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Enhancing Rural Livelihood Through Income-Generating Activities: A Study in Remote Rural Communities in Beni-Suif and El-Minya Governorates

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ABSTRACT

The new rural communities in Egypt face pressing socio-economic, political and environmental challenges. These challenges drove the urgent need to give more attention to the agricultural sector via its modernization, coupled with sustainable use of natural resources. Yet, the development of the non-farm sector offers an alternative option to rural people who are not employed in agriculture. Therefore, the current study explores the effect of farm as well as non-farm income-generating activities (IGAs) on rural livelihood in four remote rural communities in Beni-suif and El-Minya governorates in Egypt grapple with poverty and limited opportunities threatening their livelihoods. Using a pre-tested structured questionnaire, the study data have been collected randomly in October and November 2022 from 300 households (classified into 185 farm and 115 non-farm respondents or 234 males and 66 females) who participated in IGAs. The collected data were analyzed by using descriptive statistics, Pearson chi-square, Paired-sample t-test, Wilcoxon signed-rank test and Multiple regression analysis in order to achieve the study objectives. The findings revealed that both farm and non-farm income generation activities significantly improve respondents' quality of livelihood across human, social, economic, natural, and physical capitals. The findings also indicated that non-farm activities have a more positive effect on respondents' quality of livelihood compared to farm income-generating activities.

KEYWORDS: Rural income-generating activities, Sustainable livelihood, Quality of livelihood

1. INTRODUCTION

The Sustainable Development Goals (SDGs) set forth an ambitious agenda for global action to address the challenges of poverty, inequality, and environmental degradation. Among its ambitious targets, goal 8 of the SDGs specifically aims to promote higher levels of economic productivity through diversification, technological upgrading and innovation, promoting productive employments and decent work for all. This goal underscores the importance of income diversification and income-generating activities (IGAs) in fostering

sustainable livelihoods and reducing poverty, particularly in rural areas where agriculture often serves as the primary source of income (J. Hickel, 2019).

Improving rural incomes and rural poverty reduction are mainly based on the engagement of individuals in economic activities and productive income creating employments that enable them to sustain and improve their livelihoods (S. Abosedra, *et al.,* 2016). Hence, the Government of Egypt in collaboration with the International Fund for Agricultural Development gave particular attention to the sectors where most of the poor and vulnerable are employed in, especially after the concurrent shocks including climate change, covid-19 pandemic and inflation since 2020 (S. Haggblade, *et al.,* 2010 and S. Bernardin, 2012; M. Hung Do, 2023). Clearly, this attention should be circulated around the new and remote rural areas, due to the fact that the rural Egypt has the highest share of poor population compered to urban Egypt. Moreover, more than half of the population residing in rural Upper Egypt is considered poor (CAPMAS, 2023).

Agriculture has been and remains the main source of rural livelihood for the majority of households not only in Egypt but also in all developing countries. On grounds of that, agriculture is expected to be one of the pillars upon which rural economic development stands on and consequently has a fundamental role in poverty reduction (A. Bedemo, *et al.,* 2014). But, evidence from various contexts concluded that agriculture on its own is inadequate to provide a pathway out of poverty, means of sustenance and livelihood for the majority of rural poor households (E. Asmah, 2011; A. Bedemo, *et al.,* 2014). The Egyptian Central Agency for Public Mobilization and Statistics (CAPMAS) reported that the agricultural sector's share of employment has shrunk to 18.9% of the total workforce in 2022. This represents a significant decline from 35% in the past two decades, when agriculture employed a much larger portion of Egyptians (Zaki et al., 2020).

To support the agricultural sector and reduce farm income fluctuation, several key areas must be addressed in conjunction with agriculture. These include strengthening the asset base of rural poor populations, facilitating access to technological innovation, enhancing the competitiveness and sustainability of smallholder farmers, and diversifying income sources into the rural non-farm economy (Stifel, D., 2010).

This study seeks to fill the gap in the existing literature on rural development and provide policymakers and practitioners with evidence-based strategies for poverty reduction and sustainable development in remote rural areas with limited services and facilities.

With reference to Egypt most of empirical studies done were focusing on either farming for future economic growth (Mellor and Gavian, 1999; K. Saleh, 2014; G. Elmonofi, *et al.,* 2013; G. Hafez, 2014) or non-farming income generating activities (J. Adams and H. Richard, 2002; A. Croppenstedt, 2006) with little evidence on the importance of combined role of farm as well as non-farm IGAs as a successful strategy to fight poverty and promote sustainable development in remote rural areas. Therefore, the focus of this paper is to highlight the role of diversifying rural IGAs in poverty reduction, quality employment opportunities and sustainable use of natural resources that can be reflected through better quality of life for the rural households, and improved, sustainable communities.

2. PROBLEM STATEMENT

In light of the fact that the agricultural sector in Egypt is the core of the rural economy and is considered to be the main source of livelihood for the majority of the rural population. The social, economic, political and environmental circumstances happening to the agricultural sector in Egypt resulted in a marked deterioration in the sector performance and diminishing its contribution to the national GDP over the past 50 years from 29% to 16% between the years 1970 to 2000 and from 16% in 2000 to 11.6% in 2017 and 10.9% in 2022 according to the latest statistics published by CAPMAS 2023. These can negatively affect the livelihoods of rural households depending on the sector directly or indirectly. Moreover, the ribbon of the agricultural land along the Nile valley is subjected to degradation and over farming, that subsequently reduce the soil quality, meanwhile the land productivity is not able to satisfy the food requirements of the fast-growing

population. A critical need to expand into new rural areas and reclamation of desert lands has been chasing an important governmental strategy to enhance the agricultural productivity, promote food security, alleviate the stresses on the old lands and create employment opportunities. However, the government has invested considerable resources for the rehabilitation of the new rural areas, although these areas are facing challenges that hinder their growth and development including lack of access to financial services, reduction in some crops production as a result of adverse effects of climate change, lack of access to services offered by agricultural cooperatives and community development associations**.** Therefore, diversification of rural income sources plays a crucial role in improving rural people's livelihoods, mitigating the consequences of economic shocks; it also acts as a coping mechanism against unpredictable events. The current research was formulated from this point of departure.

1. What are the socio-demographic characteristics of the respondents?
2. What are the forms of changes driven to the respondents' livelihoods after having a new income generating activity whether main or additional source of income?
3. Does the type of income-generating activity (farm or non-farm) influence the respondents' quality of livelihood?

3. RESEARCH OBJECTIVES AND HYPOTHESES

The current study broadly aims at examining the effect of diversifying income sources both farm and non-farm IGAs on the rural livelihoods over the remote rural space

1) Identify the respondents' socio-demographic characteristics.
2) Identify the relationship between the respondents' financial capital and their engagement in either farm or non-farm IGAs.
3) Determine the change that comes about to the respondents' livelihoods after having a new income generating activity whether main or additional source of income.
4) Assess the effect of the studied independent variables including farm and non-farm IGAs on the respondents' quality of livelihood

Upon the above-mentioned objectives, research hypotheses have been formulated:

Hypothesis one (H1): there are relationships between the respondents' financial capital and their engagement in farm IGAs (H1.1) or their engagement in non-farm IGAs (H1.2)

Hypothesis two (H2): There are changes in the respondents' quality of livelihood regarding their human capital (H2.1), social capital (H2.2), natural capital (H2.3), physical capital (H2.4), and financial capital (H2.5) before engaging in IGAs to after.

Hypothesis three (H3): There are relationships between the respondents' quality of livelihood and their gender (H3.1), age (H3.2), marital status (H3.3), household size (H3.4), years of education (H3.5), Housing conditions (H3.6), source of information (H3.7), animal holding (H3.8), trainings' extent of benefit (H3.9), Physical capital (H3.10), contribution of the activity in the total household income (H3.11), farm activity (H3.12), non-farm activity (H3.13).

4. LITERATURE REVIEW

Sheheli (2012); Ndhlovu (2018); Mbajiorgu, (2021) and Allison (2004) agreed that sustainable livelihood approach originated by studies that target to improve rural livelihoods, reduce poverty, and enhance peoples' capabilities to cope with crises.

The current study has adopted the sustainable livelihoods approach as its basis for the purpose of understanding and focusing more clearly on the livelihoods of the poor. This approach provides a framework for organizing the factors that either limit or improve opportunities for rural peoples' livelihoods, and illustrates their interrelationships. Additionally, the approach can assist in the planning of development activities and evaluating the effect of existing activities on sustaining rural livelihoods (O. Serrat, 2008)

The sustainable livelihood approach encompasses a mindset that guides development priorities, it is also underpinned by set of principles derived from sustainable livelihoods (SL) concepts which developed by the Department For International development

(DFID, 1999). This approach draws on a range of tools, including the sustainable livelihood framework, to inform and facilitate decision-making and action plans. By adopting this approach, development practitioners can effectively address the complex dynamics of livelihoods of rural people and prioritize sustainable development outcomes.

Livelihood: refers to the means of earning a living, encompassing the activities, resources, and strategies employed to secure basic necessities and achieve a certain standard of living. It focuses on the economic dimension of individual and household survival and prosperity (N. Khan, *et al.*, 2020).

Sustainable livelihoods: Livelihoods that meet the needs of the present without compromising the ability of future generations to meet their own needs. IGAs can contribute to sustainable livelihoods by providing income diversification, reducing vulnerability to shocks, and promoting environmentally friendly practices (S. Paudel, *et al.*, 2017).

The International Labor Office (2019) refers to the economic diversification of the rural economy as the integration between farm and non-farm income generating activities within rural areas or the diversification of the income sources within these sectors.

Rural economic diversification is a dynamic phenomenon, within farm and into non-farm activities; it has significant potential on poverty reduction, improving coping mechanisms in face of agricultural seasonality or price fluctuations, improving food security, providing better-paid jobs and construction of sustainable livelihood of rural households (M. Israr, *et al.*, 2014; K. Hussien and J. Nelson, 1998).

Poverty is generalized in rural areas; in this respect the ILO (2015) noted the importance of modernizing the farm sector and diversifying into the non-farm sector as a key objective for countries aimed at reducing poverty rapidly. This aim is in the heart of the Egypt vision 2030, and comes in consistency with some pillars of the sustainable development strategy as the following: 1) A well-balanced, knowledge-driven, competitive and diversified economic system that is structured in such a way that it promotes innovation and wide range of sectors to attain sustainable growth. 2) The efficient use of renewable energy and natural resources is one of the on-farm diversification strategies contributing to economic growth, in addition to that it leads to diversified rural economic outputs providing new jobs and a vehicle for poverty alleviation.

The coming section is classified according to the Food and Agriculture Organization (FAO, 2008) initial division to farm and non-farm rural income generating activities (B. Davis, *et al.*, 2008).

According to the 2017 Egypt Labor Market Survey, 19.4 million Egyptians were employed in informal employment, which includes both farm and non-farm IGAs. Of these, 13.6 million were employed in farm IGAs and 5.8 million were employed in non-farm IGAs.

With reference to rural areas, 42% of rural households in Egypt were engaged in IGAs. Of these, 28% were engaged in farm IGAs and 14% were engaged in non-farm IGAs (C. Krafft, et al., 2021).

According to the CAPMAS latest statistics in 2023 census, more than half of the Egyptian population (60,049,000) is residing in rural areas representing about 57.1% compared to about 42.9% residing in urban areas (45,125,000). The rural areas in Egypt house the majority of the poor population, with poverty rates being three times higher than that of the urban poverty rate (G. Hafez, 2014; IFAD, 2021).

Since agriculture is a key economic activity, principal development option and a major source of income for most of the rural population who are relaying in many ways on agricultural sector for their sustenance (G. Elmonofi, *et al.*, 2013: I. Al-Ayoty, 2022). Also, it is crucial to emphasize that the positive impact of rural growth on poverty reduction extends beyond rural areas and significantly affects poverty reduction in urban areas. Furthermore, agricultural growth has the potential to contribute to reducing income inequality in both rural and urban areas (F. Bresciani and A. Valdes, 2007). Therefore, agricultural development and modernization is a significant diversification on-farm strategy (P. Zohonogo, 2011); to compensate the losses that may results from climate change, maximize revenues, strengthen natural resources utilization and stimulate agricultural development, reduce rural

poverty, improve food security, offer job opportunities and enhance rural livelihoods as a whole (K. Saleh, 2014).

The Department For International Development (DFID), developmental report (2004) suggested that agricultural development can be a ladder out of poverty and improvement in the livelihood of millions in some ways;

1) Agricultural development should have a direct impact on rural income improvements for both landowners and landless farmers.
2) Agricultural development should lower food prices for both rural and urban populations.
3) Agricultural development has an indirect effect on the non-farm sector by creating job opportunities.
4) Agricultural development should have a key role in switching rural areas from agricultural-based to processing, manufacturing and services.

The utilization of solar energy is a sustainable, clean, reliable, money saving technology for rural electrification in addition to improving the financial situation of farmers (O. M. Roche and R.E. Blanchard, 2017). In this setting, the World Bank (2018) reported that about 7.6 billion EGP was spent annually on energy consumption in agriculture between the years 2007 and 2017. This clean technology has emerged as a consequence of the rising energy prices which coincide with gradual removal of energy subsidies. Since agricultural sector is a key and growing market utilizing solar energy in Egypt. Thus, replacing diesel power pumps with the fuller utilization of solar energy is a transformative step especially in remote rural areas in Egypt that contributes dramatically to the support of farmers by stable, competitive and cheaper source of energy in agricultural process particularly in irrigation, moreover preserving the environment by reducing the carbon dioxide emissions (CAPMAS, 2018).

The Nile water is the major contributor to the agricultural sector in Egypt. Since Egypt is not a rain-fed country and is totally dependent on the Nile water for irrigation purposes. Regrettably, Egypt officially enters the state of water poverty and falls under the water poverty line as a consequence to the massive population growth with an average individual share 570 cubic meters of water per capita per year meanwhile the Egypt's annual share of water is stable equals 55.5 billion cubic meters of water per capita per year (Y. Kassim *et al.,* 2018). Over and above the country is on its way to absolute water poverty with an average individual share less than 500 cubic meters of water per capita per year in 2025 (F. Alemadi., 2021)

Although, the agricultural sector is challenging the issues of water scarcity and lack to water resources most notably remote rural regions depending mainly on the groundwater (Osman R., *et al.,* 2021). Upon the previous, agricultural productivity is restricted by water scarcity and this situation is getting worse by the construction of the Grand Renaissance Dam in Ethiopia. Hence, a developed and efficient irrigation system is a crucial element for the sustainable and efficient use of the available water resources (Osman, *et al.,* 2016). In this context, L. S. Gidi (2013) argued that multiple routes lead to technological development in agriculture, drip irrigation is one of the improved technological advances not only for agricultural development, but also natural resources conservation and socio-economic enhancement.

Livestock rearing is a traditional activity carried out by rural households involving large animals, small animals and poultry for family and market consumption. Artificial insemination is one of the technological advances that not only positively correlated to the household income but also it's a way for securing animal protein to confront the rapidly growing population (A. Alwishy, 2013). S. Walsh, (2011) argued that the reproductive efficiency of cattle is significantly affected by some factors such as; inadequate nutrition, improper management practices and unfavorable environmental conditions leading to adverse impacts in terms of quality and quantity of meat and milk. On the contrary, artificial insemination in cattle plays a vital role in improving genetics, disease control, reproductive efficiency, convenience, and access to superior genetics. It offers numerous benefits to farmers, leading to increased productivity, profitability, and sustainability in the cattle industry (A. Mohamed, 2018).

By integrating sustainable agriculture with sustainable development principles, rural

areas can achieve economic prosperity while preserving natural resources, fostering social well-being, and enhancing resilience to environmental challenges (A. Trigo, *et al.*, 2021).

Basically, there are two income diversification strategies that are classified on conceptual bases: off-farm and non-farm.

According to F. Ellis, (1998) and Z. B. Weldegebriel, *et al.*, (2015), off-farm diversification activities are defined as all agricultural-related activities that take place beyond the farm, for instance post-harvest processes, food processing, compost making and packaging. In addition to technical work related to natural resources including wood collection and charcoal extraction. However, all the above-mentioned activities could be seasonal and they may differ from one context to another. While non-farm activities refer to activities that are not related to crop and/or livestock production and can be classified according to FAO (2008) to wage work and self-employment and an important agent for economic growth in rural areas, including carpentering, plumbing, electricity, sewing, food processing, pottery making, electrical devices maintenance, mobile devices maintenance, construction, and transportation (Z. B. Weldegebriel and M.Prowse 2013; A. Loko, *et al.*, 2017; J. Ukoha, *et al.*, 2021).

The current review of literature is focusing on non-farm activities as a risk insurance and income smoothing method for the rural economy:

It is a fact that in new rural areas, limited job opportunities within the non-agricultural sector are available to rural households. Consequently, the unfavorable and risky farming conditions, rural households are heavily relying on crop production and livestock for their livelihoods (DFID, 2004). Non-farm income is an economic diversification mechanism that requires less resilience on agriculture and more dependency on services in order to minimize the adverse impact of household income fluctuations resulting from agricultural seasonality, hence, sustain poverty reduction (J. Lanjauw and P. Lanjauw, 2001; S. Haggblade *et al.*, 2010). Similarly, p. Lanjouw, (1999) and P. Zahonogo, (2011) emphasized the importance of nonfarm activities in creating a continuous stream of income as a pathway that can be attributed to the declining farm income, and the aspiration to mitigate risks associated with agricultural production.

Income diversification via non-farm activities is considered as a crucial component in the livelihood strategies of rural households even though agriculture is the core economic activity in rural areas (Z. B. Weldegebriel, *et al.*, 2015). According to the World Bank report (2006) in Egypt, rural households can be pulled into non-farm income generating activities fundamentally when the household is landless and may lack education. The rural households' participation in non-farm income generating activities enable them to be secured from economic instability which can be summarized as reducing the purchasing power, increasing vulnerability to poverty, limiting investment capacity on one hand. While on the other hand, non-farming economic activities require minimal capital investments while providing more job opportunities than the agricultural activities do (N. Nersin and T. Wahid, 2015).

Additionally, non-farm income generating activities can positively correlated to the wellness of the community by absorbing the surplus labor force, slowing down the rural urban migration, contributing to growth and development in rural areas and enhancing economic base. N. Nersin and T. Wahid (2015); J. Lanjauw and P. Lanjauw, (2001) pointed out that non-farm job opportunities have a significant effect on poor households, strictly speaking those who are peasant wage workers in agriculture. Because, the agriculture labor market in Egypt is characterized by hiring farm labor on a casual day-to-day bases which is not sufficient for the households to survive especially during the agricultural off-picks. In this setting, K. Neglo, (2021) indicated that the non-farming income generating activities are a stabilizing income mechanism, welfare improvement alternative and a successful coping diversification strategy.

Indeed, IGAs play a significant role in enhancing sustainable livelihoods and addressing socio-economic challenges, particularly in developing economies. They have increasingly been recognized as a valuable tool to alleviate poverty and improve overall

well-being (E. Kaukumangera, 2021; M. Kumari, *et al.*, 2021).

The United Nations Development Program acknowledge that IGAs, are a vehicle to stimulate economic activity, generate job opportunities, and ultimately improve the well-being of individuals and communities (NDP 2,3,4), NDP5 2017/18-2021/22. In this respect IGAs play a crucial role in shaping various aspects of rural quality of livelihood as the following dimensions

1) Overall quality of life measures: A quality life encompasses more than just financial aspects. It includes physical health, mental well-being, social connections, and life satisfaction. While IGAs contribute to economic well-being, they also indirectly affect other dimensions of well-being. For instance, having a stable income can reduce stress and improve mental health (K. Deininger, and Y. Liu, 2019).

2) Social Inclusion:

Diversification of income and the promotion of IGAs can enhance social inclusion by providing opportunities for marginalized groups, empowering women, and fostering community participation. This supports the social dimension of sustainable development by promoting equity and inclusive participation in economic activities (S. Balestri, and S. G. Meda, 2016).

3) Environmental Sustainability:

Sustainable IGAs, such as organic farming, agroforestry, and renewable energy ventures, promote environmentally friendly practices and natural resource conservation. This aligns with the environmental dimension of sustainable development by ensuring the responsible use of resources and minimizing negative environmental impacts (C. Vezzoli, and E. Manzini, 2008).

4) Access to essential goods and services:

IGAs can improve access to essential goods and services in rural areas. When individuals generate income, they can afford necessities such as food, healthcare, education, and housing. By diversifying livelihoods through IGAs, rural communities reduce their reliance on a single income source and gain better access to essential resources (M. Kumari, et al., 2021).

5) Poverty Alleviation:

By engaging in various IGAs, rural households can improve their financial security and access to resources, contributing to poverty alleviation and economic empowerment, which are essential components of sustainable development (J. Hickel, 2019).

6) Economic Resilience:

Diversification of income sources through IGAs reduces the dependence on a single livelihood activity, making rural communities more resilient to economic shocks and market fluctuations. This contributes to the economic dimension of sustainable development by promoting stability and reducing vulnerability (M. Israr, et al., 2014)

7) Income Levels:

IGAs directly impact individuals' and households' financial capital. By engaging in IGAs, rural communities can enhance their economic stability and improve their overall standard of living (A. Akter, et al., 2020).

8) Asset accumulation:

IGAs contribute to the accumulation of assets. These assets can include land, livestock, savings, and other tangible resources. Accumulated assets provide a safety net and enhance resilience against economic shocks over time (E. Kaukumangera, 2021).

In summary, income-generating activities are not only about income, they shape the fabric of rural life by influencing social inclusion, environmental sustainability, economic stability, asset accumulation, access to necessities, and overall quality of livelihood.

5. METHODOLOGY

5.1.The area of the study

The current study was conducted in newly settled rural communities which the Government has allocated for settlement and rehabilitation over the past 50 years. Regrettably, the private sector is not attracted to invest in such new and remote areas, coupled with a major constraint facing the area which is the absence of financial and marketing services. In the meanwhile, the Sustainable Agricultural Investments and livelihoods project (SAIL) is looking to invest in and develop the new lands, on one hand, to gradually remove the stresses on the overcrowded old lands, on the other hand the

creation of new and productive farming communities.

The area of the study is affiliated to 4 villages selected on the bases of simple random sampling namely Elamany, Eltadamon, Elfeda and Elwafa from two governorates of northern-Upper Egypt: Beni-suif and El-Minya governorates. The research focused on regions subjected to a mixture of income creating sources, involving agricultural development and modernization activities as well as non-farm income generating activities offered by the SAIL project in cooperation with the Ministry of International Cooperation (MIC) and Ministry of Agriculture and Land Reclamation (MALR). Both governorates are located in the northern part of Upper Egypt but each one of them is bounded by different governorates. Beni-suif governorate is bounded from the north by Giza governorate; from the south by El-Minya governorate; from the east by Suez governorate and from the west by Fayoum Governorate. While El-Minya governorate is bounded from the north by Beni-suif governorate; from the south by Asyut governorate; from the east by Red sea governorate and from the west by Giza Governorate.

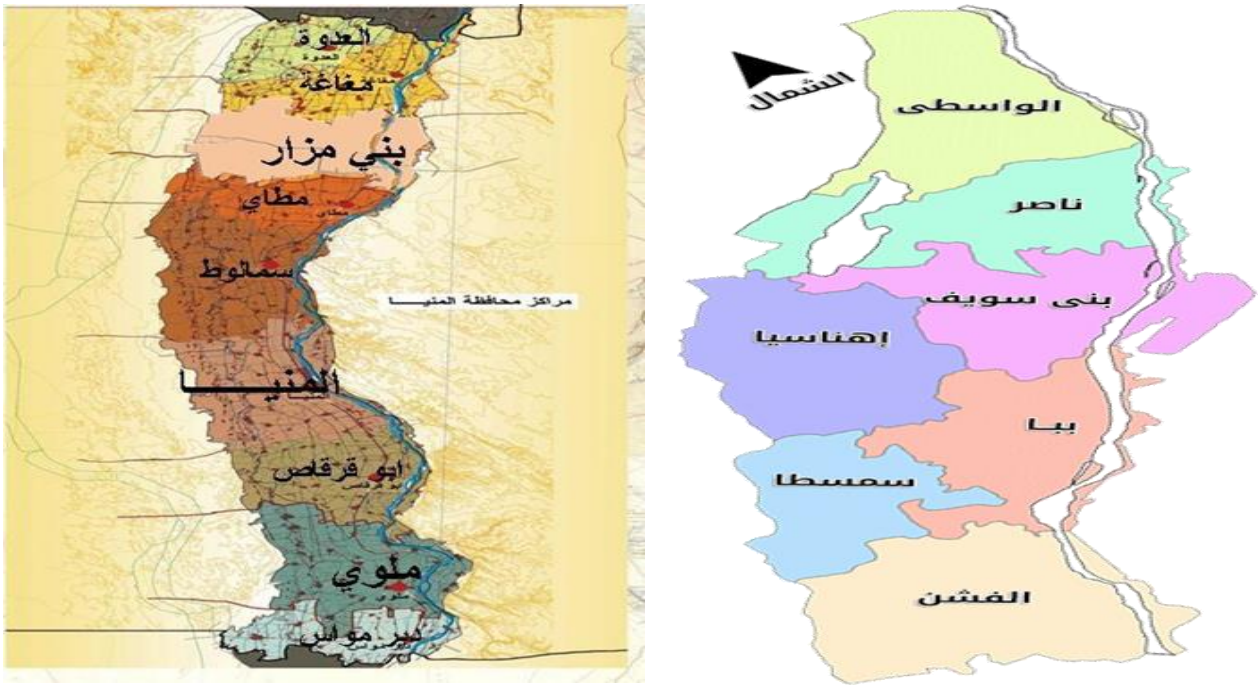

Figure 1. Illustration of Samalot and El-fashn districts on the map of El-Minya and Beni-suif governorates. Source: The Ministry of Planning and Economic development (MPED, 2023).

5.2. Data collection and sampling procedures

The empirical work was conducted in the framework of the SAIL project for the following reasons:

1) Representativeness: the SAIL project covers a diverse range of activities, making the sample representative of the area of study. This ensures that the findings can be generalized to similar newly settled rural communities.
2) Doubling the benefits gained from the project, on one hand, the direct benefits gained by beneficiaries, on the other hand the indirect benefit reflected on the whole community.
3) To reveal the governmental efforts in collaboration with IFAD in supporting the new and remote rural communities and improving their livelihood conditions.

A simple random sampling technique was used to select the respondents of the study. The study sample was composed of farm and non-farm beneficiaries who were selected from the previously mentioned 4 villages, where the project was implemented.

The sampling process was guided by the project's beneficiary list. According to the

projects' documents and reports of 2022, a total population of 1365 men and women, farm and non-farm beneficiaries were involved in the projects' activities, 300 individuals were chosen as a representative sample based on the Krejcie and Morgan 1970 and the statistics sample size calculator tool. The sample involved rural household who benefitted from the project with a wide range of farm activities distributed as 185 farm activities and 115 non-farm (Quota sampling with percentage 61.6% and 38.3% of farm and non-farm respondents respectively). The farm activities included the introduction of solar energy, and drip irrigation to the farming system in addition to animal production. While the non-farm activities included: vocational trainings in various areas, followed by providing the trainees with the required inputs that enabled them to start up their own business.

5.3.The data collection instrument

The data collection instrument used was a pre-tested structured-questionnaire via face-to-face interviews. Data were obtained from the rural men and women who were subjected to poverty, food insecurity and/or some forms of vulnerability. The men were mainly farmers and some of them were engaged in seasonal, casual work or even jobless, while the majority of women were not engaged in productive work. Throughout the field work and data collection procedures, all the interviewed households were involved in various income generating activities under the umbrella of the SAIL project since 2018.

This empirical work took place in October and November 2022.

5.4. Data analysis tools

For dataset analysis, the study used the tools that aligned with its hypotheses testing and satisfy its objectives including descriptive statistics, Chi square test, Paired sample t-test, Wilcoxon signed rank test and Multiple regression analysis were applied using SPSS software.

5.5.Study variables

The variables of this study were determined based on the research problem and related objectives as well as to test the proposed research hypotheses.

Dependent variable

To determine the effect of income-generating activities on the respondents' quality of livelihood: an index of ten statements was developed, represented in: satisfaction about housing conditions; facing the problem of the increase in life expenses; income adequacy; financial situation, school fees and supplies; private courses for the kids; supporting kids to follow up their education; visit doctors and buy medicines; buying meat and dairy products; buying new clothes. All the previous statements were measured on 3- point scale (1= better before IGA, 2= no change, 3= better after IGAs) factor analysis was preformed to reduce the number of the index's statements into fewer variables then scores were summed up. The Cronbach alpha coefficient was used to assess the extent to which the items within a composite index are correlated with each other, indicating the reliability or consistency of the index as a whole with acceptable values of alfa (alfa= 0.792) (M. Tavakol, and R. Dennick, 2011).

Independent variables

Gender: categorical variable measured on the bases of being a male or female.

Age: continuous variable measured in years at the time of data collection

Marital status: categorical variable measured by asking the respondents whether they were single, married, divorced, widowed, or separated

Housing conditions information: composite variable measured by 6 items including separated kitchen, potable water, electricity, natural gas, sewage system and a separated animals' barn.

Source of information: composite variable measured by 9 items that would reflect different sources of information including television, radio, internet, newspaper, mobile phone, extension worker, conversations with relatives and neighbors, field schools and agricultural cooperative's newspaper.

Contribution of the activity in the total household income: continuous variable measured in percentage, and reflected the present of cash generated from the respondents' activity in the total household income.

Non-farm income-generating activity: Dichotomous variable indicating whether the

respondents was participating in non-farm income- generating activities or not.

6. PRESENTATION AND DISCUSSION OF THE FINDINGS

6.1. Description of the data

Characteristics of the sample (n=300)

The following sub-section presents the findings of the surveyed household characteristics by using frequencies and percentages. The findings are also presented according to the involvement of the respondents in either farming or non-farming income generating activities. The results show that the majority of the respondents (78%) are males compared to 22% females' respondents. The maximum age for respondents is 72 years old, while the minimum age is 18 years old. Most of the respondents were married representing 72.3% of the total sample size. Regarding household size, the overwhelming majority of respondents had medium-sized families from 6 to 10 members accounting for 87.6%. As for educational status, 33.3% of respondents received formal education of the total sample size, while more than half (52.7 %) of the respondents attended literacy classes and only 14% of the respondents are illiterate. The majority of respondents (61.7%) were involved in farm activities as their primary occupation, compared to 115% of respondents were involved in non-farm activities.

Table 1. Demographic characteristics of farm and non-farm respondents

Demographic characteristics	Farm IGA N= 185		Non-farm IGA N= 115		Total	
	Freq	%	Freq	%	Freq	%
Gender						
Male	140	46.7	94	31.3	234	77.9
Female	45	15	21	7	66	22.3
Age						
18-36	61	20.3	90	30	151	50.3
37- 55	84	28	21	7	105	35
56-73	40	13.3	4	1.3	44	14.6
Marital status						
Married	161	53.6	63	21	224	74.7
Single	17	5.6	52	17.3	69	22.9
Divorced	3	1	0	0	3	1
Widowed	4	1.3	0	0	4	1.3
Household size						
Small (2-5)	10	3.3	8	2.6	18	5.9
Medium (6-10)	165	55	98	32.6	263	87.6
Large (11-15)	10	3.3	9	3	19	6.4
Educational status						
illiterate	26	8.6	21	7	47	15.7
Read and write	13	10	7	2.3	20	12.3
Primary	2	0.6	4	1.3	6	1.9
Preparatory	3	1	9	3	12	4
Secondary	68	22.6	61	20.3	129	42.9
University and above	73	24.3	13	4.3	86	28.6
Total	185	61.6	115	38.3	300	100

6.2. The relationship between distribution of respondents throughout different farm activities or non-farm activities and their distribution over different financial capital indicators

A Chi-squared test was conducted to test the significance of ordinal or nominal data (P.E. Greenwood and M.S. Nikulin, 1996).

In order to test the first research hypothesis (H1), the relationships between the respondents' financial capital and the IGAs either farm (H1.1) or non-farm (H1.2) have been tested and revealed the following results.

The results obtained from Pearson Chi-square (V= 135.534 df= 8) have shown that there is a significant difference (p= 0.000) between the distribution of respondents throughout different FAs' categories and their distribution over the categories indicating the extent of contribution of the farm IGAs in the total household income, knowing that animal production activity had the highest contribution in the total household income compared to solar energy and drip irrigation. Cramer's V for this relationship was 0.475, indicating a moderate association between farm IGA's and their contribution to the total household income (p= 0.000).

The results obtained from Pearson Chi-square (V= 24.065, df= 8) have shown that there is a significant difference (p= 0.002) between the distribution of respondents throughout different NFAs' categories and their distribution over the categories indicating the extent of contribution of the non-farm IGAs in the total household income, knowing that construction work (carpentering, plumbing and electricity) had the highest contribution in the total household income compared to sewing, irrigation supplies and electronics' maintenance stores, artificial insemination and veterinary paramedical. Cramer's V for this relationship was 0.283, indicating a weak association between non-farm IGA's and their contribution to the total household income (p= 0.002).

The results obtained from Pearson Chi-square (V= 46.906 df= 4) have shown that there is a significant difference (p= 0.000) between the distribution of respondents throughout different FAs' categories and their distribution over the categories indicating the presence of monthly savings obtained from their farm IGAs, knowing that animal production activity had the highest share of savings in the total household income compared to solar energy and drip irrigation. Cramer's V for this relationship was 0.395, indicating a moderate association between farm IGA's and their contribution in the amount of monthly savings (p= 0.000).

The results obtained from Pearson Chi-square (V= 15.763 df= 4) have shown that there is a significant difference (p= 0.003) between the distribution of respondents throughout different NFAs' categories and their distribution over the categories indicating the presence of monthly savings obtained from their non-farm IGAs, knowing that construction work (carpentering, plumbing and electricity) had the highest share of monthly savings in the total household income compared to sewing, irrigation supplies and electronics' maintenance stores, artificial insemination and veterinary paramedical. Cramer's V for this relationship was 0.229, indicating a weak association between non-farm IGA's and their contribution in the amount of monthly savings (p= 0.003).

The results generated from Pearson Chi-square (v= 111.046 df= 20) have shown that there is a significant difference (p= 0.000) between the distribution of respondents throughout different FAs' categories and the categories of annual income earned after having their main or additional farming IGAs, knowing that animal production activity had the highest annual income compared to solar energy and drip irrigation. Cramer's V for this relationship was 0.304, indicating a moderate association between farm IGAs and their annual income (p= 0.000).

The results generated from Pearson Chi-square (v= 264.570, df= 20) have shown that there is a significant difference (p= 0.000) between the distribution of respondents throughout different NFAs' categories and the annual income earned after having their main or additional non-farming IGAs knowing that artificial insemination and veterinary paramedical had the highest annual income compared to sewing, irrigation supplies and electronics' maintenance stores, and construction work (carpentering, plumbing and electricity). Cramer's V for this relationship was 0.470, indicating a moderate association

Table 2. Cross-tabulation between the distribution of respondents over different farm and non-farm IGA and financial capital

Financial ca	FA (N=185)				NFA (N=115)			
	Value	df	*p*	CV	Value	df	*p*	CV
Contribution the activity in the HH income	135.534	8	0.000	0.475	24.065	8	0.002	0.283
Monthly savings	46.906	4	0.000	0.395	15.763	4	0.003	0.229
Annual income	111.046	20	0.000	0.304	264.570	20	0.000	0.470

between non-farm IGA's and their annual income (p= 0.000) .

Accordingly, the results support the (H1.1) and (H1.2) hypotheses.

This study conducted paired sample t-tests and Wilcoxon signed-rank tests to explore the effect of income-generating activities (IGAs) on various pairs of variables representing respondents' human, social, natural, physical, and financial capitals.

In order to test the second research hypothesis (H2), the change in the respondents' human (H2.1), social (H2.2), natural (H2.3), physical (H2.4), and financial (H2.5) capitals before to after engaging in IGAs either farm or non-farm, have been tested and revealed the following results.

6.3. The change in the respondents' livelihood capitals before to after having an income generating activity by using the paired-sample t-tests

A paired-sample t-test is applied when the same subject or group of people is measured or investigated under different conditions or different time points. The test also determines the presence of significant differences between the means of the paired observations (A. Rose, and V.L. Willsonm 2017).

The results generated from the paired-sample t-test indicated a statistically significant difference between the before group to the after group, with improvements in the respondents' Human capital with increase in the number of years of education after engaging in IGAs (M=5.83, SD=6.747) to before engaging in IGAs (M= 5.77, SD=6.765), t(299) =2.309, p< 0.022. Accordingly, the results support the (H2.1) hypothesis.

Concerning, social capital after engaging in IGAs. Remarkable increase in social participation after engaging in IGAs (M= 11.31, SD= 5.715) to before engaging in IGAs (M= 8.67, SD= 5.055), t(299) = 21.414, p< 0.001. A positive change occurred in the sources providing respondents with information after engaging in IGAs (M= 10.22, SD= 3.543) to before engaging in IGAs (M= 8.64, SD= 3.302), t(299)=1 3.4436, p< 0.001. And an increase in respondents' membership in association after having IGAs (M= 1.03, SD= 0.923) to before having IGAs (M= 0.70, SD= 0.760), t (299)= 10.805, p< 0.001. Accordingly, the results support the (H2.2) hypothesis.

Regarding Natural capital, a statistically significant difference between the before group to the after group, with a an increase in the respondents' animal holding after engaging in IGAs (M= 7.122, SD= 8.173) to before engaging in IGAs (M= 3.61, SD= 4.697), t (297)= 10.315, p< 0.001. Additionally, farmers' perception toward adaptation strategies in facing climate change increased after engaging in IGAs (M= 16.7342, SD= 5.31003) to before engaging in IGAs (M= 13.4747, SD= 3.71381), t(157)= 12.112, p< 0.001. Accordingly, the results support the (H2.3) hypothesis .

With respect to physical capital, a statistically significant difference between the before group to the after group, positive change occurred in the respondents' means of transportations' ownership after engaging in IGAs (M= 0.96, SD= 0.917) to before engaging in IGAs (M= 0.65, SD= 0.870), t(299)= 10.456, p< 0.001. Also, house appliances viewed improvements after engaging in IGAs (M= 7.56, SD= 1.813) to before engaging in IGAs (M= 7.20, SD= 1.892), t(299)= 9.083, p< 0.001. The overall house status witnessed positive change after engaging in IGAs (M= 16.97, SD= 2. 320) to before engaging in IGAs (M= 16.79, SD=

Table 3. Paired sample t-test for various pairs of variables representing respondents' human, social, natural and physical capitals

	Variable	Mean	SD	t-test	df	*p*
Human capital	Years of education, before	5.77	6.765	2.309	299	0.022
	Years of education, after	5.83	6.747			
Social capital	Social participation, before	8.67	5.055	21.414	299	0.001
	Social participation, after	11.31	5.715			
	Source of information, before	8.64	3.302	13.443	299	0.001
	Source of information, after	10.22	3.543			
	Association membership, before	0.70	0.760	10.805	299	0.001
	Association membership, after	1.03	0.923			
Natural Capital	Animal holding, before	3.61	4.697	10.315	297	0.001
	Animal holding, after	7.122	8.173			
	Adaptation strategies, before	13.474	3.713	12.112	157	0.001
	Adaptation strategies, after	16.734	5.310			
Physical capital	Means of transportation ownership, before	0.65	0.870	10.456	299	0.001
	Means of transportation ownership, after	0.96	0.917			
	House appliances, before	7.20	1.892	9.083	299	0.001
	House appliances, after	7.56,	1.813			
	Housing conditions, before	16.79	2.287	2.435	299	0.005
	Housing conditions, after	16.97,	2.320			

2.287), t(299)= 2.435, p< 0.005. Accordingly, the results support the (H2.4) hypothesis.

Overall, the results suggest that the intervention likely had a positive effect on various aspects of the respondents' capitals. Significant increases were observed in education, social participation, information access, association membership, animal holdings, adaptation strategies, transportation ownership, house appliances' ownership and housing conditions.

6.4. The change in the respondents' livelihood capitals before to after having an income generating activity by using the Wilcoxon signed-rank test

Is a non-parametric statistical test used with nominal and ordinal variables, as an alternative for the Paired sample t-test. This test was used to compare the medians of the paired samples consisting of pre and post measurements (B. Rosner, *et al.,* 2005).

In addition to the previous results generated from the paired-sample t-test, Wilcoxon signed-rank test showed a statistically significant and positive change regarding satisfaction about housing conditions after engaging in IGAs (n=14) to before engaging in IGAs (n=3), z=-2.707, p< 0.001. Accordingly, the results support the (H2.1) hypothesis.

The irrigation system experienced a positive change after engaging in IGAs (n=36) to before having IGAs (n=0), z=-6.000, p< 0.001. Accordingly, the results support the (H2.4) hypothesis

The results also revealed a positive change in the respondents' financial capital with a significant increase in the respondents' annual income after engaging in IGAs (n=198) to before engaging in IGAs (n=0), z=-12.420, p< 0.001. In addition to that, the respondents' income adequacy viewed a positive change after engaging in IGAs (n=145) to before engaging in IGAs (n=0), z=-10.93, p< 0.001. Accordingly, the results support the (H2.5) hypothesis.

In conclusion, the research findings generated from the Wilcoxon signed-rank test suggest that IGAs had a significant positive effect on the respondents' physical, and financial capitals.

Table 4. Wilcoxon signed-rank test for various pairs of variables representing respondents' physical and financial capital

	Variable	N		Z	*p*
Physical capital	Satisfaction about housing conditions, before	Negative ranks	3	-2.707,	0.001
	Satisfaction about housing conditions, after	Positive ranks	14		
	Irrigation system, before	Negative ranks	0	-6.000,	0.001
	Irrigation system, after	Positive ranks	36		
Financial capital	Annual income, before	Negative ranks	0	-12.420	0.001
	Annual income, after	Positive ranks	198		
	Income adequacy, before	Negative ranks	0	-10.93	0.001
	Income adequacy, after	Positive ranks	145		

6.5. The predictors of the respondents' quality of livelihood

The multiple regression analysis assumptions were checked to ensure the validity and reliability of the regression results. The key assumptions of the multiple regression analysis include, normality, homoscedasticity of residuals, multicollinearity and linearity (B. G. Tabachnick, *et al.,* 2007; C. G. Thompson *et al.,* 2017).

Determinants of household quality of livelihood: table 2 presents the results generated by multiple regression analysis which indicates the independent variables (predictors) influencing rural households' quality of livelihood. Gender, age marital status, years of education, housing conditions, source of information, contribution of the activity in the total household income and involvement in non-farm income generating activities are the factors that significantly contribute to respondents' quality of livelihood.

The coefficient of determination prevailed that 27% of the variation in the respondents' quality of livelihood is explained by independent variables included in the model. The coefficient of gender is positive and statistically significant to the respondents' quality of livelihood at 5%. This implies the fact that men are usually the heads of the household and are responsible for securing all forms of quality livelihood, compared to women who can freely share the household financial responsibilities. Accordingly, the results support the (H3.1) hypothesis

The coefficient of age is positive and statistically significant to the respondents' quality of livelihood at 5%. Indicating that as individuals grow older, they are linked to bigger family sizes and more age-related responsibilities, compared to younger individuals who may not engaged in family duties. Accordingly, the results support the (H3.2) hypothesis

The coefficient of marital status positive and statistically significant the respondents' quality of livelihood at 1%. This is probably because married respondents have responsibilities and commitments that are much more than those of the single respondents. They had to allocate their income and assets according to their households' needs, priorities and preferences compared to single respondents who had flexibility to control over their financial resources. Accordingly, the results support the (H3.3) hypothesis

The coefficient of housing conditions is positive and statistically significant to the respondents' quality of livelihood at 5%. This implies the fact that improvements in the status of the respondents' housing conditions improve their quality of livelihood. Considering that, adequate housing conditions such as good furniture and electric devices, proper ventilation and clean water supply can provide sense of belonging, security, privacy and stability. This will in turn reflected on good family relationships, metal and physical wellbeing of the household members. Accordingly, the results support the (H3.6) hypothesis

The coefficient of source of information is positive and statistically significant to the respondents' quality of livelihood at 5%. Access to accurate and timely information empower rural communities by providing knowledge about market trends, pricing, production

Table 5. Results of multiple regression analysis predictors of respondents' quality of livelihood

Study variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-6.681	1.339		-4.989	.000
Gender	.780	.303	.162	2.573	.011
Age	.024	.012	.162	1.990	.048
Marital status	.663	.183	.208	3.635	.000
Household size	-.011	.055	-.011	-.190	.850
Years of education	-.031	.017	-.104	-1.824	.069
Housing conditions	.140	.054	.162	2.609	.010
Source of information	.070	.033	.125	2.119	.035
Animal holding	.014	.015	.056	.942	.347
Trainings' extent of benefit	-.012	.054	-.014	-.216	.829
Physical capital	.161	.220	.040	.732	.465
Contribution of the activity in the total hh income in percent	.027	.004	.503	6.513	.000
Farm activity	1.206	.451	.293	2.674	.143
Non-farm activity	.655	.446	.159	1.469	.008

R^2= 0.271, F= 8.124, sig= .000

techniques, technical skills, and financial management, enhancing decision-making, and supporting sustainable income-generating activities. Accordingly, the results support the (H3.7) hypothesis

The coefficient of the contribution of the new income generating activity (either farm or non-farm) in the total household income is positive and statistically significant to the respondents' quality of livelihood at 1%. The income generated from this new activity (main or additional) can help to reduce and alleviate poverty, buffer against financial constraints, and improve the overall economic well-being of the household. With more income, the respondents can afford better food, healthcare, education, and other essential goods and services, thereby raising their quality of livelihood. Accordingly, the results support the (H3.11) hypothesis

The coefficient of being involved in non-farm income-generating activities is positive and statistically significant to the respondents' quality of livelihood at 5%. Non-farm income activities play a critical role in improving the quality of livelihood for households especially those who are landless, as it provides them with a main and stable source of income instead of being involved in casual, seasonal and unstable work. Therefore, the non-farm income is essential for survival as it provides immediate relief from poverty and contributes to better quality of livelihood. While, farm income remains vital for farmers with agricultural lands as it provides resilience against crop failure and contributes to the accumulation of wealth. Accordingly, the results support the (H3.13) hypothesis.

Regarding the (H3.4), (H3.5), (H3.8), (H3.9), (H3.10) and (H3.13) hypotheses were not supported by the results.

7. CONCLUSION

The current study highlights the importance of rural income diversification which is considered as the most important strategy for raising income and reducing rural poverty in remote areas of Upper Egypt. The reason behind the selection of the study area is that most of the people living in new and remote rural areas of Upper Egypt are vulnerable as they depend only on agriculture and its related activities for their livelihood while they are subject to different types of risks like drought, scarcity of irrigation water, and absence of financial assistance. Therefore, this study is based on the effect of diversification of income generating activities across rural space on the quality of livelihood for rural households. The results generated from the

Paired sample t-test and Wilcoxon signed-rank test revealed significant improvements across various aspects of the respondents' capitals (human, social, natural, physical capitals and financial) after participating in IGAs. The findings generated from the multiple regression analysis indicated that gender, age, marital status, contribution of the income generating activity in the total household income and the non-farm income generating activity have significant effect on the respondents' quality of livelihood. Due to the fact that men are the main actors responsible for the household quality of life; married respondents are totally engaged in household related factors and supporting their family quality of life; getting older means involvement in age-obligation including providing family members with a quality life; finally, being involved in a non-farm income generating activity has a significant effect on the quality of life of rural households as it provides a main source of productive income activity that obviously reflected on their quality of livelihood for those who were landless, seasonal workers and even jobless. By understanding the landscape of rural income generation activities and their effect on livelihood sustainability, this research aims to inform policymakers, development practitioners, and local communities in designing and implementing holistic approach and effective strategies for fostering sustainable rural development in Egypt

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الملخص العربي

تعزيز سبل عيش الريفيين من خلال الانشطة المدرة للدخل: دراسة بالمجتمعات الريفية النائية في محافظتي بني سويف و المنيا

مي احمد النادي، عزة تهامي البنداري و سلوى محمود اسماعيل

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تواجه المجتمعات الريفية الجديدة في مصر العديد من التحديات الاجتماعية والاقتصادية والسياسية والبيئية. هذه التحديات دفعت إلى زيادة من الاهتمام لقطاع الزراعة من خلال تحديثه، مقترنًا بالاستخدام المستدام للموارد الطبيعية. وبالاضافة الى ذلك، فإن تطوير القطاع غير الزراعي يقدم خيارًا بديلًا للسكان الريفيين الذين لا يعملون في القطاع الزراعي. لذلك، تستهدف الدراسة الحالية التعرف على تأثير الأنشطة المولدة للدخل سواء انشطة زراعية أوانشطة غير زراعية على سبل عيش المبحوثين في أربعة مجتمعات ريفية نائية في محافظتي بني سويف والمنيا في مصر، التي تعاني من الفقر والفرص المحدودة التي تهدد سبل عيشها. أجري البحث خلال شهرين اكتوبر و نوفمبر لسنة ٢٠٢٢ على ٣٠٠ مبحوث تم اختيارهم عشوائياً (تم تصنيفها إلى ١٨٥ مزارع و ١١٥ مشاركاً في القطاع غير الزراعي أو ٢٣٤ ذكراً و ٦٦ أنثى)) باستخدام استمارة استبيان بالمقابلة الشخصية تم اختبارها قبلياً. وتم تحليل البيانات بمجموعة من الأساليب الإحصائية تضمنت الأساليب الوصفية واختبار مربع كاي واختبار "ت" لعينتين غير مستقلتين واختبار ويلكوكسون وتحليل الانحدار المتعدد. وتوصلت النتائج أن كل من الأنشطة الزراعية وغير الزراعية المدرة للدخل تحسن بشكل ملحوظ جودة معيشة المبحوثين عبر رؤوس الأموال البشرية، والاجتماعية، والاقتصادية، والطبيعية، والمادية. وأخيراً اوضحت النتائج أن الأنشطة غير الزراعية لها تأثير أكثر إيجابية على سبل عيش المبحوثين مقارنة بالأنشطة الزراعية.