DEDICATION

FOR SOULS OF MY FATHER AND MOTHER

FOR MY WIFE

BROTHERS AND SISTERS

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ABBREVIATIONS

ABS: Agricultural Bank of Sudan

AAS: Administration of Agricultural Statistics

AE: Allocative Efficiency

CE: Cost Efficiency

CM: Cubic Meter

FAO: Food and Agriculture Organization

FL: Family Labour

GDP: Gross Domestic Product

HL: Hired Labour

IFAD: International Fund for Agricultural Development

Kg: Kilogram

LP: linear programming

M.d: Mandays

MFNE: Ministry of Finance and National Economy

PPF: Production Possibilities Frontier

PSERA: Planning and Socio-economic Research Administration

RHS: Right Hand Side

SDG: Sudanese pound

SGB: Sudan Gezira Board

SPF: Stochastic Production Frontier

UNDP: United Nations Development Programme

TE: Technical Efficiency

TL: Total Labour

WUAs: Water Users Associations

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ABSTRACT

The main objective of this study was to analyze and evaluate the technical efficiency of crop production in Gezira scheme and specifically to determine the main factors that caused technical inefficiency, to assess the maximum farm's returns level under optimum cropping patterns and to identify the socio-economic factors that affected the level of efficiency of farmers. Production and yield have deteriorated and the returns of farmers have consequently declined in recent years. Both primary and secondary data were used for study purposes. Primary data were collected from a survey conducted in season 2011/12, through a multi-stage stratified random sampling technique using a sample of 150 tenants. The secondary data collected from the relevant institution sources. Descriptive statistics, technical efficiency, linear programming models and gross margins were employed to analyze the collected data. And achieve the study objectives. The descriptive statistics of selected socio-economic characteristics showed that the average age of the sampled farmers was 50 years. Most of the farmers 88.7% were within the active age of 25-65. Most of the farmers 98% have attained some sort of education. All surveyed farms were managed by males; about 90 % of the surveyed farmers were married. For the sampled farmers, the average family size was found to be 8 persons per household. The majority of the sampled farmers (71.3%) have stayed for more than 10 years in the agricultural work. The sampled farmers (82.7%) were fully occupied with tenancy (i.e. had no off-farm activities). The frontier production function analysis revealed that most of the estimated β co- efficients of the stochastic frontier model for all crops production models have the expected signs and significance. The mean technical efficiency was 63%, 75%, 65%, and 90% for cotton, sorghum, groundnuts, and wheat productions, respectively. This shows that there is scope for increasing cotton, sorghum, groundnuts, and wheat

production lie by 37%, 25%, 35%, and 10%, respectively with present technology. Tenancy location, age, education years, sowing date, farm income, off farm income, irrigation number, weeding number and total labour, for production crops were significant variable for improving technical efficiency. Education level, experience, family size, marital status and credit were significant in explaining technical inefficiency in Gezira scheme. The results of LP models revealed that the real cropping was different from the basic cropping pattern, the net farm income in the optimal models was over the current situation by 59.3%, most of the land was allocated to onion crop which was 8.68 feddans, followed by cotton crop which was 6.88 feddans, while sorghum and groundnuts entered in the optimal plan with small areas 1.74, and 0.92 feddans, respectively, wheat and chickpea did not enter in the optimal plan. In the real situation cotton, sorghum, and onion occupied about the same area 4 feddan, followed by wheat and chickpea, 3 feddan, and then groundnuts 2 feddan. Many scenarios were tried by developing the parameters of the free LP model to reflect a range of production options. The budget analysis of crops, onion crop had the high cost followed by cotton. Onion crop yielded the higher gross margin per feddan followed by cotton. The study recommended for improvement of the technical efficiency of crop production in the scheme, that the Gezira Scheme Management should improve the extension services and supervision, more coordination between Gezira Scheme Management, Ministry of Irrigation and Water Resources, and Ministry of Agriculture and Forestry to solve problems of irrigation by cleaning and maintaining water canals, and adoption of the recommended improved technologies will increase farmers' income.

خلاصة الأطروحة

الهدف الاساسي من هذة الدراسة هو قياس وتقيم الكفاءة الإنتاجية للمحاصيل في مشروع الجزيرة وذلك بالنظر الى العوامل التي تتسبب في عدم الكفاءة الفنية ، تحديد أعلى مستوى دخل مزرعي في ظل توليفة محصولية مثلى ومعرفة العوامل الاقتصادية الاجتماعية التي تؤثر علي مستوى الكفاءة الفنية الانتاجية للمزارعين. الدراسة أهتمت بالمشاكل المتعلقة بالتدهور في الانتاج والانتاجية وتدني عائدات المز ارعين في السنوات الاخيرة بالمشروعأعتمدت الدراسة علي البيانات الأولية والثانوية معً ا، البيانات الأولية جمعت من المسح الميداني للموسم12/2011 من 150 مزارع في المشروع عن طريق عينة عشوائية طبقية متعددة المراحل بواسطة إستبيان مصمم للدراسة ، والبيانات الثانوية جمعت من المصادر ذات الصلة. التحليل الوصفي ، دالة الإنتاج المجال العشوائى ، تحليل البرمجة الخطية و تحليل هامش الربح ، أستخدمت هذة الطرق المختلفة لتحليل بيانات الدراسة وتحقيق اهداف الدراسة.

أظهرات نتائج التحليل الاحصائي الوصفي أن متوسط أعمار المزارعين في العينة 50 عاما منهم حوالي 88.7% تقع في المدى العمري النشط 25-65 ، ومنهم حوالي 98% تحصلوا علي تعليم ، وكل المزارع تم ادارتها بواسطة الرجال ومنهم حوالي 90% متزوجين ، ومتوسط حجم الأسرة 8 افراد. حوالي 71.3% من العينة عملوا في مجال الزراعة أكثر من 10 عوام ، وتمثل الزراعة المهنة الاساسية لحوالي 82.7 % من المزارعين في العينة. أظهرات نتائج دالة الإنتاج المجال العشوائى إن معظم عوامل الإنتاج التي تؤثر علي الكفاءة الفنية ذات تأثير معنوي وان متوسط الكفاءة الفنية للمزارعين 63% ، 75% ، 65% ، 90% لكل من القطن ، الذرة ، الفول السوداني والقمح علي التوالي ، وفقا لذلك هنالك مجال لزيادة إنتاج المحاصيل بنسبة37% ، 25% ، 35% ، 10% للمحاصيل علي ذلك التوالي عند نفس عوامل الإنتاج المتاحة و المتوفرة. موقع الحواشة ، العمر ، عدد سنوات الدراسة ، تاريخ الزراعة ، الدخل المزرعى ، عدد الريات ، العزيق و العمالة تمثل العوامل المعنوية بمستويات مختلفة لتحسين الكفاءة الإنتاجية الفنية. الخصائص الاجتماعية للمزارعين ممثلة في المستوي التعليمي ، حجم الاسرة ، الحالة الاجتماعية و خبرة المزارعين والتمويل كانت عوامل ذات أثر معنوي في تفسير عدم الكفاءة الفنية في المشروع بمستويات مختلفة.

أظهرات نتائج البرمجة الخطية أن التركيبة المحصولية تختلف في الخطة الحقيقية عن تلك المتحصل عليها في النموذج الحر أو الاساسي ، حيث أن صافي دخل المزرعة في النموذج الحر (الأمثل) يفوق صافي دخل المزرعة في الواقع بنسبة 59.3% ، ومعظم الاراض مخصصة للبصل 8.68 فدان و القطن 6.88 فدان ، بينما الذرة و الفول السوداني يدخلان بمساحات أقل في النموذج 1.74 فدان و 0.92 فدان علي التوالي ، ومحصول الحمص و القمح لم يدخلان الخطة ، وفي النموذج الحقيقي كانت مساحة كل من القطن و الذرة و البصل 4 فدان ، ومساحة القمح و الحمص 3 فدان و بينما مساحة الفول السوداني 2 فدان. أجريت عدد من السيناريوهات بتغير معاملات النموذج الاساسي للبرمجة الخطية لعكس مدى خيارات الإنتاج. أظهر تحليل هامش الربح ان محصول البصل كان أعلى تكلفة ثم يلية محصول القطن ، وايضا يمثل محصول البصل أعلى ربحية للفدان ثم يلية محصول القطن.

أوصت الدراسة بتحسين الكفاءة الفنية الإنتاجية بالمشروع ، وذلك علي أدارة المشروع الاهتمام بخدمات الإرشاد الزراعي والإشراف علي المزارعين ، وحل مشاكل الري بتنسيق مع الجهات المختصة ، وتبنى التقانات الحديثة و الموصى بهاو التي تؤدي الي زيادة دخل المزارع.