dispersion of farmers, poor transport infrastructure and, sometimes, to the marketing and management inefficiencies of the state-owned companies and institutions which responsible for single channel input supply and marketing. The informal seed supply system is the dominant source of seed/planting materials for resource-poor farmers in marginal areas and has proven to cope better with a disaster situation compared to the formal seed sector. However big or small the resources mobilized for investment in agriculture, it is essential to cut the cost and improve the accessibility and reliability of loan funds to farmers, who are

the primary producers in the system. It is also crucial to make sure that a larger part of those resources reach the primary producers, the farmers in the form of support services for agriculture and loan funds for investment. The financial systems of most developing countries are made of two sectors: the formal and the informal financial sectors that operate side by side. The formal sector, also known as the organized sector is made up of the Central Bank, Commercial Banks, Development Banks, Building Societies, Insurance Companies etc. These institutions are mostly found in the urban and semi-urban settings. On the other hand, the informal financial sector also known as the un-organized sector consists of individuals such as money lenders, relatives, friends, neighbors, landlords, traders and group of individuals that operates mainly in the rural setting, (Mehrteab 2005).

The formal financial structure of Sudan is dominated by commercial banks in terms of both deposit-taking and lending. Globalization brings about enormous challenges to smallholder agriculture. Farmers need to adjust to changing market conditions and opportunities by commercialization of their existing agricultural activities or by diversifying into new enterprises. These strategies often require farmers to invest in farm-related assets, such as farm machinery, irrigation and post-harvest equipment, tree crops, transport, land or livestock. These investments need to be funded, sometimes with borrowed funds, involving amortization over long time periods. The basic idea is that transfer of existing technologies and economic knowledge from the more progressive to the lagging farmers could increase productivity. Mechanization and agricultural engineering technology are the most vital input through the value chain, a capital intensive inputs require high investments and money when compared to other agricultural inputs. Term finance (term loans and leasing) is provided for consumptive and productive purposes in mainstream banking. A further distinction has to be made between term loans to enterprises (mainly for productive purposes) and term loans to individuals (mainly for consumptive purposes). Term finance comprises several financial instruments such as term loans, leasing and equity finance. A further distinction can be made between medium-term (1–5 years) and long-term (above 5 years) finance. Which of these instruments is most appropriate for a specific purpose depends on a number of factors. They include size and cash-flow of the investment, socio-economic characteristics of the investor, financial market structure and the macro-economic environment. Especially in the case of larger investments with considerable capital requirements or a longer gestation period, external finance would be provided as term finance, to be repaid over several years.

According to FAO (2003), risks, transaction costs, lack of information and collateral are the main factors affecting the demand and especially the supply of term finance. Many of the specific underlying problems are interrelated and are general constraints for agricultural investments and the provision of finance to farmers. The central bank of Sudan used to finance all the other agricultural activities of the irrigated schemes including Rahad scheme through credit

which will be reimbursed at the end of the season. In 1992, the government of Sudan (SG) adopted a major reform and introduced liberal economy where all the government irrigated schemes were to be financed through a consortium of banks (mainly private banks) which were instructed to finance agriculture in the country. The interest of the Banks' credits were extremely high (about 70%) in comparison to the facilities offered by the Central Bank; financed without interest. This system resulted in a severe setback to the whole agricultural production. The consortium of banks doesn't have the sufficient resources; so this situation resulted in reduction of cultivated areas and lower productivity. Therefore the aim of this paper is to assess financing of agricultural value chain with emphasis in mechanization as the crucial input in relation to farmers' socioeconomic factors

## II. METHODOLOGY

The Study was conducted in Rahad National Agricultural Project which was established in 1973. The scheme is a socio – economic enterprise based on tenancy system school and it is very significant for the national economy. The existing Rahad scheme comprising 350,000 fed, irrigated through pumping station at Meina on Blue Nile. The pumped water is for supplementary irrigation during the dry period of river Rahad. The area is inhabited by about 250,000 families, the production relationship is based on land and water charges as determined by the corporation from season to season. The area allocated to 15,000 tenants. The size of holdings is 22 feddans for field crops and 20,000 feddans are allocated for separate tenants each five (5) feds . The Ministry of Agriculture appointed the Rahad Agricultural Corporation to be the responsible institution for managing farm operations in the Rahad scheme. Currently administratively, the scheme is divided into 3 groups; southern, central, and northern groups; each group consists of three sections also known as blocks. Every section contains five villages; villages were given numbers from 1-46 .The project is divided into nine (9) groups of approximately 33,000 feds as a basic administration unit. A tenth section was established in the north of the scheme as the third phase of the Rahad scheme. The main pattern of cropping was cotton, groundnuts and sorghum as summer crops and wheat and sunflower as winter crops in addition to horticultural and fodders (Rahad Agricultural Corporation, 2010).

The total development cost of the project was about 400 million dollars. Mainly financed by Kuwait fund, Saudi Fund, Arabs Fund, U-S AID and local components by the Sudan Government .

### ➤ *Population Sampling and Sample Size of the Study :*

The scheme is a socio – economic enterprise based on tenancy system school . A sample of farmers population of Rahad scheme was targeted in the research Stratified simple random sampling was done for the farmers in Rahad scheme. The process was done in consultation with the manager of the scheme intending to cover the 10 sections of the scheme with the larger portions for heavily populated areas or sections. Total number interviewed was (310) farmers, the respondents were 279 i.e. 90% of the total number interviewed.

➤ *Data Type and Collection Tools;*

Primary and secondary data were obtained and used in this research ; Primary data were obtained by conducting interviews , and surveys by the researcher with farmers using a questionnaire as tool for data collection in addition to interviews with some Key informants during 2013. The questionnaire was designed and prepared in Arabic language including open-ended and close -ended questions according to the situation and the qualitative and quantities information required .It was structured and consisted of about 51 indicative questions.

Secondary data; were collected and utilized from previous studies, published papers, workshops, seminars proceedings, studies and annual reports and other relevant sources .

➤ *Data Analysis Procedures;*

Data collected were coded, computerized and analyzed using the Statistical Analysis System (SAS) program to carry out descriptive analysis frequency matrix and percentages for the variables of the study. Chi-square Test of Independence was used as an inferential test to determine the existence and the level of relationship between two nominal (categorical) variables. The frequency of one nominal variable was compared with different values of the second nominal variable. The test is based on the level of significance of 0.05 (significant), 0.01 (highly significant) and, 0.001 (very highly significant).

**III. RESULTS & DISCUSSION**

The results reflected that the majority (83.5%) of the interviewed farmers was males as shown in figure (1) and that coincide with the fact that most families in Sudan are headed with males and lands are mainly owned by men.

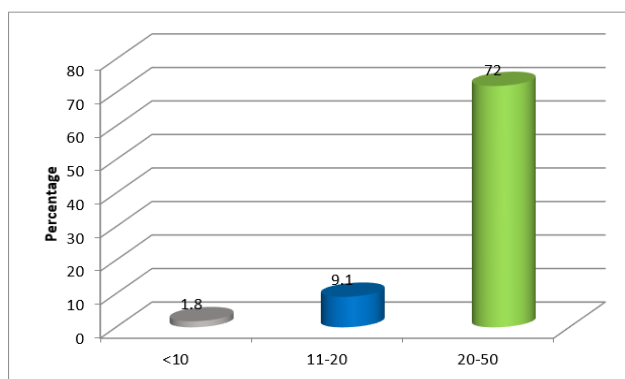


Fig 2 Percentage Distribution of Respondents by age

The higher percentage of young people reflected the trend of prevalence of young in Sudan and other developing countries, (Plecher, 2020). 89.2 % were educated at least at the preliminary level. About 76.3% had their own land, which indicated that there is a possibility of technology application and adoption due to the stability of the land ownership. Fuglie and Kascak (2001) found that human capital is positively correlated with innovators or early adopters; farmers with higher levels of education adopt new technology more rapidly than farmers with only a high school diploma; and laggards are associated with lower education .About 63.8% of the respondents attaining an area of about 5-500 feddans (Figure, 3).

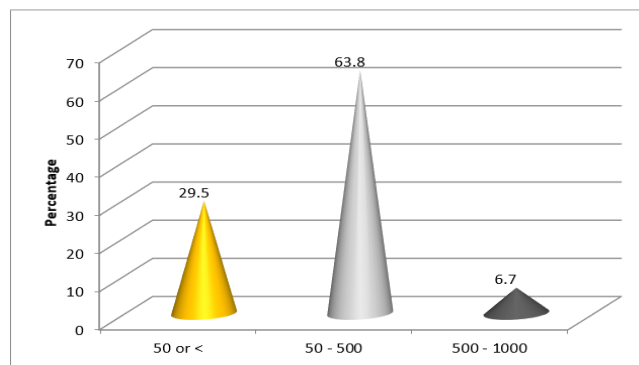


Fig 3 Percentage Distribution of Respondents by area

They used to use their family members as labor in addition to hired labors in their farms ( figure 4) .

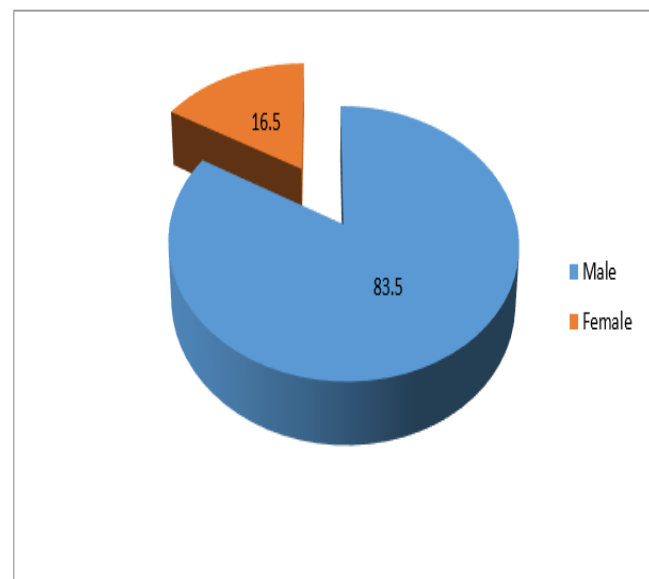


Fig 1 Percentage Distribution of Respondents by Gender

68.3% were married, and 71.9% within the economically productive range 20-50 years old as shown in figure (2) ;

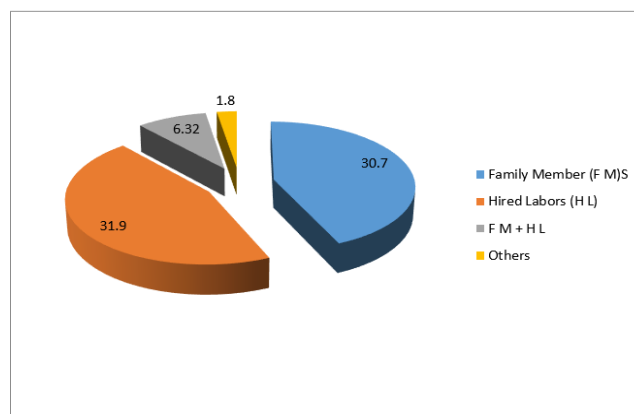


Fig 4 Percentage Distribution of Respondents by Labor force

The majority (79.45%) had permanent or casual additional jobs .The annual income for about 34.89% within an average 1500 SDG which was not enough even for living cost ( figure ,5) .

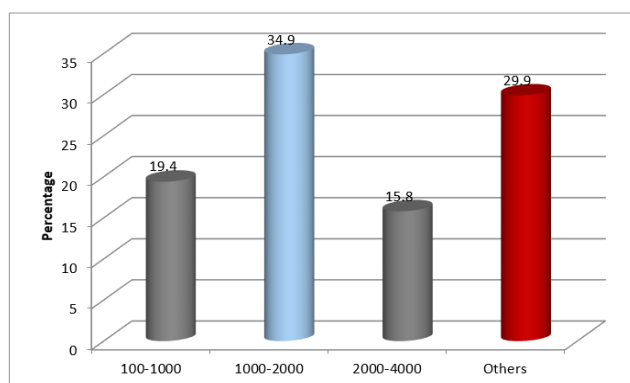


Fig 5 Percentage Distribution of Respondents by Annual Income

As illustrated in figure (6) ,the results declared that the majority (64.21%) of the respondents were involved in crop production, followed by animal husbandry (17.34%) and 18.45% were poultry producers and others.

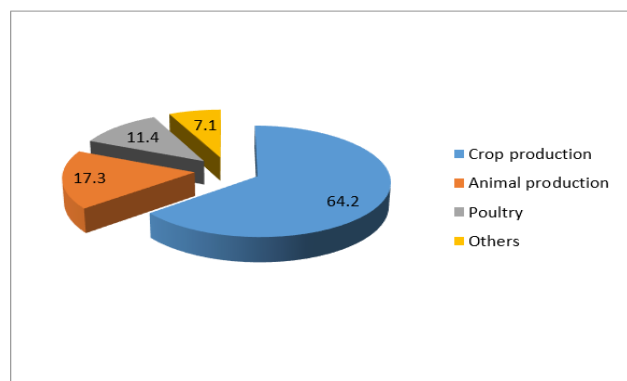


Fig 6 Percentage Distribution of Respondents by Activity type

Some farmers had stockyard, buildings, and the least portion (2.15%) owned machinery in their fields , shown in figure (7).

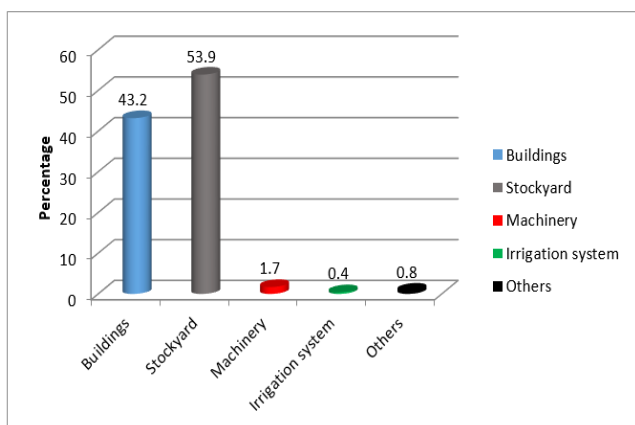


Fig 7 Percentage Distribution of Respondents by Assets Existence.

Technology adopted and implemented were very negligible and low productivity was the most constraint( figure 8).

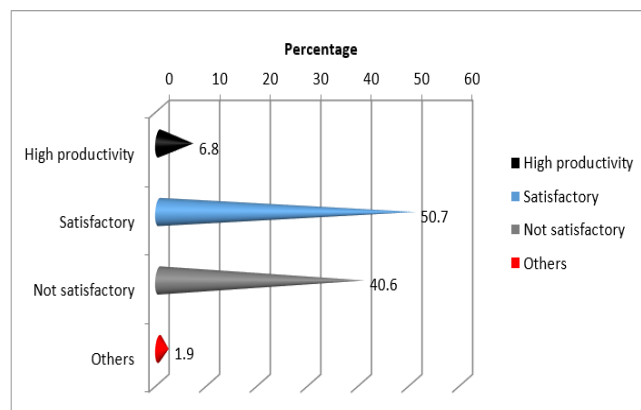


Fig 8 Percentage Distribution of Respondents by Level of Productivity

Figure (9) illustrated that more than half of the respondents (53.4%) attributed their low productivity to financial reasons, while 28.99% attributed that to technical and managerial reasons which also might arise from financial reasons.

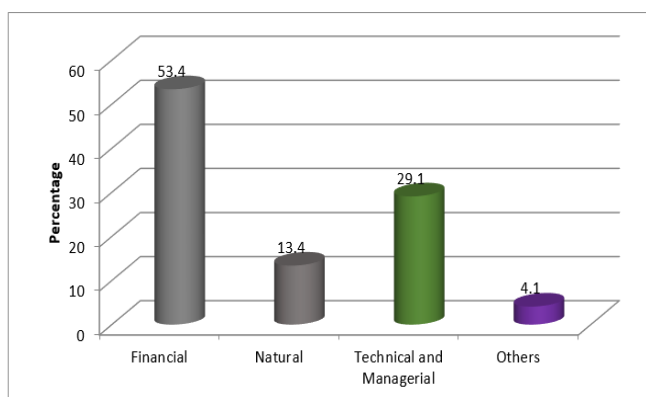


Fig 9 Percentage Distribution of Respondents by Low Productivity Reasons

This is supported by a study carried by Allam Ahmed ( 2004) , who proved that there was a very high correlation ( 0.819) that existed between productivity increase and the availability of finance and funding and described finance as the major constraint facing farming in Sudan .He emphasized that farmers need new high-payoff inputs and technologies to increase their productivity. About 42.9% of farmers said that they were using fertilizers and /or chemicals as technical packages in their cultivation, and those who were using machinery (mostly for land preparations and harvesting) were only 19.6%( figure 10). Low level of technical package used and machinery existed and used were indicators for the low mechanization level and technology been used in Rahad scheme which supposed to be fully mechanized. Negatu and Parikh(1999) examined the conventional (traditional) factors which influence farmers' technology adoption decision and identify these factors to include resource endowments, socio-economic status; demographic characteristics; as well as access to institutional services.

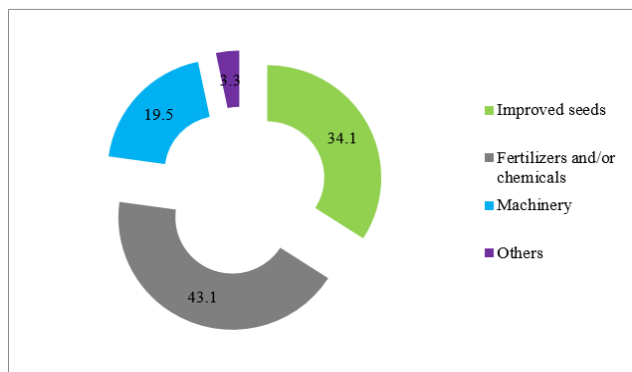


Fig 10 Percentage Distribution of Respondents by Technical Package Used.

(55.6%) of those who were financed by the agricultural bank claimed the insufficiency of finance, as more than half (52.8%) was financed by less than 10000 SDG only. Murabahah was the dominant mode followed by Muzarahah, and Musharakah was the least score. Those modes were used for both whether they were operating cost or capital one.

The results of the study as shown below in the figures reflected that (12.5%) of farmers said that the finance for the operational cost was done by banks and the rest which was the majority by informal sources. Figure (11) showed that (33.2 %) of those who had machinery and equipment were financed by the banks and mostly by the Agricultural Bank of Sudan.

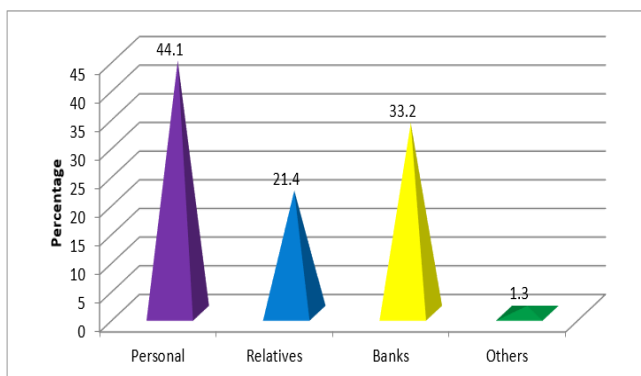


Fig 11 Percentage Distribution of Respondents by Machinery Finance Source

The informal sources were more dominant in the scheme than the formal for both operational and capital cost and that was supported by (Mehreteab 2005), who defined individuals in the rural area such as money lenders, relatives, friends, neighbors, landlords, traders as informal sources. It was found clearly that the informal sources play a vital role in financing operational cost but they failed in financing machinery and agricultural technology. That was confirmed by FAO (2013) which stated that high capital and operational costs of mechanization coupled with low commodity prices were the most important factors that have driven agricultural mechanization in the past 60-70 years in the region. According to State Bank of Pakistan a distinction should be made in terms of loan type and modes between operational and capital cost. About 72.4.8% fulfilled their loans even though not within the specified period.

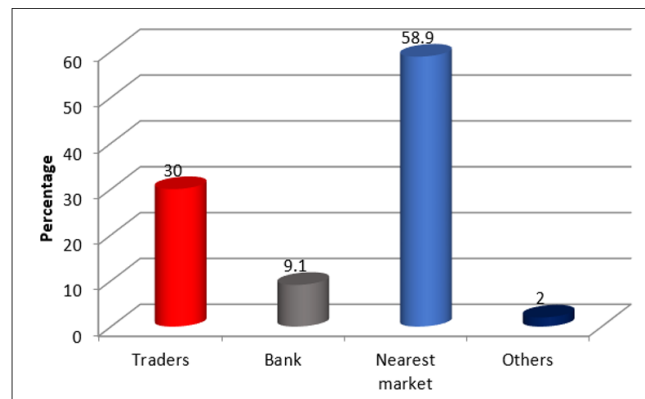


Fig 12 Percentage Distribution of Respondents by Marketing Channels

Those (56.6%) who did not fulfill their loans or fulfilled them partially attributed that to the unsuitability of the payback criteria, insufficiency of the grace period, low productivity, marketing obstacles, or not using the loan in its purpose (Fungibility). Only 30.1% of the farmers fulfilled their loans from the transaction itself, but the majority (61.7 %) said they did their payment from their off-farm additional jobs beside the transaction itself. Regarding the bank support in case of not fulfilling loans about 65.3% was unaware of the role of the bank in that area. About 48.80% believed that legal action should be taken in case of not fulfilling loans, and about 33.2% attributed finance obstacles to finance procedures. Although the majority (64.6%) described the margin profit as suitable or not high but about 57.2% denied the suitability of the collateral for them as small farmers. The majority (71.2%) and about (54%) of the interviewed farmers denied the role of the Agricultural bank in the extension, and in the marketing respectively, illustrated by figure 12.

Only (9.1 %) of the interviewed farmers sold their products to the bank. Figure 13 illustrated that about (41.8%) of respondents got their information from traders, and they used to sell their products to the nearest markets, and the low prices were the most obstacle.

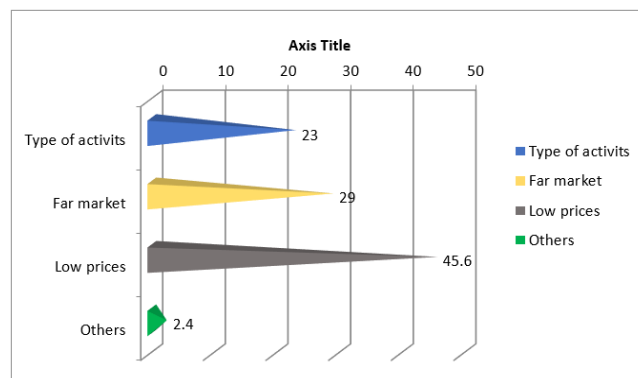


Fig 13 Percentage Distribution of Respondents by Marketing Obstacles

Negate and Parikh (1999) thought that it is very important to strengthen the linkages with farmers and among farmers themselves. Farmers need Information to improve or adapt their farming practices and extension can provide them with relevant and timely information.

➤ *Based on Assumptions that there were Relationships Between Some Selected Variables;*

Tables below (3.1 to 3.6) illustrated that, although there was no significant relationship between gender and bank as source of finance (p=.95) but there was a very high significant relation (p=0.009) between gender and finance source whatever it was.

Table 1 Gender by Finance Source

Gender	Finance Source					
	Themselves	Relatives	Banks	Shale	Others	Total
Male	97 (36.1)	43 (16.0)	85 (31.6)	2 (0.7)	1 (0.4)	228 (84.8)
Female	10 (3.7)	16 (6.0)	13 (4.8)	2 (0.7)	00.0	41 (15.2)
Total	107 (39.8)	59 (21.9)	98 (36.4)	4 (1.5)	1(0.4)	269 (100.0)

Chi value = 13.5\*\*\* P=0.009

Table 2 Gender by Finance Mode

Gender	Finance mode					
	Muraabahah	Musharakah	Muzarahah	Salam	Others	Total
Male	73 (41.7)	24 (13.7)	33 (18.9)	25 (14.3)	1 (0.6)	156 (89.2)
Female	6 (3.4)	8 (4.6)	5 (2.9)	0 (0.0)	0 (0.0)	19 (10.9)
Total	79 (45.1)	32 (18.3)	38 (21.7)	25 (14.3)	1 (0.6)	175 (100.0)

Chi value =10.9 p= 0.03

Table 3 Education Level by Bank as Finance Source

Education	Bank as finance source				
	Agricultural Bank	Bank A	Bank B	Other	Total
Illiterate	6 (3.9)	1 (0.6)	3 (1.9)	0 (0.0)	10 (6.4)
Preliminary	46 (29.5)	2 (1.3)	0 (0.0)	0 (0.0)	48 (30.8)
High 2ndry school	50 (32.1)	10 (6.4)	5 (3.2)	0 (0.0)	65 (41.7)
Graduate	22 (14.1)	7 (4.5)	2 (1.3)	1 (0.6)	32 (20.5)
Others	1 (0.6)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.6)
Total	125 (80.1)	20 (12.8)	10 (6.5)	1 (0.6)	156 (100.0)

Chi value = 23.9 p=0.02

There was no relationship (p=0.4) between gender and finance volume and no relationship (p=0.4) between gender and finance inaccessibility but still there was a significant relationship (p= 0.03) between gender and finance mode. Tables showed that there was no significant relationship (p=0.5) between education and finance source and a significant relationship (p=0.02) between education and the bank as source of finance .Also there was no significant relationship between education and finance volume (p=0.7), education and finance mode (p=0.1), and between education and finance inaccessibility (p=0.3).The analysis result shown in tables indicated that there was a significant relationship (p=0.03) between technical package used and finance source There was no significant relationship (0.6) between technical package used and the bank as source of finance and technical package used and finance volume (p=0.11).But regarding the relation with the finance mode and finance inaccessibility there were highly significant relationships (p=.0001) and (p=0.04) respectively. They revealed that It was very highly significant relationship (p=0.0001) between machinery used

and finance source as well as very highly significant relationship ( p=0.0001) between machinery used and the bank as source of finance . It was very highly significant relationship (p=0.0004) between machinery used and the finance volume as well as very highly significant relationship (p= 0.0001) between machinery used and finance mode. However, regarding inaccessibility there was no significant relationship (p= 0.11) between machinery used and finance inaccessibility.

It was very highly significant relationship (p=0.0001) between the purpose of machinery existed and finance source. There was a significant relationship (p= 0.03) between productivity and low productivity reasons. There was no significant relationship (p= 0.21) between the existence of additional job and the finance source. It was a highly significant relationship (p=0.01) between additional job and the annual income. There was no significant relationship (p= 0.27) between finance volume and loan fulfillment.

Table 4 Technical Package Used by Finance Source

Technical package used	Finance source					
	Themselves	Relatives	Banks	Shale	Others	Total
Improved seeds	27 (10.2)	8 (3.0)	17 (6.4)	1 (0.4)	1 (0.4)	54 (20.4)
Fertilizers and/or Chemicals	56 (21.2)	39 (14.8)	52 (19.7)	1 (0.4)	0 (0.0)	148 (56.1)
Machinery	19 (7.2)	9 (3.4)	27 (10.2)	1 (0.4)	0 (0.0)	56 (21.2)
Others	3 (1.1)	1 (0.4)	1 (0.4)	1 (0.4)	0 (0.0)	6 (2.3)
Total	105 (39.8)	57 (21.6)	97 (36.7)	4 (1.5)	1 (0.4)	264 (100.0)

Chi value = 22.7 p=0.03

Table 5 Technical Package Used by Finance Mode

Technical package used	Finance mode					
	Muraabahah	Musharakah	Muzarahah	Salam	Others	Total
Improved seeds	28 (16.2)	1 (0.6)	3 (1.7)	16 (9.3)	1 (0.6)	49 (28.4)
Fertilizersand /or Chemicals	30 (17.3)	20 (11.5)	23 (13.3)	5 (2.9)	0 (0.0)	78 (45.0)
Machinery	17 (9.8)	10 (5.8)	10 (5.8)	4 (2.3)	0 (0.0)	41 (23.7)
Others	3 (1.7)	0 (0.0)	2 (1.2)	0 (0.0)	0 (0.0)	5 (2.9)
Total	78 (45.1)	31 (17.9)	38 (22.0)	25 (14.4)	1 (0.6)	173 (100.0)

Chi value = 41.1 p=0.0001

Table 6 Technical Package Used by Finance Inaccessibility

Technical package used	Finance inaccessibility						
	Provisions	Procedures	Modes	Feasibility study	All of them	Others	Total
Improved seeds	18 (6.9)	19 (7.3)	0 (0.0)	2 (0.7)	12 (4.6)	0 (0.0)	51 (19.5)
Fertilizers and /or Chemicals	41 (15.8)	27 (10.4)	9 (3.5)	28 (10.8)	37 (14.2)	4 (1.5)	146 (56.2)
Machinery	15 (5.8)	21 (8.1)	5 (1.9)	6 (2.3)	9 (3.5)	1 (0.4)	57 (22.0)
Others	3 (1.2)	2 (0.7)	0 (0.0)	0 (0.0)	1 (0.4)	0 (0.0)	6 (2.3)
Total	77 (29.6)	69 (26.5)	14 (5.4)	36 (13.9)	59 (22.7)	5 (1.8)	260 (100.0)

Chi value = 25.6 p=0.04

**IV. CONCLUSION**

The study concluded that; The Rahad National Scheme has already been constructed as a socioeconomic enterprise and supposed to be fully mechanized. The area is inhabited by about 250,000 families, the production relationship is based on land and water charges as determined by the corporation from season to season. The area allocated to 15,000 tenants. The size of holdings is 22 feddans for field crops and 20,000 feddans are allocated for separate tenants, each five (5) feddans. More areas could be attained through purchasing or inheriting. Financing of the value chains ; production ,harvesting and post-harvest techniques including processing , distribution and marketing for field crop production ,horticultural crops or livestock production were done mainly by the informal sector .Mechanization is crucial and should be considered through the value chains to increase productivity and optimize production. Formal sector should play their hypothetical role to finance farmers and mitigate risks .

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