The Economic Impact of flood hazard on the agricultural resources in affected Areas

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The Economic Impact of flood hazard on the agricultural resources in affected Areas

Abstract:

Although Egypt is located within the belt of arid desert with scarce rainfall, seasonal unstable weather conditions occur in Egypt's eastern desert during spring and autumn, and result in flash floods that largely damage homes, crops and livestock. This frequently occurs for many villages in the mountainous are of Egypt's eastern desert. Thus, the current study objective is to identify the most important agricultural economic activities that are mostly vulnerable to damages by stronger flash floods in Al-Ibrahimi watershed (wadi), and to estimate and quantify the potential economic damages/losses, and to determine appropriate mitigation/protection actions.The current study developed a field questionnaire that identified the average family income from each of the important agro-economic activities, and used it to collect field information after one powerful flash flood event in Al-Ibrahimi watershed (wadi). The current study performed descriptive and quantitative evaluation of the obtained field data in order to determine the economic losses/damages in the study area, and to use that information in estimating similar losses/damages in other areas under other flash flood events.The current study found that the total agricultural area of 3950 Feddans is vulnerable to flash flood of high-strength at the watershed, with the potential economic losses estimated at LE 31,003,150 during the winter season. The current study also estimated that the flash flood event resulted in 2,291 farm-labor lost employment, in addition to 263 irrigation pumps losing business because of damaged crops. The current study recommends helping unemployed agro-labor with alternate employment opportunities, and/or to compensate affected labor and irrigation pumps' ad other business owners with the

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equivalent of their average monthly incomes, according to their professions/activities.

Keywords: Economic Environment – Wadi Al-Ibrahimy – Floods – Flood Intensity

المستخلص

على الرغم من أن مصر تقع ضمن الحزام العالمي للصحراء الجافة وتقع في المناطق التي يقل فيها سقوط الأمطار إلا أن الجو في الصحراء الشرقية غير مستقر في فصلي الخريف والربيع حيث قد تسقط الأمطار بغزارة على الجبال مكونة ما يعرف بالسيول فتسقط كميات غزيرة في فترة قصيرة وتتجمع تلك المياه عبر مخراتها وتتجه إما غرباً في اتجاه نهر النيل أو شرقاً في اتجاه البحر الأحمر ء وتجرف في طريقها كل ما يقابلها من الأراضي الزراعية والتجمعات السكنية والمنشآت والثروة البشرية والزراعية والحيوانية (نظمي،٢٠٠٩). لذا أستهدف البحث دراسة أهم الأنشطة الاقتصادية الزراعية بالقرى شديدة التأثر بارتفاع شدة السيل لوادي الإبراهيمي وتقدير حجم الخسائر واساليب تفادى الخسائر المتوقع حدوثها. وتناول البحث أسلوب التحليل الوصفي والكمي لمعالجة البيانات التي تم الحصول عليها من خلال تصميم استمارة استبيان تحتوى على عدد من الأسئلة تستهدف التعرف على متوسط صافى الدخل للأسرة من الأنشطة المختلفة مثل صافى الدخل من الانشطة الاقتصادية الزراعية، وذلك للوصول إلى تقدير قيمة الأثار السلبية التي يمكن أن تحدث لبعض الانشطة الاقتصادية الزراعية عند حدوث سيول عالية بوادي الإبراهيمي ، وقد تجاوب مع أسئلة الاستمارة ما يقرب من ٩٥% من المبحوثين الذين بلغ عددهم ٩٠ عينة بحث بقرى عرب العوامر وعرب القداديح ودير الجبراوى بمركز ابنوب بمحافظة اسيوط وذلك خلال الموسم الشتوي ٢٠٢٣. وقد خلص البحث إلى تقدير متوسط المساحات التي يمكن ان تتضرر من السيول بحوالي ٣٩٥٠ فدان وخسائر في صافي العائد الفدانى قدرت بحوالي ٣١٠٠٣١٥٠ جنيه بالموسم الشتوي، وقدرت أعداد البطالة بين العاملين بنشاط الانتاج الزراعي بحوالي ٢٢٩١ فرد، كذلك تعطل العمل بأكثر من ٢٦٣ ماكينة ري تستخدم لري المساحات المتضررة. وأوصى البحث بضرورة الالتزام بتوفير فرص عمل للأصحاب الأنشطة الزراعية المضارة، واما تعويضهم مالياً بما يعادل متوسط الدخل الشهري حسب طبيعة عمل كل منهم.

مفاتيح كلمات البحث: البيئة الاقتصادية – وادي الإبراهيمي – السيول- شدة السيل.

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Introduction

The urban expansion in Assiut Governorate, driven by sustainable development, has led to the spread of agricultural economic activities and infrastructure within the paths of flood channels that ultimately drain into the Nile River. These encroachments on flood channels have occurred due to the absence of floods over long periods, causing residents to overlook the dangers of floods and their potential to destroy agricultural lands, homes, and roads, and even lead to loss of life (Abd Ellhafez,2008). The damage to agricultural economic activities is considered a type of disaster that harms people, their properties, and their interests. This damage can occur directly in the areas where people reside or in uninhabited areas that still hold particular interests either directly or indirectly, or that are planned for future economic benefit (Mahsoub, 2002).

The valleys in the eastern and western parts of Assiut Governorate are classified based on flood intensity into weak, moderate, and very high categories. In eastern Assiut, Wadi Al-Ibrahimy is classified as very high in terms of flood intensity, while there are two other valleys in eastern Assiut classified from moderate to very high (Wadi El-Assiouty – Wadi Emo El-Bahri). Additionally, there are two valleys in eastern Assiut classified from weak to very high in terms of flood intensity (Wadi El-Omrani – Wadi El-Jebrawi). In western Assiut, Wadi W6 is classified from weak to very high. A group of valleys in both eastern and western Assiut is categorized as having weak flood intensity, totaling about 27 valleys (such as the group of valleys between Wadi Abu Sheih and Wadi Emo, Wadi Emo El-Qibli, and other specified groups) (Ministry of Water Resources and Irrigation, 2018).

Assiut has a history of devastating floods, with the 1996 floods causing damage to approximately 26,538 households and destroying 13,165 feddans of agricultural land, including 13,098

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feddans of high-quality field crops, with the remainder being orchards (Abou Kheila, 2013). Wadi Al-Ibrahimy is considered one of the high-risk valleys for some agricultural economic activities in nearby villages such as Arab El-Qadadih, Arab El-Awamir, and Deir El-Jebrawi. Therefore, this research aims to study the effects of increased flood intensity on agricultural economic activities in these villages. The research problem that,
The villages at the outlet of Al-Ibrahimi watershed (wadi) are frequently exposed to severe economic losses/damages from flash floods. However, there is scarcity in the studies that determine the affected areas, the numbers of agro-labor that lose employment, and other business thar are impacted, and the resulting financial losses**.** The research problem is that there is lack of suitable evaluation of such economic activities' losses. Developing methodology for evaluating the losses of the affected economic activities will enable the decision maker to prepare action plans under different potential scenarios. Finally, the objective of this research is to study the major agricultural economic activities in villages significantly affected by high flood intensity in Wadi Al-Ibrahimy, estimate the extent of losses and various damages, and explore methods to mitigate the anticipated losses.

Methodology

The research employed both descriptive and quantitative analysis methods. Various mathematical and statistical techniques, such as averages and statistical frequencies, were used to process the data, yielding optimal results. The study relied on both published and unpublished data obtained from the Central Administration for Agricultural Economics at the Ministry of Agriculture and Land Reclamation, as well as data from the Ministry of Water Resources and Irrigation and the

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Information Center in the city of Abanoub. Primary data was collected through direct interviews with those involved in agricultural economic activities in the villages of El-Qadadih, part of the Abanoub district. A field work questionnaire was designed, containing several questions to clarify production indicators such as feddan productivity, economic indicators including prices, costs, revenues, net yield per feddan, cultivated areas, barren lands, and areas used for construction. This questionnaire was implemented at field level according to the following sample of selected farmers.

Research Sample and Measurement Methods:

- The research sample was based on specific indicators and evidence, with a focus on:
  - The human framework for the field sample, which included selected farmers, agricultural workers, and local leaders in the research area.
  - The research area was divided into three parts: the southern part represented by the village of Arab El-Awamir, the central part represented by the village of Arab El-Qadadih, and the northern part represented by the village of Deir El-Jebrawi.
  - Samples were selected from various affected areas directly influenced by Wadi Al-Ibrahimy. A total of 90 samples were studied to analyze the economic environment. The research utilized a spatial sampling approach to define targeted geographical areas and the human scope within these areas to achieve the research objective.

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Description of the study area

The study area is located in the northeast of Assiut Governorate, on the eastern side of the Nile River, and is part of the Eastern Desert valleys that slope westward into the Nile River. The valley is approximately 29 km from the city of Assiut and about 20 km from Abnoub. The tributaries of Wadi Al-Ibrahimy originate from the highlands and mountains of the Eastern Desert, including Gebel El-Fent, Gebel El-Ghaza, Gebel Abu Awad, and Gebel Um Mriykha, and eventually drain into the Nile River. The valley's outlet crosses the Eastern Desert Highway (Cairo/Assiut) via a concrete culvert with four openings. Some residential and agricultural areas are located at the valley's outlet, as illustrated in Figure (1). (Ministry of Water Resources and Irrigation, 2010).

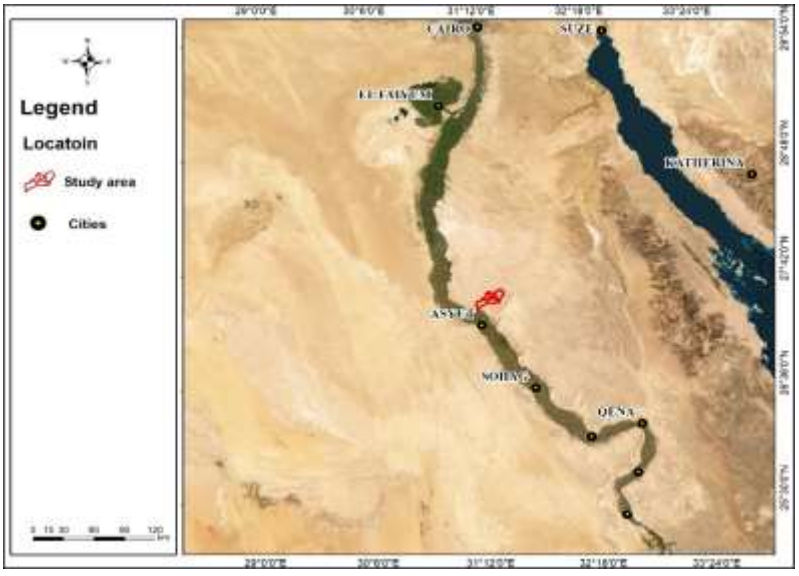

Figure (1): Location map of the study area

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Results and Discussions

Flood Risk and intensity

Due to rainfall in the mountainous regions of southern Egypt, floods occur in certain active valleys with high flood intensity, such as Wadi Al-Ibrahimy in Assiut Governorate. These floods cause severe damage to local residents and essential infrastructure, including road networks, electricity and gas lines, transformer stations, housing, schools, and other critical facilities. Therefore, it is necessary to implement protective measures for these facilities to ensure sustainable development (Helal, 2008).

The flood risk levels in the study area were determined by assessing the hydrological factors affecting water flow velocity, including the basin slope, rock classification, and the intensity of rainfall from the maximum storm. Flood intensity was generally assessed within the valley channels as illustrated in Figure (2). Flood intensity is defined as the product of water velocity and water depth, and the results indicate that the flood intensity ranges from moderate to high. It is important to note that flood intensity varies according to changes in the geometric dimensions of the cross-section of the watercourse, the slope of the channel, and the rock classification of the valley bed.

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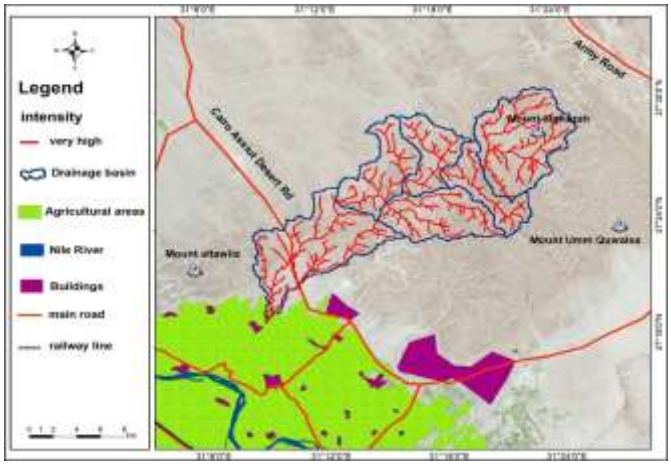

Figure (2): Intensity map of wadi Al-Ibrahimy, Assuit Governorate

- **Orange:** Includes areas where development is not permitted except for strategic facilities (such as pipelines and essential services), with the necessity of implementing required protective measures.
- **Red:** Includes areas where development is not permitted.

Figure (3) illustrates that the flood risk level in the Wadi Al-Ibrahimy basin ranges from moderate to high, which necessitates implementing engineering precautions to safeguard development activities within the valley boundaries.

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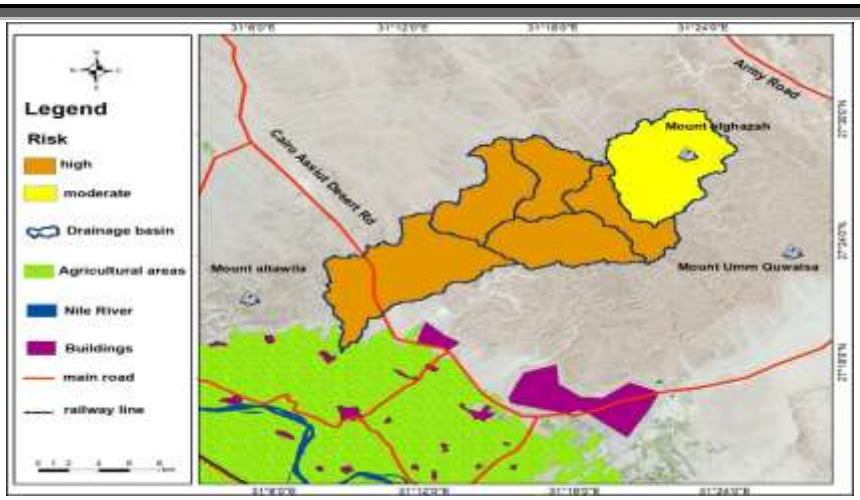

Figure (3): Flood risk map of wadi Al-Ibrahimy, Assuit Governorate

Cultivated Area

The land area in the Abanoub district of Assiut Governorate includes both old and new lands. The old lands cover an area of 44,028 feddans, divided into 33,371 feddans owned by local residents and 10,657 feddans owned by the government. These lands are less affected by the flood path of Wadi Al-Ibrahimi. On the other hand, the new lands which are the focus of this study and are more severely affected cover an area of approximately 5,111.7 feddans. These are divided into 4,319.3 feddans of land owned by individuals (see Table 1). Central Agency For Public Mobilization & Statistics – Egypt, 2021

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Table No (1): Government-Owned Lands

	Uncultivated land		Residential Buildings' land		Non-reclaimable land		Agricultural services' land		Total possessed area	
Actual Area	Fedden	Qirat	Fedden	Qirat	Fedden	Qirat	Fedden	Qirat	Fedden	Qirat
	4319	3	730	4	26	-	36	-	5111	7
Percent of the Total Study Area	84.5		14.3		0.5		0.7		100	

Source: Collected and calculated from: "The Bulletin of Agricultural Boundaries and Properties data". Published by: "Central Agency for Public Mobilization & Statistics – Egypt, 2021."

Fedden is 4200 m^2; 1.0 Fedden = 24 Carat; 1.0 Carat = 175 m^2.

- The total area of land cultivated with the winter crop is approximately 4124.9 feddans, representing about 95.5% of the total cultivated area in the Abanoub Center, which amounts to approximately 4319.3 feddans(see Table 2).
- **Total Summer Crop Area in Abanoub Center:** The total area of summer crops in Abanoub Center is approximately 4107.6 feddans, which represents about 95.1% of the total cultivated area in Abanoub Center, which is approximately 4119.3 feddans (see Table 3).
- Irrigation Sources: Nile water is the primary source of irrigation, with approximately 3964 feddans being irrigated with Nile water, representing about 96.1% of the total

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cultivated area. Groundwater irrigation covers approximately 160.9 feddans, representing about 3.9% of the total cultivated area.

- Agricultural Drainage: There is no agricultural drainage in the study area.

The main crops in Abanoub Center include wheat, alfalfa, and sugar beet. The area planted with wheat is approximately 2000 feddans, representing about 48.5 % of the total cultivated area of approximately 4124 feddans and 3 carats. The area planted with alfalfa is approximately 1000 feddans, representing about 24.2 % of the total cultivated area. The area planted with sugar beet is approximately 950 feddans, representing about 23.3 % of the total winter crop area (see Table 2). For summer crops, peanuts occupy .

Table No (2): Winter Crops in the Study Area

Crops' Areas	Winter Field Crops								Total possessed area	
	Sugar Beet		alfalfa		Wheat		Other winter crops			
Actual Area	Fedden	Qirat	Fedden	Qirat	Fedden	Qirat	Fedden	Qirat	Fedden	Qirat
	950	-	1000	-	2000	-	174	3	4124	3
Percent of the Total Study Area	23.03%		24.2%		48.5%		4.2		100	

Source:

Collected and calculated from: "The Bulletin of Agricultural Boundaries and Properties data". Published by:

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"Central Agency for Public Mobilization & Statistics – Egypt, 2021." the largest area, with approximately 1990 feddans and 9 carats, representing about 48.7 % of the total cultivated area of approximately 4107 feddans and 6 carats. The area planted with sorghum is approximately 600 feddans and 2 carats, representing 14.6 % of the total cultivated holdings. The area planted with summer onions is estimated to be about 1000 feddans and 3 carats, representing 24.3 % of the total cultivated holdings (see Table 3).

Table No (3): Summer & Nili Field Crops

Crops' Areas	Summer & Nili Field Crops								Total possessed area	
	Dry Onion		Summer Sorghum		Peanuts		Other Summer crops			
Actual Area	Fedden	Qirat	Fedden	Qirat	Fedden	Qirat	Fedden	Qirat	Fedden	Qirat
	1000	3	600	2	1990	9	516	16	4107	6
Percent of the Total Study Area	24.3%		14.6%		48.7%		12.4%		100	

Source: Collected and calculated from: "The Bulletin of Agricultural Boundaries and Properties data". Published by: "Central Agency for Public Mobilization & Statistics – Egypt, 2021."

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Production and Economic Indicators for Key Crops in the Study Area

Data from Table No. (4) highlight the main production and economic indicators for key crops in the study area. It is evident that the largest areas of summer crops are occupied by peanuts, sorghum, and summer onions. The yield per feddan for these crops is approximately 1.544, 2.44, and 18 tons, respectively. The revenue per feddan for peanuts, sorghum, and onions is approximately 19,965, 9,910, and 36,900 Egyptian pounds, respectively. The costs per feddan are around 11,567, 8,117, and 8,316 Egyptian pounds, while the net return per feddan is approximately 8,830, 1,793, and 28,584 Egyptian pounds for peanuts, sorghum, and onions, respectively.

For winter crops, wheat, alfalfa, and sugar beet are the largest in terms of cultivated area. The yield per feddan for these crops is approximately 3, 24.5, and 30 tons, respectively. The revenue per feddan for these crops is approximately 16,902, 16,513, and 18,750 Egyptian pounds, respectively. The costs per feddan are about 11,424, 4,082, and 10,733 Egyptian pounds, respectively, while the net return per feddan is approximately 5,478, 12,431, and 8,017 Egyptian pounds, respectively.

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Table No. (4): Production and Economic Indicators for Crops in the Study Area

Crops	Yield per Fedden (ton)	Average Farmgate Price	Revenue/ Fedden	Total cost/ Fedden	Net Return
Peanuts	1.54	13310	19965	11576	8380
Summer Sorghum	2.4	4129	9910	8117	1793
Dry Onion	18	3568	36900	8316	28584
Wheat	3	5634	16902	11424	5478
Clover	24.5	674	16513	4082	12431
Sugar Beet	30	625	18750	10733	8017

Source: Collected and calculated from the field research questionnaire in the study area

To assess the robustness of these production and economic indicators compared to national averages, a one-sample T-test was used to test the hypothesis of whether the average production and economic indicators for the key crops in the study area are similar to or differ from those at the national level, either by increasing or decreasing. Therefore, the study hypotheses are as follows:

- **Null Hypothesis (H0):** There are no differences between the average production and economic indicators for the key crops in the study area and those at the national level. Any differences are due to chance and not to characteristics of the study area, thus the differences are not statistically significant.

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- **Alternative Hypothesis (H1):** There are significant differences between the average production and economic indicators for the key crops in the study area and those at the national level, either increasing or decreasing, and these differences are statistically significant at levels of 0.05 and 0.01.

Results of the Statistical Estimation of Yield per Feddan

The results of the one-sample T-test for the yield per feddan of key crops in the study area, compared to national averages, are shown in Table No. (5). It indicates that there is an increase in the yield per feddan for summer crops—peanuts, sorghum, and onions—compared to the national average for these crops. The increase was approximately 0.14, 0.3, and 5.8 tons, respectively, and these increases were statistically significant at the 0.01 level. Similarly, for winter crops, the yield per feddan for wheat and sugar beet was higher

Table No. (5): **Results of the Statistical Estimation of Yield per Feddan for Crops in the Study Area**

Crops	Study Area Yield per Fedden	National Average Yield[#]	Deviation of Study Area Yield from National Average	t- test value
Peanuts	1.54	1.4	0.14	(2.4) **
Summer Sorghum	2.4	2.1	0.3	(6.5) **
Dry Onion	18	12.1	5.8	(19.9) **
Wheat	3	2.8	0.200	(7.7) **
Clover	24.5	31.4	-6,9	(-21,2) **
Sugar Beet	30	20.9	9.1	(43.1) **

Source: Collected and calculated from the field research questionnaire in the study area

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Source: Collected and calculated from the field research questionnaire in the study area

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**Significant at the 0.01 level

than the national average by approximately 0.200 and 9,1 tons, respectively, and these differences were statistically significant at the 0.01 level. However, for clover, the yield per feddan was lower than the national average by approximately -6,9 tons, and this decrease was statistically significant at the 0.01 level.

Results of the Statistical Estimation of Costs per Feddan

The data shown in Table No. (6) illustrate the average costs per feddan for key crops in the study area compared to national averages. The results of the one-sample T-test indicate that there is a decrease in the costs per feddan for summer crops—peanuts, sorghum and onions —compared to the national average for these crops. The decrease was approximately 2792, 250,1284 Egyptian pounds, respectively, and these decreases were statistically significant at the 0.01 level

Table No. (6): Results of the Statistical Estimation of Costs per Feddan for Crops in the Study Area

Crops	Total cost/ Fedden	Genral Average cost#	Deviation of Study Area cost from National Average	t- test value
Peanuts	11576	14368	-2792	(-265) **
Summer Sorghum	8117	8367	-250	(-0.17) **
Dry Onion	8316	9600	-1284	(-50,3) **
Wheat	11424	11634	-210	(-7,18) **
Clover	4082	7484	-3402	(-152,4) **
Sugar Beet	10733	10261	472	(119) **

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Source: Collected and calculated from the field research questionnaire in the study area

#. Ministry of Agriculture and Land Reclamation, 2022

**Significant at the 0.01 level

Similarly, for winter crops, the costs per feddan for wheat and alfalfa were lower than the national average by approximately 210 and 3,402 Egyptian pounds, respectively, with these differences being statistically significant at the 0.01 level. For sugar beet, the costs per feddan

were higher than the national average by approximately 472 Egyptian pounds, and this increase was statistically significant at the 0.01 level.

Results of the Statistical Estimation of Net Return per Feddan

The data presented in Table No. (7), which show the averages of net return per feddan for key crops in the study area compared to national averages, indicate that the results of the one-sample T-test reveal an increase in the net return per feddan for summer crops—peanuts—compared to the national average. This increase was approximately 4,713 Egyptian pounds and was statistically significant at the 0.01 level. Conversely, the net return per feddan for sorghum and onions decreased by 388 and 12,287 Egyptian pounds, respectively, with these decreases being statistically significant at the 0.01 level.

For winter crops, the net return per feddan for wheat and sugar beet was higher than the national average by approximately 2,232 and 4,376 Egyptian pounds, respectively, with these differences being statistically significant at the 0.01 level. But otherwise, alfalfa was lower than the national average by approximately 4045 Egyptian pounds,

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Table No. (7): Results of the Statistical Estimation of Net Return per Feddan for Crops in the Study Area

Crops	Net Return	(General Average Net Return) #	Difference	t- test value
Peanuts	8380	3667	4713	(17.7) **
Summer Sorghum	1793	1405	388	(10.10) **
Dry Onion	28584	16297	12287	(688) **
Wheat	5478	3246	2232	(88.6) **
Clover	12431	16872	- 4045	(-154) **
Sugar Beet	8017	3641	4376	(148) **

Source: Collected and calculated from the field research questionnaire in the study area

#. Ministry of Agriculture and Land Reclamation, 2022

**Significant at the 0.01 level

Total Number of Workers in Agricultural Activities in the Study Area

Abanoub Center ranks third after Assiut and Dairout in terms of the availability of daily labor in the field of plant agricultural production. The available daily labor is estimated to be around 100 men, 28 women, and 33 children (Abdel-Meguid et al., 2016). Table No. (8) shows that the number of permanent family workers in the study area is approximately 1232, with the number of intermittent workers being 1234. The number of permanent wage laborers is estimated at about 34 workers.

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Table No. (8): Total Number of Workers in Agricultural Activities in the Study Area

Types of Workers	Total Number of Workers in the Cultivated Study Area				
	Men	Women	Boys	Girls	Total
Permanent Family Workers	893	249	60	30	1232
Seasonal Workers	375	150	505	204	1234
Permanent Hired Workers	10	0	4	20	34
Total Number of Workers					2500
The Total Cultivated Land in the Study Area					4319
Number of Workers per Fedden					0.58

Source: Collected and calculated from the field research questionnaire in the study area

Given that the total cultivated area in the study area is approximately 4319feddans, the labor requirement per feddan is approximately 0.58 workers.

The estimated agricultural areas expected to be affected by floods in the villages near the mouth of Wadi Al-Ibrahimy are approximately 3950 feddans. Of these, around 2000 feddans are wheat fields, and 1000 feddans are alfalfa fields, and 950 feddans are Sugar Beet which are the main crops during the flood season in winter. Table No. (9) illustrates the key economic damages resulting from the intensity of the flood in Wadi Al-Ibrahimy. The data in the table indicate that the total losses due to damage to agricultural lands amounted to approximately 31,003,150 Egyptian pounds. Additionally, the number of unemployed workers within the agricultural sector was about 2291 workers There are also indirect losses, such as the disruption of more than 263 irrigation machines, assuming that each machine services 15 feddans. There was also stagnation

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in the market for packaging and transporting goods, a rise in prices for products related to the crops such as bread flour, and higher prices for livestock that rely on secondary crops like wheat and alfalfa for feed.

The most significant damage is the reduction in household income, the potential collapse of homes, and possible loss of human lives.

Table No. (9): Expected for Crops Losses Around Wadi Al-Al-Ibrahimy in Plant Production.

Impacted Crops	Economic Losses Caused by Damaged Crops				
	Total Impacted Area	Net Return LE Per Fedden	Net Losses LE Per Fedden	Number of Workers per Fedden	Total unemployment Losses (Workers/Fedden)
Wheat Crop Losses	2000	5.478	10.956.000	0.58	1160
Clover Crop Losses	1000	12.431	12.431.000	0.58	580
Sugar Beet Crop Losses	950	8.017	7,616.150	0.58	551
Total			31.003.150	2.291	

Source: Collected and calculated from the field research questionnaire in the study area.

Conclusion

- The intensity of floods varies according to changes in the geometric dimensions of the cross-section of the watercourse,

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the slope of the channel in the valley, and the rock classification of the valley bed.

- The risk level from floods in the Wadi Al-Ibrahimy basin ranges from moderate to high.
- The area of non-cultivated land in the study area is approximately 765 feddans out of a total of 4319 feddans suitable for cultivation, including state-owned lands and reclamation lands.
- The largest area among winter crops is wheat, with approximately 1125 feddans, while the summer crop with the largest area is peanuts, with approximately 1141 feddans.
- The net return per feddan is approximately 8380,1793, and 28,584 Egyptian pounds for peanuts, sorghum, and onions, respectively.
- The net return per feddan is approximately 5478,12431 and 5478 Egyptian pounds for wheat, alfalfa, and sugar beet, respectively.
- The net return for peanuts, sorghum and onions is higher than the national average net return by approximately 4713,388, 12278 Egyptian pounds, with this increase being statistically significant at the 0.01 level.
- For winter crops, the net return per feddan for wheat, and sugar beet increased compared to the national average by approximately 2232, 4376 Egyptian pounds, respectively, with these differences being statistically significant at the 0.01 level.
- alfalfa were lower than the national average by approximately 4045 Egyptian pounds, respectively, with

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these differences being statistically significant at the 0.01 level.

- The average area potentially affected by floods is approximately 3950 feddans, with net return losses estimated at around 31,003,150 Egyptian pounds for the winter season. The number of unemployed individuals in agricultural production activities is estimated at 2291, and more than 263 irrigation machines used for irrigating the affected areas are out of service.

Recommendations

- Implement engineering precautions to secure developmental activities within the boundaries of Wadi Al-Ibrahimy.
- Ensure the provision of job opportunities for individuals involved in agricultural activities affected by the floods.
- Financially compensate those affected by floods with an amount equivalent to the average monthly income based on their type of work.
- Taking engineering precautions to secure developmental activities established within the Ibrahimy Valley's protected area.
- Providing food supplies related to crop damage during severe floods, such as bread flour.
- Providing animal fodder affected by severe floods, such as wheat straw.
- Ensuring the availability of rapid ambulance services during severe floods to avoid loss of human lives.
- The necessity of committing to providing job opportunities for those whose agricultural activities have been harmed.

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- Financial compensation for those affected by the floods, equivalent to the average monthly income according to the nature of each person's work.
- Implement Flood Protection Infrastructure like dams and artificial lakes
- Implement a channel from the outlet of wadi al Ibrahimy to the nile river
- Prohibit or strictly regulate farming and construction in high-risk flood zones

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References

Abdel-Mawgoud Abdel-Hafez, Effects of Flash Floods on The Ecology and Humans in Vulnerable Villages in Upper Egypt. Symposium on Structure Safety Against Disasters in Arab Countries. Counsil of Arab

Ministers of Housing and Construction. Riyadh, KSA, 2008.Ministry of Agriculture and Land Reclamation, Agricultural Census Bulletin, 2010.

Ministry of Agriculture and Land Reclamation, Agricultural Statistics Bulletin, 2022.

Ministry of Water Resources and Irrigation, National Water Research Center, Flood Atlas for the Wadis of Assiut Governorate, 2018.

Ministry of Water Resources and Irrigation, National Water Research Center, Study on Protecting Infrastructure from Flood Hazards in Some Active Wadis in Assiut Governorate, 2010.

Mohamed Abdel-Rahman Abo Khlaa, The Role Of Urban Planning in Facing The Natural Disasters Which Affect The Urban Structures in Egypt, Faculty of Engineering, Al-Azhar University, 2013.

Mohamed Ahmed Helal, Symposium on Housing for The Displaced from Flash-Flood Disaster in Assyut Governorate. Symposium on Structure Safety Against Disasters in Arab Countries. Counsil of Arab Ministers of Housing and Construction. Riyadh, KSA, 2008.

Mohamed Nagy Bakr Abdel-Meguid, Abdel-Wakeel Al-Ibrahimy Mohamed, Fawzy Fawzy Al-Ibrahimy Abu El-

ISSN: 2537-0804 **eISSN: 2537- 0855**

Enein, Susan Abdel-Meguid Abu El-Magd, Quantitative Assessment of Agricultural Labor in Assiut Governorate, Assiut Journal of Agricultural Sciences, 2016.

Mohamed Sabry Mahsoub, Natural Hazards and Disasters: Occurrences and Responses, A Geographical Analysis, Arab Thought House, 2002.

Naeamat Mohamed Nazmy, The Flood Disaster in Egypt with a Focus on a Case Study of a Flooded Village: Darnaka Village in Assiut Governorate, Engineering Sector Journal, Al-Azhar University,2009.

The Bulletin of Agricultural Boundaries and Properties data". Published by: "Central Agency for Public Mobilization & Statistics – Egypt, 2021."

ISSN: 2537-0804 eISSN: 2537- 0855