The impact of Agricultural Insurance on Adoption of recommended Agronomic Practices of Cotton by Farmers in Gezira Scheme


By

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بسم الله الرحمن الرحيم
قال تعالى: { إنزل من السماء ماء فسالت أودية بقدرها فاحتم السيل
زبدا رابياً ومما يوقدون عليه في النار ابتعاد حليقة أو متاع زبد مثله،
kذلک يضرب الله الحق والباطل. فأمًا الزبد فيذهب جفاء وأما ما ينفع
الناس فيمکث في الأرض كذلک يضرب الله الأمثال }
صلى الله عليه(سورة الرعد الآية 17)
Dedication

Dedicate this work with gratitude
To lovely mother and
To my husband
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First of all, my praise and thanks be to Allah, send peace and blessings upon our Prophet Muhammad, his companions, his family and all those who follow them in righteousness till the day of reckoning, Amin. For giving me the health, power and patience to carryout this study.

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I would like to thank all people who I did not mention, but who contributed in one way or another to me in this work.
Abstract

The main aims of the study were to examine the impact of agricultural insurance and assess its impact on the rate of adoption of the recommended cotton cultural practices by farmers in the irrigated scheme of Gezira. It is also intended to study the effect of the agricultural insurance on cotton productivity and net return. Finally, to assess the attitudes and behavior of the farmers towards cotton crop insurance.

A form of multi-stratified random sampling technique was used to selecting the sample. Seventy-five farmers from each of the two Groups where crop insurance is applied (W. Shair and El.Huda) were selected. The total numbers of the sample was 150 farmers. Data were collected by personal interviews. Descriptive statistics, T. test, Chi-square, correlation, and scoring techniques are used for data analysis.

The major findings of the study are:

- All farmers (insured and uninsured) adopted the following recommended practices at a lower rate: number of irrigations, irrigation intervals, time of thinning, number of pickings, and picking intervals.
- All farmers (insured and uninsured) knew of the recommended time and methods of herbicide application, methods of insecticide application.
- All farmers (insured and uninsured) lacked knowledge of the recommended, kind of seed dressing, kind and dose of herbicide application, kind, dose, and time of insecticide application.
- Socio-economic characteristics of the farmers as farm size of cotton, Number of years of formal education, Family size, Membership in social
organizations were found significantly and positively correlated with cotton cultural practices while Age groups and Years of experience in agriculture, were not correlated.

-The cotton productivity and net return was highly and significantly dependent on agricultural insurance, in W.Shair and El. Huda Groups after and before insurance.

-The cotton productivity and net return was highly and significantly dependent on agricultural insurance in W.Shair Group after and before insurance.

-The cotton productivity and net return was not significantly dependent on agricultural insurance in El. Huda Group after and before insurance.

-There were positive attitudes toward cotton crop insurance and willingness of the insured farmers to adopt cotton insurance in the next season.

**The main recommendations of the study are:**

- Serious emphasis should be given to encourage the farmers to adopt cotton cultural practices, to increase production and farmers' return.

- It is important to promote insurance awareness among farmers.

- Agricultural insurance should be protecting farmers against risk to intensify to reduce their need for relief.

- The insurance company is advised to reduce risk by providing support to the insured farmers to solve difficult problems related to irrigation, credit, input, and to provide services and continuing monitoring and evaluation of the program.
خلاصه الأطرحة

الأهداف الأساسية للدراسة هي معرفة أثر التأمين الزراعي على مزارعي القطن لتقسيم الأثر على معدل تبني الممارسات الزراعية الموصى بها بين المزارعين بشريو الجزيرة المرؤو ودراسة أثر التأمين الزراعي على إنتاجية القطن والعائد منه واخيرا توجيهات وسلوك المزارعين نحو تامين محصول القطن.

طبق في اختيار العينة أساسا على الطبقية المركبة لاختيار خمسة وسبعون مزارع من كل من قسمي وأدى شعير والهدى عشوانيا الذين طبق فيهما التأمين الزراعي بمجموع 150 مزارعا. تم جمع البيانات بالمقابلية الشخصية والتحليل بالإحصاء الوصفي، اختبار (ت)، مربع كاي، معامل الارتباط و

النتائج الأساسية للدراسة:
- الممارسات الزراعية الموصى بها لمزارع القطن، والتي طبقها المزارعون (مؤمن وغير مؤمن)، بمعدل عالمي ميعدد الرية الأولى، نوع وجرعة وطرق تطبيق سماد اليوريا، والى بعد التسميد، عدد التقانة والجمال، تعبير البذور، و مبيد العوال وإلآت.

- الممارسات الزراعية الموصى بها لمزارع القطن، والتي طبقها المزارعون (مؤمن وغير مؤمن)، بمعدل أقل، هي عدد الريات، الفترة بين الرية والأخرى، ميعدد الشكل، عدد لفترات القطن، الفترة بين اللدقة والأخرى.

- الممارسات الزراعية الموصى بها لمزارع القطن، والتي يعرفها المزارعون (مؤمن، وغير مؤمن)، هي ميعدد وطرق تطبيق مبيدات الحشراس، طرق تطبيق مبيدات الافات والحشرات.

- الممارسات الزراعية الموصى بها لمزارع القطن، والتي لا يعرفها المزارعون (مؤمن، وغير مؤمن)، هو نوع مبيد تغبير التفاوي، نوع وجرعة تطبيق مبيد الحشراس، نوع وجرعة وميعدد تطبيق مبيد الافات الحشرات.

الصفات الاقتصادية والاجتماعية للمزارع كحجم حواشة القطن، عدد سنوات التعليم الرسمي، حجم الأسرة، عضوية المزارع في المنظمات الاجتماعية ترتبط ببعض التوصيات الزراعية بينما عمر المزارع ومدة الخبرة في الزراعة لا ترتبط.

- إنتاجية محصول القطن والعائد منه تعتمد على التأمين الزراعي في (وادي شعير) بعد وقيل التأمين الزراعي.
- إنتاجية محصول القطن والعائد منه لا تعتمد على التأمين الزراعي في (والهدى) بعد وقيل التأمين الزراعي.
- هناك تأثير إيجابي للمزارعين نحو تأمين محصول القطن متمثلًا في الرغبة لدى المزارعين للتأمين في الموسم القادم.
التوصيات الأساسية للدراسة هي:
- أهمية تطبيق التوصيات الزراعية الموصى بها لمحصول القطن من قبل المزارعين لزيادة الإنتاجية والعائدات.
- الاهتمام بتنوير المزارعين بالتأمين الزراعي.
- التأمين الزراعي يجب أن يشجع لحماية المزارعين ضد المخاطر وتقلييل الحاجة للمعونة والهبات.
- من الضروري للشركة المؤمنة تقليل المخاطر وذلك بالمساهمة في حل المشاكل الصعبة التي تواجه المزارع والتي لها علاقة بالري، والتمويل، ومدخلات الإنتاج والحصول على الخدمات والمتابعة والتقييم المستمر.
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## Glossary and abbreviations:

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<td>Asian Productivity Organization</td>
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<td>ARM</td>
<td>Agricultural Risk Management LTD.</td>
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<td>ARTC</td>
<td>Agricultural Research and Technology Corporation</td>
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<td>CIR</td>
<td>Crop insurance reserve</td>
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<td>ELS</td>
<td>Egyptian long staple</td>
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<td>FAO</td>
<td>The food and agricultural organization</td>
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<td>GNP</td>
<td>Gross national product</td>
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<td>IAS</td>
<td>Individual account system</td>
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<td>IGARDA</td>
<td>Inter Governmental authority on drought and development</td>
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Chapter One

1.1 Introduction and background:
The total area of Sudan is 2.5 million square kilometers (596,621 Feddan-A feddan is equivalent to 1.038 Acres). About one third of this area is desert or semi-desert.
The remainder is suitable with varying capacities for crop production, livestock, grazing and forestry.
Although about one third of the area is desert and semi-desert, the country is endowed with ample resources, fertile land, livestock, fisheries, mineral resources, rivers, underground water and forestry. Cultivable land amounts to about 200 million feddans of which about 10 percent is potentially under cultivation and the reminder excluding desert is suitable for livestock grazing. IGARDA (1993)
Sudan is very rich in natural resources, a fact that has inevitably made the country base its economy on agricultural and animal production. Consequently, agriculture is considered the backbone of the economy in the country. The society is conditioned by anthropological and climatic factors, as well as the nature of the land, but agriculture is the foundation of the social structure. Although there is great potential in the field of agriculture, development and reaping maximum benefit from this sector needs more effort to move the wheel of production forward towards improvement and progress.
The agricultural sector has many opportunities and enormous resources that make a good basis for development and investment. Sudan was thought as one of three countries, with Australia and Canada, to solve the problem of food insufficiency in the world report of the investment authority (2000).
"Despite the importance of agriculture in the developing countries, the various initiatives taken for its development have often failed to deliver full
benefits. Low levels of income, low capital labor ratios, and the general precariousness of agricultural production still characterize this sector in many countries. There is often a dichotomy between the urban and rural sectors of the economy, not only in terms of technology but more importantly, in terms of access to services, for example, transportation, medical and educational facilities, and credit and insurance." Conference Toko Japan (1994).

The Sudan with its enormous irrigated area of almost five million acres, owns, it has the biggest irrigated area in the African sub-Saharan countries. Still added to this land wealth, is the huge financial investment in infrastructure as dams, pumps, water control-devices and huge machinery. As such, it was inevitable that such material capabilities should be given all possible care and necessary conservation to guarantee its priceless performance for generations to come. The irrigated sector in Sudan represents a fundamental base for agriculture.

In fact, despite its small area (Twenty percent only of the whole cultivated lands) yet it produces fifty percent of the total agricultural production in the country.

Knowledge of cotton planting in the Sudan goes back to the 18th century when it was grown for the first time in Eastern Sudan (Tokar area). Commercial growing started in 1905 in Zeidab Pilot Scheme in Northern Sudan. Over 90% of cotton is grown in state-managed large irrigated schemes; the remaining part is private ownership and rain-grown. Management is tripartite, involving government scheme management and the tenants.

"In 1910 then Sudan (condominium) government started the first pilot scheme for growing Egyptian long-staple cotton in the Sudan Gezira plain with a view to finding out the suitability of the soil, as well as the climatic conditions for introducing such a cash crop in the Sudan."
In the year 1911, the pilot scheme became an established fact, where 250 feddans of Egyptian variety cotton were grown. In the following year 1912, and an average yield of 5.32 kantars per feddan was obtained. This indicated, in no limited terms, the suitability of the soil and climatic conditions for introducing the long-staple variety of the Egyptian cotton into the Gezira plain" William Garstin (1904).

1925 was a landmark year in irrigated agricultural production in the Sudan, following the establishment of Sennar Dam. Since then, cotton assumed the leading role as a cash crop.

Sudan has also been ranking 10th in production of cotton worldwide before the tremendous expansion in cotton cultivation in the United States of America and China.

The process of declination yield has aggravated itself. Income form cotton has declined because of lower yields and this lower income has in turn forced many farmers to decide to spend less labor on weeding, irrigation, and cotton picking. The later became relatively more expensive with the declining yields. The introduction of intensification and diversification has had a big impact on the yield leading to more critical cropping calendar, to more competition for water between crops during the sensitive period October November and to the cultivation of more crops.

It might be concluded that, the tenants, the S.G.B and M.O.I, were all held responsible for the decline in agricultural production at that time.

However, this disappointing situation was not only attributable to the tenants. The (S.G.B) and (M.O.I). Another important factor was the deterioration of the overall economic situation which has caused a shortage of funds and of foreign exchange for necessary investment, operations and maintenance .The economic situation was also responsible for the farmers low cotton revenues, and the quality of tenants farming declined because they were unable to attract the required hired labors. Despite the
tremendous efforts done by S.G.B. to enhance and improve cultural practices through implementation of research recommendations, no significant amelioration has been recorded in crop production; this disastrous situation had cast its own shades on tenants life from one side and on the Sudan economy from another side. Yousif G.M., (1997)

1.2 Problem:
"Agricultural production is inherently a risky business, and farmers face a variety of weather, pests, diseases, input and market-related risks giving an uncertain income each year. And as a result farmers must worry about their ability to repay debt, to meet overhead costs (e.g. land rents and water taxes) and in many cases, their ability to meet essential living costs for their families. The same risks are also of concern to agricultural credit institutions confronted with risky borrowers. Lenders must seek to reduce the possibility of poor loan recovery rates in unfavorable years, even if this means only modest level of lending to agriculture.

The prevalence of risk in agriculture is not new and farmers rural institutions and lenders have, over generations, developed ways of reducing and coping with risks. A key question is whether these traditional mechanisms of risk management are sufficient, or whether public interventions, such as crop insurance, can provide a more efficient alternative." (APO reports 1990).

"Agricultural farming risks pose serious problems not only to farmers but also to the agricultural credit banks through negative effects on their operations and performance. The farmers’ delinquency problems on the low collection rate suffered by banks are mostly a result of various agricultural risks. These risks generally result from natural hazards such as floods, drought or other perils such as diseases, low prices of agricultural output, fire, and accidents etc. " Workshop (NENARACA. 1992).
The dominant risks vary widely from one agricultural regime to another but it is probably fair to claim that farmers in developing countries are exposed to most types of risk and that low income farmers, especially in semi-arid and arid areas are the most exposed.

Before 2001 there was no crop insurance in Sudan, if we exclude the trials initiated by the Islamic Insurance in the early seventies, while some livestock insurance was practiced since the early seventies. The situation with respect to crop insurance is not unique to this region of the world. The food and agricultural organization insurance compendium (FAO 1991) established that in Africa there are some 48 African nations without crop insurance programs Sudan was one of those countries.

Sheikan and other companies have offered livestock cover for a number of years; this has been confined mainly to commercial cattle farms. Reinsurance of the livestock program has been through Rebert Fleming into the London Market, as well as with other multinational companies. However, Sheikan Insurance and Reinsurance Company Limited, in order to rectify this situation with regard to Sudan, has instigated a long term plan to bring the benefits of agricultural risk management through insurance to those engaged in agricultural production.

The main rehabilitation measures identified in the World Bank (WB) the Government of Sudan report of 2000; introduction of either insurance option may have limited impact on the farmers as a measure in isolation of resolution of other constraints. However, should the Gezira be re-vitalized and made self-sufficient, as is recognized as feasible in the (WB) report, then insurance can play a role in establishing farmers' income, and facilitating credit.

The insurance of crops and livestock on the other hand, is considered to have more impact that is direct on the productive efforts of farmers. Since
Graph

Sudanese agricultural risk fig. 1
these constitute a major investment and also the major source of income for most farmers in the developing countries and any loss of these will not only result in a loss of their investment and income, but also affects their productive capacity in the immediate future.

With this objective in mind, Sheikan organized two conferences one in 1994, which raised the awareness of agriculture in Sudan (Including a paper exploring the role and acceptability of agricultural insurance in Islam), and a second workshop in 1995 exploring the possibility of agricultural insurance within the country.

Agricultural Risk Management (ARM) is a London based consultancy company which provides specialist risk survey analysis and risk management services world-wide in agriculture, principally in the planning and design of agricultural insurance projects. ARM has subsidiary companies in Australia, New Zealand, Chile and the USA. (ARM. 1995).

ARM's proposal presented to Sheikan in December 1995 recommended a three-staged approach to the development of agricultural insurance in Sudan.

Stage 1 Identification of Priority Enterprises.

Stage 2 Risk Analysis, Insurance and Reinsurance Planning of First Pilot Project: and

Stage 3 Implementation of a Pilot Project.

Subsequent to these stages there would be monitoring and evaluation of the pilot project. This would enable improvements in the project parameters to be implemented for enhanced future performance. In addition, experience gained from the pilot project would enable further new agricultural insurance products to be designed to meet the requirements of commercial producers.

Therefore, insurance scheme should be introduced in stages to provide time to build up the necessary expertise; in the early stages, the crops to
be covered should be few major crops and then gradually bring in another crop and more risks.

Sheikan has gone a step further by formulating the framework for the country crop insurance program on an experimental basis and to implement it on a wider scale if found effective.

Cotton in the Sudan until now is considered a main cash crop and does play an important role in the national income. Generally, cotton is an important crop for Sudan’s economy because:

Cotton crop contributes a large portion of the country’s (GNP); this crop has been protected from natural Calamities such as drought, flooding and pest infestation. Hence, the Sheikan is urged to implement a crop insurance program in order to reduce the risk of farm loss.

A pilot cotton insurance program was initiated in W. Shair irrigated Groups, in Gezira Scheme (Extra long staple ELS).

Pilot cotton insurance scheme was implemented for season 2002-2003 in the area, about 22029 fed. and covered about 6600 farmers. The project was extended from W. Shair area to include other areas in season 2003-2004 El. Huda Group; others Five blocks Wad Hilal, Wad Albur. El Nur. Wad Hussein, Elrukan in addition to irrigated Sorghum in only one block, namely Amarakasir block, in Wadi- Shair in an area of about 5.000 fed. In addition to the Gezira Scheme crop, insurance has extended to other irrigated corporations. Including Rahad and Suki, as well as to rain-fed mechanized production in the states of Gadarif, Blue Nile and Upper Nile. The crops covered include Sorghum, Seasame Sunflower Corn and rain-fed cotton.

However, the Gezira Scheme has been chosen for the study because the experience is the oldest and because the farmers’ are fidget within the scheme facilitating collection of data, in addition to personal interviews with the farmers.
Compensation scheme by the Sheikan Insurance Company against losses due to excessive rain, flood, wind, fire and diseases due exclusively adverse to climatic conditions cover the period from emergence until the end of the vegetative stage.

Agricultural insurance is designed to transfer risk from the farmer, which he faces as a result of the impact of naturally occurring hazards, usually climatic (or perils for which the proximate cause is climatic) and over which he has no control in the normal course of the day to day management.

Such hazards may be those, which either the farmer cannot prevent or minimize by good planning, or the cost of doing so exceeds that which may be reasonably borne by the economics of the farm enterprise. Sheikan Insurance Company is seeking government support for agricultural insurance by the Ministry of Agricultural and the Ministry of Finance through provision of financial to support the farmers at the start of the program.

Ministry of Agriculture of Sudan is highly recommending and supporting agricultural insurance to cover different crops in different sectors. Some (630,000,000 S.D) have been approved in 2006 budget for supporting agricultural insurance. Direct support of the Ministry of Finance to the agricultural insurance is 50% of the premium, amount of (35,000 S.D).

The Gezira Scheme is currently suffering severe financial and operational problems. These include lack of maintenance of the irrigation infrastructure, and financial constraints, which translate, at the farmer’s level, to lack of reliable credit and input availability, inadequate pest control, and falling levels of yield for cotton.

Any insurance introduced into the present structure will not bring major benefits unless, it can be linked in some way to alleviate the main
constraints faced by farmers, such as credit availability or input supply. Further, the benefits are likely to be gained only if there is potential to improve the main irrigation infrastructure. It is clear that much higher yields than the current levels can be achieved, should some of the constraints be removed and the Gezira Scheme has the fundamentals to support profitable farming. If insurance is able to play a role in an integrated way with the alleviation of other constraints, the potential improvement for farmers would be significant. Agricultural insurance stabilizes agricultural output and provides a certain degree of security to the farming population together with agricultural extension services and an effective system of rural credits.

1.3 Statement of the problem
Despite the importance of agricultural, crop insurance, and its anticipated impact on the stability and sustainability of crops production, yet farmers in the agricultural sector in Sudan do not know it. Crop failures due to climatic changes and risks are very frequent and mainly drought, floods, heavy rains and fire, etc cause the most serious and prevalent losses in agricultural production. This situation has led farmers to pay less attention to farming activities. Crop insurance seeks to protect farmers against loosing their crops (totally or partially) as result of the hazards caused by changes in climatic conditions which are no doubt beyond their control. Crop insurance enables farmers to cover their debts and increase their capital through enhancing their ability to borrow more from banks. Banks like to have guarantees for recover of bad crops. Crop insurance would generally encourage farmers to invest more in agriculture and hence promoting modernization, continuity and improvement of economic stability.

Cotton insurance in the Gezira Scheme which started with 22,029 feds and one block has extended to more than 120 thousand feds in 6 groups. This
has given a considerable measure of security in farmers’ income over the years and this will contribute to the stability of agriculture and in turn to the stability of the general economy of the Country. Such interventions not only improve the overall performance of the farmers but also convinced the farmers Union to decide to extend the insurance system throughout the scheme and to all crops. The main challenge here is not our ability to do the job, but the readiness of the government to come forward with the required amount of subsidy. The cotton crop insurance is expected to result in playing a very important and dynamic role in stabilizing farmers’ income and facilitating credit through implementation of the pilot project. But nothing has been done to study and assess its impact on adoption of recommended cotton cultural practices, cotton productivity and net return and finally farmers’ attitudes and behavior towards cotton crop insurance.

1.4 Objectives of the study:
The main objectives of this study are divided into five parts:

1.4.1 Comparative study among insured farmers in W. Shair (Gezira) to assess the impact of cotton crop insurance before and after insurance in 2002/2003 and 2003/2004 seasons respectively on:
- Adoption of the recommended cotton cultural practices
- Cotton productivity. - Cotton farmers' net return.

1.4.2 Comparative study between insured and uninsured farmers in El. Huda group before adopting the cotton crop insurance in season 2002/2003 and after adopting it in season 2003/2004 to assess the impact of cotton crop insurance on:
- Adoption of the recommended cotton cultural practices.
- Cotton productivity. - Cotton farmers' net return.

1.4.3 Study the effect of some socio-economic characteristics of the farmers, Farm size of the cotton, Age groups, Years of formal education,
Family size, Years of experience in agriculture, Membership in social organizations and adoption of some cotton cultural practices Sowing date, Time of resowing, Time of Thinning, Time of urea fertilizer application, and number of pickings.

1.4.4 Farmers attitude and behavior towards cotton crop insurance.

1.5 Limitations of the study:
- The field of agricultural insurance is new in the Sudan. For this reason, there is difficulty in gaining relative information and data.
- The data was collected in the rainy season and it was difficult to reach the farmer in the area of sample selections, because of bad roads and because farmers were too busy.

1.6 Design of the study:
The study is divided into five chapters: chapter one covers introduction background, problem, statement of the problem, objectives of the study, limitations of the study, design of the study, hypotheses and definition of terms. Chapter two covers literature review. Chapter three covers research method. Chapter four covers data analysis and results, Chapter five describes summary, finding of results, conclusion, and recommendations.

1.7 Hypotheses of the study:
The hypotheses are divided into two parts:
- Cotton insurance has no significant effect on:
  - The adoption of recommended cotton cultural practices.
  - Productivity of cotton crop.
  - Cotton net returns.
  - Farmers’ attitude and behavior towards cotton insurance
- Some socio- economic characteristics are not correlated by adoption of some cotton practices.
Each hypothesis is branched into sub-hypotheses


Cotton insurance has no significant effect on adoption of:

- Sowing date
- Number of seeds per hole
- Spacing between plants
- Time of first irrigation
- Irrigation intervals
- Number of irrigations during the season
- Time of resowing
- Time of thinning
- Number of plants after thinning
- Specific kind of urea fertilizer
- Dose of urea applied
- Time of urea fertilizer application
- Irrigation after urea fertilizer application
- Method of urea fertilizer application
- Time of green ridging operation
- Number of Tagnats and Gadwals
- Herbicide application
- Specific kind of herbicide
- Quantity of herbicides applied
- Time of herbicide application
- Methods of herbicide application
- Seed dressing application
- Kind of seed dressing
- Insecticide application
1.7.2. Cotton insurance has no significant effect on adoption of recommended cotton cultural practices of insured farmers in El.Huda (Mangil Extension) Group Seasons 2002/2003 and 2003/2004. Cotton insurance has no significant effect on adoption of:
- Sowing date
- Number of seeds per hole
- Spacing between plants
- Time of first irrigation
- Irrigation intervals
- Number of irrigations during the season
- Time of resowing
- Time of thinning
- Number of plants after thinning
- Specific kind of urea fertilizer
- Dose of urea applied
- Time of urea fertilizer application
- Irrigation after urea fertilizer application
- Methods of urea fertilizer application
- Time of green ridging operation
- Number of Tagnats and Gadwals
- Herbicide application
- Specific kind of herbicide
- Quantity of herbicide applied
- Time of herbicide application
- Methods of herbicide application
- Seed dressing application
- Kind of seed dressing
- Insecticide application
- Specific kind of insecticide
- Quantity of insecticide applied
- Time of insecticide application
- Methods of insecticide application
- Irrigation after pickings
- Number of pickings
- Picking intervals

1.7.3 The cotton productivity were not dependent on agricultural insurance in (W.Shair Group) before and after insurance Seasons 2001/2002 and 2002/2003.

1.7.4 The cotton productivity were not dependent on agricultural insurance in (El. Huda Group) before and after insurance 2002/2003 and 2003/2004.

1.7.5 The cotton net return is not dependent on agricultural insurance in (W.Shair) Groups, before and after insurance seasons 2001/2002 and 2002/2003.

1.7.6 The cotton net return is not dependent on agricultural insurance in (El.Huda) Groups, before and after insurance seasons 2002/2003 and 2003/2004.

1.7.7 Holding of farmers to agricultural insurance for the cotton crop, contributes to their benefits.

1.7.8 Holding of farmers to agricultural insurance for the cotton crop contributes to their protects the farmers against risks and catastrophe.
1.7.9 Holding of farmers to agricultural insurance for the cotton crop contributes to solving problems related to irrigation.
1.7.10 Holding of farmers to agricultural insurance for the cotton crop contributes to solving problems related to credit.
1.7.11 Holding of farmers to agricultural insurance for cotton crop contributes to solving problems related to input.
1.7.12 Farm size of cotton has no significant effect on adoption of cotton cultural practices. (Sowing date, Time of resowing, Time of Thinning, Time of urea fertilizer application, and Number of pickings)
1.7.13 Age groups have no significant effect on adoption of cotton cultural practices. (Sowing date, Time of resowing, Time of Thinning, Time of urea fertilizer application, and Number of pickings)
1.7.14 Years of formal education have no significant effect on adoption of cotton cultural practices. (Sowing date, Time of resowing, Time of Thinning, Time of urea fertilizer application, and Number of pickings)
1.7.15 Family size has no significant effect on adoption of cotton cultural practices. (Sowing date, Time of resowing, Time of Thinning, Time of urea fertilizer application, and Number of pickings)
1.7.16 Years of experience in agriculture have no significant effect on adoption of cotton cultural practices. (Sowing date, Time of resowing, Time of Thinning, Time of urea fertilizer application, and Number of pickings)
1.7.17 Membership in social organizations has no significant effect on adoption of cotton cultural practices. (Sowing date, Time of resowing, Time of Thinning, Time of urea fertilizer application, and Number of pickings).
1.8 Definition of terms

Act of god
An event arising out of natural causes with no human intervention, which could not have been prevented, by reasonable care or foresight e.g. floods, earthquakes, windstorms.

Impact assessment:
Evaluation of the extent to which a program causes changes in the desired or undesired direction in a target.

Loss:
All changes resulting from the major climatic conditions defined above which could call for the insurer's cover.

Risk:
Relates to an event, which may or may not occur, and the likelihood of which can be predicted with certain degree of confidence.

Moral hazard:
The risk or danger to be looked for from human nature, both individual and collective, moral hazard depends mainly on the character of the society, the character of the insured, and on the character of his employees and the manner in which they work and behave at work. Example of poor moral hazard are carelessness, fraudulent claims, crime or arson, irresponsibility, gross over insurance, general moral climate due to period of depression and recession and unreasonable demand of high amount of claims settlement.

Other definition
Refers to the effect of insurance on the insured’s incentives to reduce expected losses.

Risk control:
Broadly defined, risk control consists of those techniques that are designed to minimize, at the least possible costs, those risks to which the organization is exposed; risk control methods include risk avoidance and
the various approaches at reducing risk through loss prevention and control efforts.

**Insured peril:**
The peril that causes of the loss, which entitles the insured to recover loss under the policy; e.g. hail, frost, wind, drought excessive rain, pests and diseases.

**Risk management tool:**
Our definition of risk management states that it deals with risk by designing and implementing procedures that minimize the occurrence of loss or the financial impact of the losses that do to occur. This indicates the two broad techniques that are used in risk management for dealing with risks. In the terminology of modern risk management, the techniques for dealing with risk are grouped into two approaches: risk control focuses on minimizing the risk of loss to which the firm is exposed, and includes the techniques, of avoidance and reduction. Risk financing concentrates on arranging the availability of funds to meet losses arising from the risks that remain after the application of risk control techniques, and includes the tool of retention.

**Flood:**
Major agricultural risk resulting from excess precipitation and entailing total or partial submersion of insured crops during amore or less long period of time  (The minimum duration of the flood risk shall be determined in special conditions).

**Drought:**
Climatic phenomenon resulting from precipitation, which is insufficient for the cultivation cycle requirements of, insured crops. Especially when there are rainless intervals during the delicate stages of growth of plants.
The minimum level of rainfall described as insufficient precipitation shall be determined in the special conditions.
**Hail:**
Frozen rain falling in grains

**Insurer:**
Shiekan Insurance and Reinsurance Company Ltd., Khartoum Sudan.

**Project:**
All agricultural operations performed in one season for named crops in a specified scheme.

**Insured:**
The underwriter or agricultural operator, this insurance shall cover the major climatic risks as described below and decreed as such by the competent authorities.
The farmer or producer, who owns the named scheme.

**Crop insured:**
The crops specified by SIRC e.g. cotton crop.

**Insurance:**

1/ Is the financial mechanism which, aims at reducing the uncertainty of loss by pooling a large number of uncertainties so that, the burden of loss is distributed. Generally, each policy-holder pays a contribution to a fund in the form of a premium assessed by the insurer commensurate with the risk he introduces, which is established and administered by the insurer and out of that fund are paid the losses suffered by any of the insured.

2/ Insurance is an important tool in the hands of the civilized man to protect him, his next of kin and other fellow beings against the multiplicity of hazards to which his and their lives and properties are subject. Such hazards may be due to natural causes. To human failures and devices, to materials and situations created by and for himself. Some of the hazards may be of great magnitude and some of small; some are unavoidable and some may be avoidable but only at great cost to an individual man, which is beyond his means to master. To assure the well-being and welfare of
man these hazards need to be faced, to be controlled where possible but, where not, it is necessary to reduce the force of their impact by distributing the burden of the resulting losses over time, space and persons. This later is the function of insurance.

**Agricultural insurance:**
This is the insurance applied to agricultural enterprises e.g. crop insurance, livestock insurance, generally against death sickness or serious injury to the animal is included in this class of business insurance on agriculture, e.g. rearing of prawns and fish, is also included. The term "agricultural insurance" is not normally used to describe insurance of farm buildings or equipment, though the same insurer may cover both the agricultural and non-agric assets such as buildings.

**Crop insurance:**
- Is one means by which the farmer can protect his income and his investment from the more disastrous effects of crop losses due to natural hazard.
- Provides protection against loss or damage to growing crops including perennial crops such as tree crops against specified or multiple perils, e.g. hail, wind-storm, fire, flood. Measurement of the loss could be by" yield" basis production costs basis, agreed value basis or rehabilitation costs basis.
- Crop insurance is one of the channels for providing compensation to farmers suffering from serious crop losses due to climatic factors, plants diseases etc. during various stages of crop growth.

**Insurance policy:**
A formal document including all clauses, riders, endorsements and papers attached thereto and made apart thereof which expresses the terms, exceptions and conditions of the contract of insurance between the insurer and insured. It is not the contract itself but evidence of the contract. In compulsory schemes, the individual insured may not hold a formal
insurance policy document directly related to the insurance contract but an insurance certificate, which gives brief outlines of the insurance terms and conditions.

**Insured value:**
The cost of production related to each single feddan of each crop as agreed upon between the insurer and the insured.

**Insured unit:**
The total sown area (feddan) of the specified crops

**Reinsurance:**
- Just as businesses and individual purchase insurance, reinsurance is the purchase of insurance by an insurer. In addition to reducing underwriting risk (and the amount of capital needed to achieve a given level of insolvency risk by diversifying across geographic areas and lines of business, insurers can reduce underwriting risk by purchasing reinsurance. As a result, the purchase of reinsurance can substitute for capital and allow an insurer to hold less capital without increasing its insolvency probability.
- Reinsurance is a device by which an insuring agency shares the risks assumed by it with one or more other similar agencies or with agencies, which specialize in reinsurance. The first is called a direct-writing agency or company, and the second the reinsurer. Usually a contract or "treaty relation" is entered between the two, defining the specific circumstances under which reinsurance is to apply, the respective shares of obligations in case of losses and indemnities to be paid, and the allocation of premiums received by the direct-writing agency.
- Insurance taken out by a direct insurer from another insurer (termed the reinsurer); so as to share and spread the risk (s) accepted under the original policy (ies) the original risk (s) may be too great for the direct insurer to bear solely on his own account due to large exposure or accumulation.
-Is a device by which an insuring agency shares the risks assumed by it with one or more other similar agencies or with agencies, which specialize in reinsurance. The first is called a direct writing agency or company. and the second the reinsurer, usually a control or treaty relation is entered between the two defining, the specific circumstances under which reinsurance is to apply, the respective shares of obligations in case of losses and indemnities to be paid and the allocation of premiums received by the direct-writing agency.

-Agricultural reinsurance is a means by which insurance companies can in partnership with professional rein-insurers safely develop this increasingly important class of business.

Agricultural reinsurance is crucial in view of national disasters whereby government responsibility and financial aid are greatly alleviated by its utilization.

**The amount of insurance:**
The amount of insurance is the maximum yield covered by the insurance scheme from which the amount of indemnity is estimated. In particular, two methods may be used in computing the insurance amounts the area-based method and the yield based method.

**Insurance coverage**
The scope of the protection provided under a contract of insurance.

**The insurance damage rate** = \( \frac{\text{indemnities paid}}{\text{Amount of insurance}} \)

**Period of insurance:**
The period of protection for which, the policy is issued. Any losses taking place outside this period are not indemnified. For annual crops this period of insurance, normally commence at the time of sowing, sprouting, blooming, transplanting, and ends at the time of harvest. For perennial crops, e.g. Oil palm, the period of insurance may be on an annual basis.
**Premium:**
- The amount, which the insured undertakes to pay in exchange for the insurer's cover.
- The monetary consideration payable by the insured to the insurers for the period (or term) of insurance granted by the policy.

**Premium rate:**
The price per unit of insurance normally expressed as a percent or per mille of the sum insured.

\[
\text{Premium rate} = \frac{\text{premium (or Gross premium)}}{\text{Amount of insurance}} \times 100
\]

Clearly the greater the risk of insured loss, the greater will be the premium rate.

**Gross premium written:**
Include all premiums written, received and receivable in the years, net of taxes and cancellations before deduction of commissions.

**Gross premium:**
The premium paid by the insured, which is the aggregate of components including risk premium plus operation expenses, commissions, reserves and other expenses paid by the insured.

**Net premium:**
The premium necessary to cover any anticipated losses, before leading to cover commission and other expenses. Also called "risk premium or pure premium"

**Deductible:**
A common way to limit the amount of coverage is through deductibles, which eliminate coverage for relatively small losses.

**Indemnity:**
- The amount payable by the insurer to the insured, either in the form of cash, repair, replacement or reinstatement in the event of an insured loss
which amount is measured by the extent of the insured’s pecuniary loss, is termed the indemnity. It is set at a figure equal to but not more than the actual value of the subject matter insured just before the loss, subject to adequacy of sum insured. This means for many crops that an escalating indemnity is established, as the growing season progresses.

The dictionary definition of indemnity is "The protection or securing against damage or loss or securing against legal responsibility" the idea of security and protection, of course fits in well with the condition for development of insurance and gives some hint as to the meaning of indemnity.

- Is defined as a mechanism by which insurers provide financial compensation in an attempt to place the insured in the same pecuniary position that be occupied immediately before the event, subject to any limitation which may have been agreed and willing into the contract. The insured is not entitled to receive any thing in excess of his financial losable may even receive less than this if there is any limitation in the policy.

- The difference between the total cost insured and the value of the harvested crop provided that the difference is due to insured hazard.

- The amount due by the insurer in respect of the covers.

**Yield:**
Production per unit area.

**Standard yield:**
An average yield under given conditions.

**Normal yield:**
That yield which a number of years' experience indicated can be expected from a particular plot under normal conditions, when no extraordinary natural disaster or unusual meteorological events occur. In practice, the mode value of yield (the yield most commonly occurring) is taken as the normal yield. The mode is also the yield most commonly conceived by
farmers as being acceptable since they generally ignore bad years when estimating future yield on the basis of past performance.

**Potential yield:**
Potential yield for a given crop per year is the yield, which can be obtained if disasters do not occur in that particular year. It does not necessarily mean the highest yield year ever achieved. The potential yield relates to a particular year. Loss adjustment under the potential yield approach usually requires determination of the percentage of damage. Potential yield is used for example in computing indemnities for wind damage in the tree crops. In this case, (and in most cases) the potential yield is considered as follows number of fruit dropped plus number of fruit on tree.

**Insurable yield:**
Maximum yield to be covered, normally expressed as percentage of potential yield, it normally represents cost of production and has the advantage of requiring in situation appraisal and hence better underwriting procedures.

**Guarantee yield:**
The physical yield of crops established in the insurance policy, against which actual yields will be compared when calculating indemnities.
Chapter Two
Literature review

The chapter of relevant literature review is divided into five parts, covering: (1) Diffusion and adoption of innovation (The communication processes, the classical models of the innovation–decision process, empirical studies of adoption.
(2) Risks in agriculture (3) Agricultural insurance
(4) Cotton risks in the Gezira Scheme
(5) Attitudes and behavior of farmers.

2.1 Diffusion and adoption of innovation:

2.1.1 The communication process:

Definition:
Rogers and Shoemaker (1971)
Define it as "the process by which messages are transferred from a source to a receiver or in other words,
The transfer of ideas from a source with a view-point of modifying the behavior of receiver.
Leagns (1961) defines it, as “The process by which two or more people exchange ideas, facts, feelings or impressions in ways that each gains a common understanding of the meaning and use of message".

Elements of communication
There is generally an agreement on four elements of the communication process:
1. The source (s): who issues the message.
2. The message: which is the content, which the source wants to transmit to the receiver with the aim to influence him.
3. The channel: which is the means by which the message gets from the source to receiver.
4. The receiver: is the person or group of persons to whom the message is directed.

Van Den Ban and Hawkins (1988) added a fifth element to the process of communication, which is "to know- how of treating the message to guarantee the needed effects."

Hence, we can discuss these communication elements:

**The source of communication:**
Sender Yella (1991), defined the source in extension as "the communicator being the person who starts the process. He may be an extension worker, block personnel, information officer, specialist or may be even a neighbor, relative, friend, a village leader and others".

**The message:**
Sender (1966), stated the purpose is "the objective the change in behavior the message is intended to bring about. These changes may be new knowledge, change in attitudes, change in skills, change in thinking or change in practices. The content is the subject matter with which the message is concerned. The treatment makes the soil favorable for acceptance and growth of the message."

**The channel**
Yella (1991) mentioned that. "Personal contact by farm and home visit, group meetings, demonstrations, exhibitions, motion pictures, radio, written materials like newspapers, pamphlets and tours are some of channels commonly used in extension work". He added that proper selection and use of channels, which is varying with type of audience (background), type of message and the recipient stage in the adoption process, are important and determine successful communication.

Rogers (1983) mentioned, "Mass- media channels are often the most rapid and efficient means to inform an audience of potential adopters about the existence of an innovation that is to create awareness knowledge. On the
other hand, interpersonal channels are more effective in persuading an individual to adopt a new idea especially if the interpersonal channel links two or more individuals who are near-peers.

Adam (1982) stated, "The communication channels used by farmers are commonly classified as fallows".

1. Mass-media channels such as radio, TV, newspapers, leaflets...etc. from government or commercial sources.
2. Personnel contact with extension workers and representatives of commercial firms either on an individual bases or in small groups.
3. Personnel contacts with other farmers.

**The receiver (Recipient):**
The receiver is the person or a group of persons to whom the message is directed. The receiver is the most important link in the communication process.

Sigh (1981), Stated that" many personal, social, physiological, economical and other factors influence the communication skills of the farmer (the receiver). Such as socio-economic status, level of education, social participation, age, adoption process, existing level of knowledge about the message, his attitude towards himself, towards the communicator and towards the message, his change-process, value orientation, aspiration for future attainments, past experience with the communicator and his length of farming career."

### 2.1.2 The classical models of the innovation–decision process
The classical model of the innovation-decision process developed by Rogers, (1983), is based on the potential adopter and his behavior.
Roger and Shoemaker (1971) Mcintosh Dolch and Hernan, 1978; McInntosh, 1983; Molnar, 1979 and Zey-Ferrell (1986) stated that, the Classical Model of the innovation-decision process (the demand side perspective)

"The major constraints on successful adoption in his perspective are the adoptor’s characteristics and psychological toward approved innovation paying attention on individual farmers and their personal characteristics. Therefore, age, education, cosmopolitanism, agrarianism, and the use of information sources are variables that have been used to distinguish adopters of innovative agricultural technology from non-adopters. The demand side perspective has focused on the organizational characteristics of farms, the size of the farm operation, the diversity of its crops, the complexity of its division of labor, and the centrality of decision-making.

Rogers (1995) defined the innovation-decision process as “a mental process through which an individual (or other decision making unit) passes (1) from first knowledge of an innovation, (2) to forming an attitude toward the innovation, (3) to a decision to adopt or reject, (4) to implementation of the new idea, and (5) to confirmation of this decision”

This concept of the innovation-decision process consists of five stages: namely knowledge, persuasion, decision, implementation and conformation figure (2). Rogers (1995):

1. **Knowledge** occurs when an individual (or other decision-making unit) is exposed to the innovation’s existence and gains some understanding of how it functions.
2. **Persuasion** occurs when an individual (or other decision-making unit) forms a favorable or unfavorable attitude toward the innovation.
3. **Decision**, occurs when an individual (or other decision-making unit) engages in activities that lead to a choice to adopt or reject the innovation.
4. **Implementation** occurs when an individual (or other decision-making unit) put an innovation into use.
5. **Conformation**, occurs when an individual (or other decision making unit) seeks reinforcement of an innovation-decision already made, or reverses a previous decision to adopt or
Graph
communication channels fig. 2
6. Reject the innovation if exposed to conflicting messages about the innovation.

The two types of discontinuance according to Rogers (1995) following the conformation stage are:

1. **Replacement discontinuance** is a decision to reject an idea in order to adopt a better idea that supersedes it.

2. **Disenchantment discontinuance** is a decision to reject an idea as a result of dissatisfaction with its performance.

Example of discontinuance according to Rogers (1995), (PhD dissertation) back in (1954) one of the Iowa farmers interviewed for PhD dissertation research rejected all of the chemical innovations. He was then studying weed sprays cattle, hug seeds, chemical fertilizer and rodenticide, he insisted that his neighbours, who had adopted these chemicals were killing their songbird and the earthworm in the soil. He selected the new farm ideas in his innovativeness scale on the advice of agricultural experts at Iowa State University. The organic farmer in your sample earned the lowest scale.

**The role of communication channels by stages in the innovation-decision process:**

According to Rogers (1983), the “communication channels play different roles at the different stages of the innovation-decision process. Mass media channels are more effective in creating knowledge of innovations, whereas interpersonal channels are more effective in forming and changing attitude toward the new idea and thus in influencing the decision to adopt or reject a new idea”

Copp et al. (1958), as cited by Rogers (1983), found that "the greatest thrust out from the knowledge stage was provided by the use of the mass media, while interpersonal channels were salient in moving the individual out of the persuasion stage"
Data on the relative importance of interpersonal and mass-media channels at each function (or stage) in the adoption of 2,4-D weed spray were collected by Beal and Rogers (1960).” From 148 Iowa farmers as reported by Rogers (1983), mass media, channels, such as farm magazines, bulletins and container labels, were more important than interpersonal channel at knowledge function for this innovation" 

According to Rogers (1983), this meta- research showed that cosmopolite interpersonal channels were especially important at the knowledge stage in developing nations.

and “ interpersonal channels, were heavily used even at the knowledge function by Colombian villagers” Rahim’s. (1961,1965), as cited by Rogers (1983), found that “mass media channels- in Bangladesh villages were seldom mentioned as channels about agricultural innovations, whereas cosmopolite interpersonal channels were very important, and in some ways seemed to perform a similar role to that played by mass media channels in more developed countries”. Rogers and Shoemaker (1971), as cited by Rogers. (1983), that made a comparative analysis of the role-played by mass media and cosmopolite interpersonal channels. By stage in innovation decision-process for twenty-three different innovations decision process, they revealed that “ mass media channels, are of relatively greater importance at the knowledge function in both developing and developed countries, although there is a higher level of mass media channels usage in the developed nations”. This meta- research showed that cosmopolite interpersonal channels were especially important at knowledge stage in developing nations”. Rogers (1983) stated, “ The role played by mass media channels in developed countries (creating awareness –knowledge) is perhaps partly replaced by cosmopolite- interpersonal channels in developing countries”.


According to Rogers (2003), “mass media channels are relatively more important at the knowledge stage, and interpersonal channels are relatively more important at the persuasion stage in the innovation-decision process. Copp and colleagues (1958), found that “A temporal sequence is involved in agricultural communication in that messages are sent out through mass media directed to awareness, then to groups, and finally to individual farmers, Upsetting this sequence in any way, prejudices a process at some point in the adoption process”. The greatest thrust out from the knowledge stage was provided by the use of the mass media, while interpersonal channels were salient in moving individuals out of the persuasion stage.

According to Rogers (1983) the classification of individuals (or other units of adoption on the basis of innovativeness into five adopter categories:

**Innovators, early adopter, early majority, late majority and laggards**

Dominant attributes of each category are the innovators - venturesome, the early adopters - respectable, the early majority - deliberate, the late majority - skeptical, and the laggards - traditional.

The continuum of innovativeness can be partitioned into the same five-adopter categories based on of two characteristics of normal distribution, the mean and the standard deviation.

The relatively earlier adopters in a social system are no different from the later adopters in age. They have more years of education, more likely to be literate, have higher social status, greater degree of upward social mobility, larger-sized units, like farms, companies, and so on, a commercial rather than subsistence an economic orientation, a more favorable attitude toward credit, and more specialized operations.

Earlier adopters in a system also differ from the late adopters in personality variables. Earlier adopters have greater empathy, less dogmatism, a greater ability to deal with abstractions, greater rationality, greater intelligence, a more favorable attitude toward change, are more able to cope with risk and uncertainty, a more favorable attitude toward education, and science less fatalism, higher achievement motivation, and higher aspiration for education,
occupations. Earlier adopters who have more social participation, are more highly interconnected in the social system, and are more cosmopolitan, have more change agent contact. Greater exposure to mass media channels, greater exposure to interpersonal communication channels, engage in more active information’s seeking, they have greater knowledge of innovations, a higher degree of opinion leadership and are more likely to belong to highly interconnected systems than later adopters.

According to Rogers (1995), the consequences of the diffusion of innovations usually widen the socioeconomic gap between the earlier and later adopting categories in a system. Havens and Flinn (1974) cited by Rogers (1995) examined the consequences of new coffee varieties among Colombian farmers over the period from 1963-1970 of fifty-six coffee growers. Seventeen adopted the new varieties, which considerably increased their yields: it was important to adopt chemical fertilizers and herbicides along with the new coffee varieties to achieve these high yields. As a result of adopting this package of innovations, Rogers (1976), stated that Diffusion view have implied a pro-innovation bias’ in that adoption is assumed advantageous for all of its members. This bias reflects current practice. Actually, farmers often do not adopt because the innovations handed down to them may be ill-adapted to their conditions. An example is the agricultural research station, which focused on developing recommendations for sole cropping, while 80 percent of the farmers' fields are under mixed cropping for very sound reasons (Baker and Norman, 1975). However, the pro-innovation bias of diffusion research implies that everyone should adopt all innovations. Often research concentrates on developing innovations, which benefit larger and more educated farmers (Mbithi, 1972).

According to Rogers, (1983) the rate of adoption "is the relative speed with which an innovation is adopted by the members of the social system". 
Rogers. (1983), summarized the different variables that determined the rate of adoption as follows;
1/ Attributes of the innovation, such as relative advantage, compatibility, complexity, triability, and observability,
2/ The type of innovation decision such as optional, collective or authority.
3/ Communication channels,
4/ The nature of the social system and
5/ The extent of change-agent promotion efforts in diffusing the innovation.

2.1.3 Empirical studies of adoption:
According, to the Sharma and Kumar (2000), socio-economic status has a positive impact on the adoption of agro-forestry innovations in the Haryana State of India. In many studies, farm size has been shown to positively affect adoption of decision. Negate and Parrikh (1999), indicated that appositive impact of farm size on the adoption of improved wheat varieties. A study by Doss and Morris (2001), revealed that the adoption of improved maize varieties is positively associated with the amount of land owned. Shoemaker, (1971), has suggested that adoption depend on decision makers' education and information level. Mittal and Kumar (2000), found a positive impact of rural literacy on the adoption of high yielding varieties of rice and wheat in India. In addition, Doss and Morris (2001), indicate that education is a significant determinant of the adoption of modern varieties of maize in Ghana. Shiyami et al. (2000), found that the more experience with growing chickpea, the higher will be the adoption of new varieties. Lee and Stewart (1983), observed that the potential for such technologies to conserve input use, reduce cost and provide economic benefits even in the short run could incentives for adoption even among renters and part-time operations.
According to a comprehensive review on the adoption of agricultural innovations by Feder and Umali (1993), the green revolution from the 1960s to the early 1980s motivated numerous studies to explain the determinants of adoption during the early stages of the diffusion process. Thereafter, studies concentrated on agricultural innovations that have reached maturity. Mostly these included the adoption of high yielding varieties in particular and a package of inter-related technologies.

Monsor Ballal (1993), reported direct negative effect on adoption of innovations from age. His study revealed significantly positive direct effect on adoption of innovations from access to information and significantly positive but indirect effect on adoption of innovations from social participation.

2.2 Risks in agriculture:

Knight, F.H., (1946), stated that the term "risk" and "uncertainty", often used interchangeably, have different technical connotations. While uncertainty is subjective probability, risk is objective probability. The former represents a probable state of mind, the latter a state of things. There is again a difference between the terms "risk" and "hazard". The former denoting property subject to loss and the latter referring to the factor, which causes loss these distinctions, however, are not strictly adhered to in current literature on insurance, nor in this text.

Bull reported that (1955), uncertainty of crop yield is thus one of the basic risks, which every farmer has to face. Nevertheless, a great majority of farmers in most countries, due to insufficient means and resources are seldom able to stand such risks, especially when these involve disastrous losses. The result often is a serious decline in farm income and the consequent failure on the part of farmers to pay their rents and taxes, a diminishing purchasing power leading to a decline in their demand for non-
farm products, and a mounting debt. So, ultimately, the entire community is affected by the risks of which, farmers are but direct and primary victims. Accordingly agricultural risks in agriculture may broadly be classified as (i) Property risks and (ii) Personals risks, according to the object of incidence of uncertainty. Risks to agricultural property may again be divided into three major groups: (a) Natural, (2) Social and (3) Economic, factors depending on whether the uncertainty involved is due to natural social or economic factors. (Fig. (3) Classification of agricultural risks)

2.2.1 Natural risks
Natural risks or, more appropriately, natural hazards, affecting farm property fall essentially into three categories, namely, (1) Natural elements, (2) Plant and animal diseases and (3) Insects and other pests. Risk due to natural elements comprise the uncertainties of weather, such as (a) Deficiency of moisture or drought, (b) Excess of moisture including flood or inundation, (c) Excessive cold such as frost and freeze, (d) Hail, (e) Storm or windstorm, (f) Natural fire and lighting, etc. these risks may also be called meteorological risks.

Natural risks affect farm property in two ways: by having an adverse impact on crop yields, and by causing losses to existing farming stock, animate and inanimate. The former may be called production risks, and the latter maintenance risks.

2.2.2 Social risks:
While the farm enterprise is particularly subject to natural hazards, many of its uncertainties arise also from different social and economic factors. The social factors include: (i) Fire; (ii) Burglary or Theft; (iii) Embezzlement; (iv) Strike; (v) War, civil commotion, etc.; (vi) Changes in social structure; (vii) Technological changes, and finally, nuclear radiation or fall-out.
2.2.3 Economic risks:
Economic risks arise from the probability of fluctuations in prices of the agricultural products not always anticipated by farmers. An important cause of price fluctuations is the relative inelasticity of both the demand and supply of agricultural products in a given period. The demand for agricultural products arises mainly on three accounts: human food, animal feed and industrial raw materials, of which, generally speaking the demand for the first two is fairly stationary in a given situation. Even the demand for raw materials does not normally vary much in short periods. But the supply or more precisely the production of agricultural commodities, in particular crops, tends to vary from season to season depending largely on weather conditions. With seasonal variation in production prices become uncertain, assuming no carry-over of stocks from a previous season or imports to counter the shortage in seasonal production.

The second economic risk in agriculture arises from the probability of loss or unexpected depreciation of investments from either natural or social causes.

The third economic risk may be said to arise from adverse "terms of trade’ of farmers, that is an unexpected increase in the prices of farm requisites without a corresponding rise in the prices of farm products. As for example, the terms of trade in agriculture, that is, the ratio of prices received by farmers for their agricultural produce to prices paid by them for agricultural requisites.

2.2.4 Personal risks in agriculture:
Willet A.H., (1951) stated that the farm enterprise besides being subject to the risks of property and investment losses carries numerous personal risks. A personal risk means the possibility of capital or income loss to the farmer arising from the uncertainty of the human factor and not from the
possibility of a farmer suffering a subjective loss as a person through the loss of, say a tractor. Such uncertainty may affect the farmer and the farm worker as well as a third party. Moreover, personal risks to farmers are more or less similar to those of a non-farmer. He may, for instance, suffer a sudden death through disease or accident, leaving thereby his family in economic distress, particularly if he leaves behind an encumbered estate. He may even die a pauper's death when it becomes difficult to give him a decent burial. Alternatively, he may survive his working age and may have lost his capacity to work. He may again, suffer from impairment of health through accident or disease. A female farm worker is liable to the risks of maternity. A farm worker may also be unable to sell his labor power, that is, he may be unemployed. Marcel Fatchamps (1999) stated that life is subject to all kinds of fluctuations. Some of these fluctuations are predictable such as absence of rain in the dry seasons, the utter helplessness of the newborn, the declining strength of the old. Others occur in a haphazard fashion that cannot be predicted, at least not precisely. These fluctuations constitute the "rhythm of life. They must be dealt with, in one way or another; otherwise life can become highly unpleasant. Taking care of these fluctuations constitutes risk coping strategies the main concern is with strategies people use to minimize the impact of these fluctuations on their welfare. Thus, the definition of risk factors encompasses both predictable and unpredictable variation in income and health.

Theodore Schultz, (1953) in a detailed analysis of the nature and factors of yield instability in the United States, has said with particular reference to West Central Regions, both north and south: "in this large area the hand of nature lifts and depresses yields despite all the efforts of farmers to counteract its influence. "For example, in spite of its known progress in agricultural techniques the droughts of 1934 in the United States was the
worst ever recorded? It extended over 75 per cent of its total area and severely affected 27 States. Wheat production fell from 941 million bushels in 1931 to only 552 million in 1933 and 526 million in 1934. The country became a substantial importer of wheat in 1934, 1935, and 1936. Yields of feed, forage and pasture were down, and a heavy reduction in livestock numbers resulted. Whole farms were turned into wasteland. Dust clouds were so dense and so vast that they cover cities as far as Washington, D.C.

thousand made paupers by the dust storms of the Southern plains, migrated to the Pacific Coast in search of employment.

Woodham Smith, C., (1962) stated that the variability in farm production is caused not by, the uncertainties of weather alone but also by diseases as well as by insects and other pests. The ravages caused by these two agencies are well known. Diseases affect diverse products like wheat, barley, potatoes, tomatoes, bananas, cotton and timber.

There is more than one record, which tells even of entire nations threatened with famine from them. For example, about 100 years back, the potato crop of Ireland was so blasted by late blight (a form of fungus) that is caused widespread starvation and even many deaths throughout the Island.

President’s Science Advisory Committee (1967) reported that in developing countries, the losses caused by insects and diseases are even greater. Accurate statistics are largely unavailable. According to FAO estimates, pre-harvest losses to food and industrial crops due to insects and diseases in 11 developing countries of the Near East Region are equivalent to 23 per cent of the crop production. In Africa and Asia particularly, locust swarms cause widespread destruction of growing crops.

In addition to personal hazards to the farmer himself, he may in certain circumstances also be held liable for accidental injury or sickness suffered by any of his employees arising out of and in course of their employment.
Figure (3)

Classification of agricultural risks

Natural Elements

- Fire and lighting
- Hail
- Windstorm
- Flood
- Excess moisture
- Drought
- Frost and freezing
- Others
- Scab
- Smut
- Rust, etc
- Tuberculosis
- Anthrax
- Locusts
- Beetles
- Gophers
- Rats, etc

Natural

- Plant and Animal Diseases

- Insects and Other pests

Property- risk to farm

Risks

- Delinquency
- Strike
- Civil disturbance and War
- Change in social environment
- Technological changes
- Quality of management
- Of the farmer (moral hazard)
- Moral delinquency
- Of the farm worker

Property and Farm inter-

Price

Social

- Change in prices of farm Requisites
- Death
- Old age
- Sickness
- Maternity

Agricultural Risks

- Price fluctuation
- Loss or unexpected depreciation of investments
- Of the farmer (moral hazard)
- Of the farm worker

Economic

- Inability to sell labor-power (unemployment)
- Injury to third persons and their property

Accident

Employers liability

Sources: P.K. Ray (1981, p. 15)

(The classification is illustrative only, not exhaustive)
Finally, the farmer may also incur liability for personal injuries to third parties. Judgment may be given against him for personal injury resulting from his ownership and use of automobiles and trucks, or from his failure to take proper precautions against the occurrence of such injury in connection with his farm machinery, livestock and even his buildings.

2.2.5 The history of modern risk management:
Harvard Business Review in (1956) one of the earliest references to the concept of risk management in literature, mentioned that although the term 'risk management' may have been used earlier in the special sense in which it is used here, the general trend in its current usage began in the early 1950s.

2.2.6 Loss theory:
N. Barou, (1936) stated that Adam Smith (1947) had foreshadowed the “Loss Theory”. For he observed "insurance, by dividing among a great many that loss which would ruin an individual, makes it fall light and easy upon the whole society". The German economist Wagner later developed this theory. Who while defining insurance said "The term insurance used in the economic sense, presents such an economic arrangement, as removes or diminishes future disadvantageous consequences of single contingencies as far as the means of an individual are concerned those contingencies must be casual for the individuals affected, and therefore, also in each single case of their occurrence unforeseen events. Insurance operates in such a way as to prorate those injurious consequences over a series of cases threatened by a similar danger which however has not yet actually occurred"

Further V.N. Valgren of USA (1932) who did a lot of study and research on insurance as specially applied to agriculture in the early thirties of this century, and prepared and published many important papers, has also expounded 'the loss theory' of insurance in clear terms. "The primary
function of insurance "he says, "is to distribute the weight of loss burdens” originating in economic risks so that the destructive force of such burdens will be lessened if not eliminated ". However, Valgren was not oblivious of the ‘risk’ aspects as well, since he mentioned the distribution of both “risks and loss burdens.”

2.2.7 Risk theory:

On the other hand, the exponents of the "Risk Theory " that is, those who have emphasized the element of risk in relation to insurance include Beveridge, "sharing in risks" Hayes, "pooling of risks," Gide, (1884) and Fisher, (1912)" consolidating risks" Patterson. S.H. and Scholz K.W.H. (1937) "diffusing risks". Willet. A. and Dobb M. (1980) "combining risks" and " making financial provisions against risk”. The most detailed and scientific exposition of the " risk theory", that is of the central role of risk in insurance, has been given by Willet in his book referred to earlier. Distinguishing between 'risk' and ' uncertainty', Willet considers risk as "objectified uncertainty as to the occurrence of undesirable event" that is to say, while all risks are uncertain, all uncertainties are not strictly risks, at least for the purpose of insurance. Only uncertainties, which are or can be concretized into specific happenings past, present or future can be covered by insurance. Willet thinks that the existence of uncertainty is the fundamental condition for the existence of insurance but according to him. Uncertainty in the abstract from is the state of mind of the individual, which corresponds to the degree of probability of an occurrence (or chance) in the objective situation. Thus, uncertainty is a function of probability it is not the uncertainty of the state of mind, which is insurable, but it is so only when it is objectified into measurable entities.

Probabilities can be divided into three classes: First, those in which a definite mathematical expression of probability can be attained in advance of occurrence of the uncertain event. Second, those in which such a
probability cannot be known definitely in advance, but be established from the observation: and **Third,** questions of judgment, in which neither a mathematical nor a statistical basis of calculation exists. The first two forms of probabilities may be regarded as "objective probabilities" and they usually come under the scope of insurance; the last form is "a subjective probability" which is sometimes covered by "underwriting" (as a special form of insurance). And by "organized speculation.

Another important consideration of "Risk Theory" which, has also been emphasized by Willet, is that while an individual risk happening has a 50:50 chance, or probability taking a large number of similar risks, the probability can be converted into a much smaller ascertainable quantity. Such "objectified uncertainty" can be estimated and the funds necessary to cover its consequences can be built up. It is what is known in insurance language of modern times as the"Law of Large Numbers."

**2.2.8 Universal theory**

Barou, (1885), quoted that beside the "Loss Theory" and the "Risk Theory", there are also certain other theories on the function of insurance. One is "Universal Theory", which considers every method of preventing or decreasing the chance or risk and loss as insurance. It includes such activities as prevention of risk and its consequences by special anticipatory measures such as building of houses from fireproof material; suppression or minimization of risk by such devices as the installation of pumps for fire extinction; and, finally, compensation.

Such activities are at present being undertaken more and more by the insurance organizations themselves, both joint stock and mutual, or by the insured themselves with encouragement of the insurance organizations, usually in consideration of reduced premiums.
2.2.9 Saving theory:
Another theory on the function of insurance is the "Saving Theory" which regards saving or the accumulation of funds as the only element of insurance. However, saving is only one important element, as well as consequence, of insurance. It is not all the functions of modern insurance.

2.2.10 Wants theory:
Lastly, there is the "Want Theory" this theory was earlier developed entirely by the German writers and mainly by Manes. Gobbi (1897) first formulated it during the last decade of the nineteenth century. He has shown that the impossibility to satisfy all the needs of an individual leads to his choice between present and future wants and then between different futures needs. To meet some of the future needs of an individual, insurance is necessary. He therefore defines insurance as an economic institution, "depending upon mutuality for the purpose of covering a casual estimable need of capital by mutuality Gobbi meant the willingness of numerous individual economic units to help each other consciously or unconsciously in case of need (Gobbi: Zeitschrift fur Versicherungsrecht and Wissenschaft. Strassburg.). A number of other German writers followed this theory without much alteration. Several writers in other countries, particularly in England, like Jevons (1924) also stressed the importance of satisfying future probable needs. This is “the kernel of the wants theory”.

2.2.11 Different ways of meeting agricultural risks
If agriculture is a risky enterprise, human ingenuity has not failed to devise ways and means to reduce risks or to mitigate their results, broadly, there are three principal ways of meeting agricultural risks (a) avoidance, (b) prevention, and, (c) assumption.

(a) Avoidance:
The first device that strikes the mind immediately is to avoid those risks, which are avoidable. But this can only have a very limited application.

(b) Prevention:
The second and more important way of meeting a risk is to prevent it. The prevention of risks in agriculture means the reduction of uncertainties through improved facilities and techniques as well as organization.

(c) Assumption:
But, notwithstanding the enormous advances made with regard to technical, organizational and personal factors in agriculture, uncertainties affecting farm property and farmers remain a major factor to be reckoned with. Naturally, therefore, a third way is necessary to meet the unavoidable risks and this lies in assuming the risks. However, in practice, even a part of the avoidable risks, need to be assumed, especially where the cost of its assumption is found to be cheaper than that of avoidance or prevention.

2.2.12 Self-insurance:
Granting that certain agricultural risks must be assumed, this can be done in a number of ways a risk may be borne by the subject of uncertainty himself, either alone or in combination with a group of persons, or it may be transferred to others. If it is a one-man enterprise, the subject may undertake to protect himself against a risk or some risks by accumulating funds in good years to support him in lean years. Alternatively, when the risk occurs; that is to say, by spreading his risks over time he may also eliminate some risks either by offsetting a number of dissimilar risks, as in diversified farming or by combining a number of similar risks.

2.2.13 Reducing exposure to shocks:
One way to deal with risk is simply to reduce risk itself. What Morduch (1995), calls “income smoothing” belong to this category. Reducing risk can be achieved in a variety of ways, all of which imply altering production choices.
(a) Selecting and modifying the environment
One way poor societies can reduce risk is by locating themselves in areas where parasite infestation is low. Patterns of settlement in Sub-Saharan Africa and Latin America, for instance, reflect these concerns. It is probably not an accident that the East African highlands are more densely populated than other parts of Africa: malaria risk is lower at high altitudes. This is so much true that Ethiopian populations severely affected by the 1984 famine vigorously resisted their relocation from the drought prone northern highlands to wet southern lowlands. Personal accounts from students and NGO's who assisted the Ethiopian resettlement effort indicate that many resettled people fled-at the risk of their life to escape exposure to malaria and other diseases morbidity and mortality among those who stayed was high.

(b) **Specification:**
Another way to reduce exposure to risk is for individuals to adopt production techniques that are resistant to pest’s drought, and other environmental risk factors. Pearl millet, an extremely sturdy cereal grown in West Africa, is perhaps the best example of such a strategy. Millet is so perfectly adapted to the peculiar conditions of the Sahel extreme evaporation aspiration, poor sandy soils, short rainy season, erratic torrential rains that it has enabled human settlement in areas previously reserved to livestock raising in those areas, millet, itinerant livestock herding becomes the only production activity. In these two examples, specialization in a single, robust production technique is the main income smoothing technique.

(c) **Diversification:**
In other situations, risk coping is achieved via portfolio diversification instead of specialization. Rural inhabitants often seek to minimize their exposure to risk by diversifying their portfolio of income generating
activities. In areas with less extreme climatic conditions, for insurance farmers often plant different crops or several varieties of the same crop to obtain a more stable output. Intercropping, that is, planting several crops in the same field is often partially justified by risk considerations as well. Similarly, livestock producers typically combine different species of animals into a single herd to take advantage of differences in their resistance to diseases, drought and grazing habits. Herders also split their livestock holdings into spatially distinct herd to hedge against spatial differences in rainfall. Diversification is also achieved by combining farm and non-farm activities within a single household. Reardon (1997) for instance, note that 45% of Sub-Saharan incomes come from non-farm work. Percentages are even higher in Asia (e.g., Fafchamps and Lund (1999), Fafchamps and Quisumbing (1997).

**2.2.14 How farmers manage risks:**

According to, Peter B. R. Hazell (1974) the major risks confronting farmers can be grouped as follows.

- **Market risks:** such as the prices of output and inputs, and interest rates, which are affected by unpredictable changes in world markets and government policy.

- **Resource risks:** such as uncertain supplies of labor, credit, and irrigation water, or the timeliness of supply of seeds and fertilizers.

- **Production risks,** which cover whole gamut of pest, disease and weather related risks.

- **Health risks:** sickness death, and accident of the father and his dependants.

- **Asset risks:** such as theft or fire damage to building, machinery and livestock.

- **Other risks:** such as confiscation of land, war damage, and other acts of god.
2.2.15 The risk management process:

Emmett J. Vaughan and Therese M. Vaughan (2001) stated that the risk management process could be divided into a series of individual steps that must be accomplished in managing risks. Identifying these individual steps helps to guarantee that important phases in the process will not be overlooked. While it is useful for the purpose of analysis to discuss each of these steps separately, it should be understood that in actual practice the steps tend to merge with one another. The six steps in the risk management process are:

- Determination of objectives
- Identification of the risks
- Evaluation of the risks
- Considering alternatives and selecting the risk treatment device.
- Implementing the decision
- Evaluation and review.

Insurance Journal March 1997 reported, that agricultural insurance is an important instrument in the strategy of risk management. When properly implemented, it results in a process of identification of risks, their control, avoidance or reduction. This is obviously in the interest of insurance companies and they are generally eager to promote it. Apart from the financial interests of insurance companies, risk management has a broader social aspect as it leads to reduction in wastage of economic resources and prevents environmental degradation. It is true that plant and animal waste upon decomposition provides valuable nitrogenous material for the soil, but it is important to manage its disposal property in order to ensure that the process does not lead to unsanitary conditions that pose a health hazard, while at the same time the maximum possible soil enrichment is obtained.

According to Walker and Jodha 1986 in order to cope with these risks, farmers and rural societies have developed a range of risk management
measures. These can usefully be classified into risk reducing and risk coping strategies.

Hazard et al, (1974) stated that, risk-reducing strategies include crop diversification, intercropping, farm fragmentation and diversification into non-farm sources of income. Crop sharing arrangements in land renting and labor hiring contracts can also provide an effective way of sharing risks between individuals, thereby reducing a farmer's risk exposure. Risk reducing strategies can be quite effective in addressing many production and market risks.

The workshop (NENARACA. 1992) reported that most of the countries in the region have been handling such problems through expedient solutions on an ad hoc basis. Rarely concrete policies or solutions are found to help alleviate, on sustainable basis, the effects of such risks on the agricultural productivity. The majority of the adopted solutions are spontaneous and offering partial compensation for the areas affected with natural disaster fund.

2.2.16 The means towards mitigating risks

Workshop (NENARACA. 1992) mentioned that there was many possible means for surmounting or reducing the adverse impact of risks. Some of these means fall within the responsibility of the farmer himself in the forms of employing sound management techniques in his farm business as well as diversifying his produce and income resources. Some other means, however, are to be adopted by the bank a case in the point a diversified loan portfolio to cover all types farmers, and various investment spheres so that the risks can be distributed in a more comprehensive manner and the adverse impact can be reduced for a certain investment or certain group of borrowers. The discussions stressed that effective agricultural insurance was one of the important means, which could be used to mitigate agricultural risks.
2.3 Agricultural insurance: (What is insurance?)

P. K. Ray M, A, D Phil (1981) defined insurance as a social device, which aims at reducing the uncertainty of loss through a combination of a large number of similar uncertainties, and through distribution of the burden of loss, if any, generally by the use of funds accumulated in advance.

In addition, they stated that insurance distributes the risk or the burden of loss not only over space but also over time. It accumulates or reserve from the contributions a common fund of the insured called premiums, in normal periods, which it utilizes in relieving any unusual loss burden occurring at an unfavorable period.

Emmett J. Vaughan and Therese M. Vaughan (2001) defined insurance from the individuals' point of view as an economic device whereby the individual substitutes a small certain cost (the premium) for a large uncertain financial loss. (The contingency insured against) that would exist if it were not for the insurance. Moreover, they mentioned a point of view which it has two fundamental characteristics:

1. Transferring or shifting risk from one individual to a group.
2. Sharing losses, on some equitable basis by all members of the group.

The primary function of insurance is the creation of the counterpart of risk, which is security, insurance dose not decrease the uncertainty for the individual as to whether the event will occur, nor dose it alter the probability of occurrence, but it does reduce the probability of occurrence, and it does reduce the probability of financial loss connected with the event from the individual point of view.

Insurance however, not only reduces uncertainty through the combination of a large numbers of similarly exposed individuals but also in the case of loss, evens out its burden among such individuals. In other words, the incidence of loss is broadly based through insurance so that the shock or even the heaviest impact of loss upon an individual can be absorbed with
little difficulty by the group as a whole. Thus, the first preface to the first English Marine Insurance A statute of (1601), observed that by means of insurance it should come to pass that loss lightly upon many rather than heavily upon a few.

J.P. Bhattacha (1981) Secretarial defined crop insurance as a collective system for reducing economic uncertainties due to crop failure. It accomplishes this through the basic technique of risk pooling whereas the frequency and severity of crop losses of individual farmers cannot be predicted. The predictability and severity of loss frequency is substantially increased when similar exposures of a large number of farmers are pooled especially if account is taken of several consecutive growing seasons rather than of a single one. By paying annual premiums over a period of years, farmers who take out crop insurance are in fact contributing to a fund from which those among them who incur large losses may be compensated. In effect farmers who do not suffer losses from insured events in a given year or over a period of years each furnish a small amount to provide compensation for those who do, so that the risks and losses of cultivation are suffered in any season by a few, in localized areas, and will be shared by many over a wide area, and that excessive losses in bad years will be met from resources accumulated from contributions in good years.

Workshop in Syria, Amman, (1992) Stated that the objectives of agricultural insurance generally, are designed to maintain some adequate level of income to farmers and promote agricultural development through increased investments those aim at higher production and productivity levels.

In addition, reported that some views expressed that agricultural insurance alone would not provide a comprehensive solution for the problem of risks. Yet, it is the best available means when accompanied by sound financial technical and administrative procedures. Otherwise, it would end as an
added burden on the beneficiaries, and the economy, and ultimately would lead to a complete failure as the case of some experiences.

Other view that agricultural insurance should be applied in their countries to protect farmer’s income, provided that it should be gradually applied depending on the experience acquired both internally and externally.

At times, losses from some of these natural hazards are heavy with disastrous effects on the farmers and the economy.

To mitigate losses from natural hazards some countries have resorted to public sector interventions in an organized manner such as establishment of drought relief funds, agriculture provident funds, credit guarantee funds, direct compensation or debt relief or even full pardoning of affected farmers from formal debts. Not only these public measures proved inadequate and ineffective but also through time showed many serious negative economic effects on agricultural development and welfare of the society. In addition, they mean that the public sector has to carry an unknown contingency cost, something that is not easy in these days of tight budgetary control.

P. K. Ray M, A, D Phil (1985), recorded three basic characteristics of insurance.

First: It is a means for distributing the burden of sudden large losses caused by hazards to a few over a longer time, a wider space and a larger number of persons, and hence it lightens the impact of losses to an individual at a given time.

Second: Most insurance is, directly or indirectly, a measure of self-help and mutual help by persons of selected groups or vocations who are subject to the same similar types of hazards.

Third: Insurance involves regular and deliberate saving and accumulating of funds in small amounts by a group or class of people, small or large, to
be of help to a few or some among them who may be affected by any of the specified hazards at certain times.

They continued to say that the following are the others consequential impacts of crop insurance:

1/ A useful tool of agricultural development when combined with other related measures e.g. price support, supervised credit etc.

2/ An important means of promoting self-help and mutual help and thus a general cooperative spirit among the farming community.

3/ A means of improvement of agricultural statistics and information at the farm and village level.

4/ A means of tuning-up local administration.

Agricultural insurance provides a well-defined institutional setup that could provide farmers with sustained means for protecting them against catastrophic losses produced primarily by national hazards beyond their control. Moreover, it enables farmers to service their debts and increase their capital by enhancing their ability to borrow more. Furthermore, for insurance, banks would have guarantees for recoveries of bad loans. In addition, crop insurance would generally encourage farmers for higher investment in agriculture, promoting modernization and advancement of agriculture and contributing to improvement of economic development and stability.

2.3.1 Crop insurance classification and types:

Ray P. K. (1981), according to different criteria used. Classified according to the hazard or hazards insured against, it may be a specific-risk or specified-peril insurance, a combined-risk insurance, or an all-risk insurance. Classified according to the object (i.e., crops) insured, it may be either single crop insurance or multiple-crop insurance. Again, classified based on administration, it may be public or private insurance; and, finally on the basis of its scope and application, it may be voluntary insurance,
compulsory insurance or optional local application of compulsory insurance. An actual system of crop insurance could be a permutation and combination of all these four criteria.

2.3.2 Functions of crop insurance in a developing economy:

Firstly, a partial failure due to natural hazards always affects a much greater proportion of the population and economy.

Secondly, a great majority being located in the tropics and subtropics their agriculture is subject to more frequent and serve incidence of natural hazards.

Thirdly, agriculture needs to organize all possible material, moral and financial incentives in order to encourage the farmers to make their best efforts to promote agricultural development. However, it is well known that the dull prospects of crop failure seriously discourage most farmers, especially small farmers, in making greater investments. Their resources are too low to enable them to take risks. Therefore, the governments attempt to improve the lot of agricultural risks by provision of material and financial resources from time to time.

Peter Hazell (1983) cited the disappointing performance of crop insurance programs among the developing countries in terms of high loss ratio and administration costs including sufficient evidence to establish the positive impact of crop insurance on farm productivity and income. He attributed such failure to: (a) severe moral hazard problems associated with many of the insured yield risks, (b) insurance of some risks that occur so frequently and expensive to insure, (c) reduce incentive for good insurance practice but increase incentive for cheating once. (d) achieve governmental objectives, (e) use of insurance only to guarantee yields at unrealistically high levels. (f) inability of crop insurers to overcome the cover-ability problem. (g) failure of the program to reach the poorest.
2.3.3 The benefits of crop insurance summarized by Bhattachna j.P. (1981) in the following:

First: Under crop insurance farmers are provided with the means to protect themselves against catastrophic losses beyond their control and can buy a protection that will provide them with income both to live and to service debts in bad agricultural years.

Second: Crop insurance allows farmers to control their capital. They can borrow more with crop insurance than without it.

Third: Banks can lend more to the agricultural sector with crop insurance than without it.

Fourth: Banks can reach smaller less well-capitalized strata of farmers with crop insurance than without it. Banks, which have guarantees of recoveries in bad years via the crop insurance, are able to lend to the poorer farmers.

Fifth: Banks recovery rates increase with crop insurance. Fewer farmers default on loans due to the crop insurance indemnities which enables them to service debt.

Finally: it is often argued that crop insurance can be made actuarially fair and can at times be operated at a modest cost once it has passed through the infant industry stage characterized by the inevitable high costs.

From a policymaker’s perspective, crop insurance has several benefits: The first benefit is equity. Disaster payments are typically made only after widespread losses. A crop grower who suffers severe crop losses due to a localized, event (doubtful, for example) will not receive disaster payments.

Crop Insurance products provide risk protection regardless of whether the loss was caused by localized or widespread phenomena.

Another benefit of insurance programs is that individuals are made aware of their risk exposure. The cost of crop insurance should make growers think twice about planting water-dependent crops in arid regions, In
contrast, the availability of free disaster payments allows individual to
discount their risk exposure, if loss events do not occur, individuals reap
the profits from their investments.
The Cyclone and Drought Insurance Board, (port louis) (1 June 1973 31
may 1974). Present certain basic difficulties among which, particular
mention may be made as follows.
(a) Lack of reliable long-period data on crop yields and losses.
(b) Wide variety of agricultural practices.
(c) Smaller and scattered risks involving greater physical and moral
hazards.
(d) Inadequate land tenure and land record systems.
(e) Lack of proper understanding about insurance in general and of crop
and other agricultural insurances in particular.
(f) Limited means of farmers.
(g) Lack of trained personnel.
(h) Lack of adequate infrastructure.
(I) Limited financial resources of the countries and their governments.

2.3.4 Agricultural insurance the principal benefits:
FAO: Report Bangkok (Thailand) (1956) mentioned that the principal
benefits are.

First, it cushions the chock of disastrous crop loss by assuring farmers a
minimum of protection against various natural hazards.
Second, crop insurance spreads the crop losses over space and time: that is
losses suffered by farmers in particular localities are borne by many
scattered over wide areas, and reserves accumulated in good years in large
part out of the premiums paid by the farmers themselves are used to meet
losses in bad years.

Third, through accumulation of premiums in a reserve fund crop insurance
can be an important means of saving by the rural community.
Forth, crop insurance would protect farmers' investments in the production of crops and thus give the farmers greater confidence in adoption of new and improved farming practices as well as in making greater investments in agriculture for improving crop yields and increasing agricultural production.

Fifth, crop insurance will improve the position of the farmers in relation to agricultural credit. Currently one of the greatest weaknesses of these credit institutions is that the farmer-borrowers are unable to repay their debts regularly, and sometimes they are not able to repay. With the help of the insurance indemnities, the farmer would be able to pay off their loans to the credit institutions. On the other hand, these institutions would be able to increase their credit to insured farmers using the insuring policies as an additional security.

Sixth, crop insurance by encouraging self-help and mutual aid would promote attitudes amongst farmers favorable to cooperative efforts generally.

Seventh, the government would, to a large extent, be relieved of the present irregular financial burden of providing relief and distress loans to farmers in case of large-scale crop losses.

Eighth, if the insurance were combined with storage of commodities as reserves the program would help to normalize the availability of supplies and stabilize prices in both surplus and deficit years.

Finally, crop insurance will help maintain the dignity of farmers as they will not have to depend on 'handouts' from Government in case of crop failures as the indemnity they receive in such eventuality is their right. Farmers under crop insurance are assured of maintaining a decent standard of living not by charity but by their own efforts.
Halcrow, H. G. (1948) summarized nine principles for good crop insurance:

1- Makes the insurer financially responsible for its affairs and there is no access to government funds.

2- The insurer should only write coverage on insurable risk, perils could easily be quantified, losses easily attributed and valued.

3- Farmer should only be compensated for actual crop damage or inputs lost.

4- Polices should include deductible levels of at least 20 percent of the coverage.

5- The premium should be set high enough to cover average indemnities, administration costs, and contribute to financial reserve.

6- The insurer should develop a rational insurance to spread its risks and minimize the chance of large losses.

7- The insurance should be voluntary.

8- To avoid adverse selection problems, premiums and indemnities should be tailored to the risk levels of individual farmers.

9- The insurer needs to control administrative costs, staff and field costs.

2.3.5 Summary of the basic principles of insurance recommended for developing countries:

Stated by Ray P. K. (1967),

1- Insurance protection should be limited to crop yields.

2- Initially it should apply only to a few major crops, others might be added as experience is gained.

3- Insurance should at first be limited to select areas, which might be gradually extended should experience prove favorable.

4- Insurance should cover all major natural hazards.
5- Insurance may be compulsory or voluntary depending on the particular conditions and requirements of each country, but for developing countries, in general the balance of advantage lies in compulsory from.

6- Protection should be limited to a specified percentage (Say 50-75.) of the average yield valued at fixed prices.

7- Initially there should be limited contribution from the farmers, which means that the cost of administration and operation, and even part of the losses would need to be borne by the government.

8- Homogeneous areas should, generally determine coverage and premium rates, and special emphasis should be placed on the development of the principle of mutuality and experience rating within given administrative areas. It would be advantageous to determine premium rates and coverage’s on an individual farm basis if it can be done.

9- Adequate incentives should be given to farmers for timely and correct reporting of the area under each crop, and for keeping losses as low as possible.

10- To keep the cost of operations to a minimum wherever possible the services of existing government agencies at the local level should be utilized, but the collection of premiums and taxes should preferably be kept distinct and separate.

11- Insurance should be administered either directly by the government, preferably the department of agriculture, or by an independent government institution, within the central government, and in collaboration with the provincial and local governments, and appropriate cooperative and mutual organizations.

12- It is important to build up an adequate reserve as soon as circumstances permit, of which a part may be in kind.
2.4 Cotton risks in the Gezira scheme:

Cotton risks affecting, yields like most risks pertaining to other crops, can be classified into two major groups, namely:

i. Risks resulting from the operation of perils of animate and inanimate nature.

ii. Risks resulting from the operation of social perils.

2.4.1 Natural risks:

Cotton production in the Gezira Scheme is exposed to a number of perils of animate and inanimate nature, as well to perils of social character, which tend to influence cotton adversely both in quality and quantity. Cotton losses due to perils of animate nature have been attributed to different agents including pests and pathogenic organisms.

2.4.2 Social risks:

Though some of the perils affecting cotton yield relate to agronomic practices, they stem from individual or gregarious behavior i.e. the nonobservance or failure to perform these practices because of certain social considerations.

Perils of such socio-economic nature include untimely sowing, poor seed bed preparation, plant population, beside these perils, there are others which have socio-political nature i.e. strike, riots and civil commotion and malicious acts- when sowing dates are staggered well beyond a recommended period, crop plants are forced to grow out of season.

The Sudan Gezira Board, in its managerial capacity, shoulders the responsibility of devising ways and means to combat the different risks resulting from the operation of both nature and social perils.

In practice risk avoidance is as far as the Gezira Board is concerned, is not possible because it means the abandonment of the agro-economic activity altogether.
It goes without saying that once a risk can not be avoided it must be accepted and the enterprise accepting it has the option either to retain adopting certain measure to prevent it or to minimize it or transformed it.

2.4.3 Physical and cultural risk prevention:
The physical or cultural risk prevention techniques are employed in the very beginning of the cotton production process. These include the up-rooting of cotton plants directly after harvest as well as weeds and others host plants and their immediate burning in order to prevent carry-over of pest, and diseases such as the black-arm or leaf curl disease heating of cotton..

2.4.4 Tenant reserve fund:
The tenants reserve fund (TRF) was originally started in 1935 and after the nationalization of the Gezira scheme in 1950) it was embodied in the Gezira Act of 1950. The TRF is by virtue of article 24 of the said act, a trust fund rested in the (S.G.B). The TRF was built from three sources namely transfer from tenants' collective accounts, surplus on depreciation funds and interest on investment of the funds at 3 ½ % war loans. The first and last sources continue to feed the fund annually.
The Gezira Scheme act (1960) reported that the ceiling of the TRF is tied to the number of feddans under cotton. Should the TRF fall short of an amount equal to L.S. 25 per feddan under cotton then a transfer amounting to 2% of the tenants gross profit or such lesser sum as may be required should be paid into the TRF. So as to raise it to statutory amount i.e. L.S. 25 per feddan under cotton (Ibid) Schedule article reported that interest earned on the TRF capital is accredited to " Special fund account to maximum limit of L.S. 15 per feddans under cotton should the ceiling be reached the interest has to be accredited to the tenant collective account”.
The sum paid annually into the TRF is influenced by the cotton sales proceeds and by the cost of the operations debited to the joint account not
of the tenant, alone but of all the remaining partners as well. The joint account determines indirect and annually sums to be paid into the TRF, this account includes the cost of the conduct of agricultural research and the bulk of pest control operations some agricultural production services, transport and insurances of crop. Annual payments into the TRF increase or decrease as the joint account falls or rises.

The formation of the TRF and its continuous statuary feeding from the TRE, as its name indicates, is formed by tenant’s proceeds contains an element of both compulsion and continuity.

A special group, which might be threatened as a whole, or in apart by common risk or risks fixing of the tenants contribution is neither based on past experience nor on calculated future expectations but rather on a fixed percent of the cotton proceeds up to a certain ceiling. The TRF is, as far as the three partner are concerned, a partial risk assumption technique adopted not by the group threatened by the possible occurrence of risk but by another partner as trustee to that fund, the third partner namely the government is altogether out of the picture. Though the objective behind constituting the TRF is the desire of its architects that it should function as an equalization fund, to supplement tenant profit if in any season yields and prices result in profit being unduly low. It has also the function of acting as a safeguard against and for payment of the tenant’s bad debts as well as financing projects beneficial to the scheme as a whole. Important for our purpose is, however, the question of supplementing tenants profits in bad seasons. It might have looked obvious that those who contributed to the TRF will be indemnified in case of material for financial loss. This is, however not exactly the case. An outgoing tenant, though he has contributed to the TRF has no right to be indemnified from it.

To acquire the right of indemnification in case of low yield, this low yield
Risks in agriculture

(Figure 4)

Application of insurance to Gezitra:
risk profile of Gezira scheme

Manageable Risk | Unmanageable Risk
--- | ---
Input supply and timing | Climate Rainfall
Credit To buy inputs | Pests and diseases
Sale prices and timing | 

Sources: William Dick and Phil Cottle (Partner Re Agricultural Services) April 2002
should not result from the tenant’s negligence. " The Board, after consulting the tenants may compensate any individual tenant whose not appears to the board to be inadequate having regard to his means of subsistence and to the earnings of other comparable tenants. A tenant who has suffered no loss is not entitled and has no claim whatever to draw from TRE.

The effectiveness of the TRF depends on the availability of financial resources in the fund all the time and to the extent of the anticipated unduly low yield or prices.

Annual payments from the tenants share going in to the TRF influence both immediate and future profits of the tenants. When such deductions are made, they reduce the tenant’s immediate profit and their repayment in future raises the tenant profit from the unduly low level. The annual sums paid into the TEF the cumulative interest there on and on previous balances.

2.4.5 Crop insurance reserve (CIR):

The crop insurance reserve (CIR) is one of different reserves constituted by the SGB. It is very different from the sum paid by the Board for covering cotton crop against maintenance risks. The Gezira act dose not refer to such reserve and it seems that its constitution was forced by objective necessity which stems from the very nature of risks the CIR is created to mitigate.

The CIR is fed each year by a fixed sum which is raised according to past claims experience and expectations and by the balance brought forward from the CIR of the preceding years, is influenced by the balance brought forward and it falls or rises conversely with any fall or rise in that balance. The level of claims arising from the CIR obligations influences the balance itself.
CIR is designed to cover losses originating from an insured peril or perils but falling within the excess to be borne by the SGB. Alternatively, for losses stemming from perils, which are completely expected by virtue of the insurance policy conditions Examples of the former, are losses to cotton by fire, rain or in transit. An example of the Latter is the famous Rabak incident in 1969/70 for which the company insuring the cotton was not liable because of the operations.

Beside the indemnities made in respect of crop losses either by way of fire, rain or in transit, there is clear evidence that compensation were paid to some tenants both in 1971/72 and 1972/73. These amounts represent almost 2% and 8% of the total claims paid respectively. It is evident that such compensations do not contradict the terms of the TRF. Since such indemnities are not paid on the basis of low yield or prices.

The sums to be paid in the general reserve as well as the mounts paid out, will be decided by the minister of finance and economics.

The insurance demanded by the SGB is to cover all cotton grown under the management of the Gezira Board, Guneid included, during the season from the time of picking from the field to ginning factories. It also includes all cottonseeds, which, may be produced by the Board and finally lint cotton and cottonseeds carryover from the previous season as specified by the Board.

The insurance of cotton at its seed cotton stage starts from the time of picking in the field, during transportation from the field to the ginning compounds, whilst there awaiting to be ginned and during ginning. The cotton lint constitutes the second phase in cotton processing. The insurance cover for this stage starts from the time cotton lint is separated from the seed cotton, and continues to cover it in the process of being baled, while lying in the ginnery compounds, or stores, in course of transit
from ginning factories to railway heads, during loading and transport to Port Sudan for shipment and storage.

The insurance cover granted for the cottonseed stage begins with the detachment of the cottonseed from the cotton lint. This also includes the cotton seed while being bagged, during its presence in the ginnery compound or in stores, during transit from the ginnery to railway heads and whilst awaiting being transported to railway heads and also during leading to Port Sudan and any place in the country and until their delivery to the tenants for sowing.

The perils insured usually depend on the terms of the policy, such polices include weather damage, burglary, theft and earthquakes and loss resulting from strikes, riots and civil commotion and malicious act. The last mentioned perils.

2.4.5.1 The insurance duration:

The duration of insurance should start from the time the cotton plant starts to grow i.e. when it is clearly visible above the ground until before picking. From the time of picking onwards the risks involved become maintenance rather than production risks and they fall outside this insurance period. The period might start from the end of July up to early march.

2.4.5.2 Insured and excepted perils:

The kind of cotton insurance to be adopted i.e. weather perils insurance or all-risk insurance determines the perils to be included and those be expected. In the former case and as the same indicates. The weather-perils insurance provides protection against financial losses due to all weather perils only i.e. wind drought, excessive moisture, rain, and variation in temperature detrimental to growing cotton. In the latter case the insurance provides to indemnity the insured for losses resulting from all perils of animate and inanimate nature examples of the former perils are insects.
infestation and plant diseases and of the latter perils are all adverse weather effect by its very nature, this type of insurance is the most imbricative.

2.4.5.3 The potential insured:
The benefits from insuring growing cotton can no doubt be enjoyed, in case of indemnity not only by the tenants but also by the S.G.B and the government as well. The distribution of the proceeds occurring from cotton sale shows that there are other parties who might be prejudiced by any loss sustained by cotton while growing these parties are the local government Council, social development and the Tenant Reserve Fund.

2.4.5.4 Indemnity:
Mac Gillivray and Parkington (1975) stated that indemnity is the extent of loss caused to growing cotton by any insured peril. The indemnity has to be based on the value of cotton at the time of maturity and not on the value of growing cotton at the time of loss assessment is a procedural question. It could be entrusted to a specialized body or could be subject to negotiations or arbitration. Two types of insurance contracts might be available for the potential insured namely, policy, policy of indemnity, and valued policy according to the former types. The insured will be indemnified for the actual loss on the bases of the ruling market price. In the latter instance and incase of total loss the indemnity will be equal to the sum insured per feddan. In case of partial loss, the indemnity will be on a pro-rata basis i.e. the ratio of the damaged to the undamaged cotton on such feddan before the occurrence of the peril insured against.

2.5 Attitudes and behavior of farmers:
According to A. W.Van den Ban and H.S.Hawkins (1996: P, 81, 82) they defined an attitude as the more or less permanent feelings, thoughts and predispositions a person has about certain aspects of his environment. Components are knowledge, feelings and inclinations to act. Or to say it
more simply: an attitude is an evaluative disposition towards some object or subject which has consequences for how a person will act vis-a-vis the attitude object the emphasis now in much research is on the feelings or emotions.

They reported that: in the past it was thought that an attitude influences a broad range of behaviors, for example, a positive attitude towards modern agriculture will stimulate the adoption of many different innovations. Therefore, it was considered an important task for extension agents to change negative attitudes. However, in the 1960s researchers showed that the relationship between attitude and behavior is often weak. Consequently, there is hardly any relationship between change in an attitude and change in behavior. If empirical facts do not confirm a theory, researchers have a good reason to do more research in order to develop a better theory. This was the case with attitudes; Many Social psychologists now assume that, among other factors, behavior is influenced by behavioral intentions. These intentions are influenced not only by the attitudes of people, but also by the expectation regarding their behavior from their social environment. The subjective norms, In addition, by their perceived ability to carry out this behavior, the self-efficacy.

On one hand, Sharma and Kumar (2000) defined attitudes as the degree of a farmer’s positive or negative feelings towards an innovation. It is assumed that attitude largely depend on household values, beliefs and circumstances.

On the other hand, Badran (1995), defined attitude as follows: Attitudes refer to inclination to react in a certain way to a certain situation, to see and interpret events according to certain predispositions, or to organize opinions into coherent and interrelated structures.
Attitudes are abstract qualities that cannot be measured directly, and their measurement requires different conceptual framework from measuring knowledge.

This new way of studying attitudes was developed by Ajzen and Fishbein (1980) in their model of reasoned action, which is reproduced in figure (6). It dose not describe properly spontaneous actions to which little thought has been given and routine decisions which we mention late and developed by Ajzen (1988). The behavior intention model to predict this behavior we have to measure the attitudes towards the same behavior and take into account that change in behavior usually has several favorable and unfavorable consequences. The most important consequences should be measured in order to predict behavior.

According to, A. W. Van den Ban, and Hawkins H.S. (1996), he mentions that if we study attitude in order to predict behavior, both have to be measured at the same level of specificity. For instance, a general attitude towards modern varieties of maize will only have a week relationship with choice of maize variety grown by the second wife of a Tanzanian farmer to feed her children and her husband in a year that rain start late. To predict this behavior we have to measure the attitude towards the same behavior and take into account that a change in behavior usually has several favorable and unfavorable consequences. The most important consequences should be measured in order to predict behavior. For instance, when compared with the local maize, hybrid maize may differ in average yield, seed cost, drought resistance and resistance to stem-borers and steak-taste cooking quality, seed color, etc. One would ask the farmers which characteristic are most important to them in deciding which variety to grow and what they think about each of these characteristic. This opinion then can be assumed by attaching a weight to each characteristic according to the importance it has for the farmers. It is also possible that a farmer will
not accept a variety which does not meet at least a minimum standard on characteristic he or she requires, such as very good drought resistance for example most Tanzanians farmers will not accept a yellow maize, irrespective to how good it is in all other characteristics, because maize porridge should be white. This approach to measuring attitudes has the advantage that it gives clear indications of how effective extension message can be formulated. A difficulty with this way of measuring attitudes is that people have different goals at the same time.

For example, farmer’s goals may be high income, low risk, to be well liked by his or her family to have high status in community and a reasonable amount of work. It can be very difficult to estimate how each characteristic of an attitude contributes to the optimization of the aggregate of these goals.

According to Judith N. Woff (1995), People’s behavior is conditioned by commonly norms and consensus. Preserving or promoting practices required for sustainable development in agriculture, or natural resources management, require more than individual incentives persuasion local institutions encourage people to take longer- term view by creating common expectations and a basis for cooperation that goes beyond individual interests, if local institutions are considered legitimate, people comply without (or with fewer) inducements and sanctions.

According to Dillon and Hard Aker (1993), risk attitude is the extend to which a decision-maker seeks to avoid risk (i.e. Risk aversion) or is willing to face risk (i.e. risk performance).

Persons and Shils (1952) concluded that an act consists of three basic elements:

1. An actor
2. Orienting to
3. A situation.

This conceptualization of human behavior implies:

(a) Behavior is oriented towards attaining ends or goals
(b) It takes place in situation (c) It is normatively regulated
(d) It involves an expenditure of effort of motivation.

Badran (1995) stated that "the trio of knowledge gathered and practice in combination govern all aspects of life inhuman societies, and all three pillars together make up the dynamic system of life itself; he also mentioned that knowledge, practice and attitude constitute a trio of interactive factors characterized by dynamism and unique interdependence.

2.5.1 Relationship among knowledge, beliefs, attitudes, and behavior:
Naster and Glotzer, (1981) stated that, change in attitudes is gained as a result of increase in knowledge, which in turn improves behavior. The relationship among knowledge, attitudes beliefs and behavior are complex and simply a causal chain. Many educators assume that if an individual acquires knowledge or beliefs that are inconsistent with his behavior, the need to resolve this dissonance will cause him to adjust his attitudes and behavior appropriately in order to relieve the insuring psychic distress.

2.5.2 Method for measuring attitudes:
According to the (Anonymous, 1988), there are three basic approaches to measure attitudes.


2.5.2.1 Equal - intervals Measurement:
The basic idea behind the equal intervals scale is that attitudes about issues exist in graduation on a continuum from positive to negative and therefore the attitude of one person can be described according to its place in the continuum.

The first step in developing the continuum at attitude is to clearly describe the attitude in question. The usages of short phrases or even one word will communicate the attitude. The next step is to develop a large number of statements (at least 50) that describe various aspects of the attitude and its components.
They have to be ranked into categories by expert judgment from the most positive to "neutral" to the most negative. The statement that generates the clearest agreements of the average ranking of all judges is the best for use in the attitude scale. 25 items (at least) represent the range of the continuum; these items are arranged from most positive to most negative, using the "Average" ranking of the judges.

The middle neutral statement is assigned the value 0. The assigned values increase by two positive and negative, to the first and last statement on the scale. If 25 statements are used, the most positive statement, usually the first statement in the scale, would be assigned the value + 5.0 and the last statement in the scale, the most negative attitude, -5.0 after, we need to ask about the types of number we get from scoring equal - intervals attitude scale. It is not really a number " a place indication". The score indicates where the person ranks on the continuum from positive to negative. From the overall number of every one test we can interpret the attitude scale scores as positive, strongly positive, neutral, and so on but it would not make any sense to report the numerical scores.

2.5.2 Summated-rating:

This implies that the score from this type of attitude measurement will be the sum of some ratings. It is more flexible than the equal interval method, and allows for easier introduction of context into the measurement process.

The following shape from summated rating, which is sometimes known as " likert's" format after its originator.

E.g., I like ice cream, strongly agree, agree, undecided, disagree, and strongly disagree. Some feel that there should be several responses possible, strongly agree, moderately agree, agree, undecided, disagree, moderately disagree and strongly disagree. Others believe that five possible responses are adequate, eliminating the " moderately" category usually. Another school of thought is that the neutral (undecided) response should
not be used because many people tend to hide their true opinion by choosing them repeatedly. Undecided category has been given a value of 0, Figure: (5)

The behaviour intention model based on Ajzen and Fishbein (1980) and Ajzen (1988)

- The person believes that the behavior leads to certain outcomes and his or her evaluations of these outcomes

- Attitude toward the behavior

- Intention

- Relative importance of attitudinal and normative consideration

- Subjective norm

- Behavior

- Self efficacy
agree +1 strongly agree +2 disagree -1, and strongly disagree -2 undecided or neutral responses are sometimes called (forced choice). The values assigned for (forced choice) formats can be more flexible +1 for strongly disagree, +2 for disagree, and up to +4 for strongly agree.

The point behind the scoring systems is to give a total score that will reveal the attitude. For instruments that include “undecided”, the zero will reduce their score dramatically if they choose undecided for many items. Those with positive attitude will have scores with appositive sign; those with negative attitude will have negative scores.

2.5.2.3 Semantic differential:
This is based on the idea that the individual reads to an issue, and makes the individual attitude apparent. Can be measured by the way the individual favors adjectives that describe various aspects are assigned a value of +1, +2, and +3, the choice toward the negative adjective -1, -2 and -3 the total score is obtained by adding up the values for each item. The validity of semantic differentials can be demonstrated by discriminates process, or multi trait, multi method, reliability by retest or internal consistency.
Chapter Three
Research method

3.1 Introduction:
Administratively, the Gezira scheme is composed of two major areas, The Gezira and Managil extension. The former comprises about 1154294.25 Feddan, the later about 946166.75 Feddan. The whole Scheme is divided into 18 Groups, ten in Gezira and eight in Managil. The Group area ranges between 75,000 and 150,000 Fed.
Each Group is then divided into four to ten Blocks totaling to 114 Blocks the block area ranges 11200- 30000 Fed in the whole Scheme. There are 62 Blocks in the Gezira and 52 Blocks in Managil extension. Moreover, each of these Block is divided into 3 - 17 Villages. The total area of Gezira Scheme is 2,12 million feddans (0.9) million hectare.
There are about 125 thousand Tenants. The average holding in the old Gezira is about 20 Feddan and in Managil are about 15 Feddan organized in five course rotation very few Tenants having more than 60 - 80 Feddan.
The study was conducted at Gezira Scheme during two Seasons 2002/2003 and 2003/2004. Two Groups (W. Shair and El. Huda) had been chosen. The farmers, were classified into two Groups those who received the insurance services were called insured farmers, while those who did not received the insurance were called uninsured farmers.
Structured questionnaire was designed to include 55 questions for the insured farmers in W. Shair Groups (Gezira) in the first Season 2002/2003 and 41 questions for the uninsured farmers in El. Huda Group, (Managil extension) in the same Season and two Groups in the next Season 2003/2004. The whole questionnaire contained 55 questions other
questions related to the attitudes and behaviors towards cotton crop insurance by the farmers.

The independent variables including adoption of cotton insurance and socio-economic characteristics such as farm size of cotton, age groups, years of formal education, family size, years of experience in agricultural, and membership in social organizations. In addition, others variables constituted the dependent variables namely cultural practices applicable to cotton crop as well as farmers cotton productivity and net return. Farmers attitude and behavior toward cotton crop insurance.

The W. Shair and El. Huda Groups of the main Gezira scheme and Managil extension were selected for studying the farm and household in the Gezira scheme. The reason for this selection is that the pilot project of cotton crop insurance was implemented in these areas and thus, provides data and information on agricultural insurance in the Gezira scheme.

3.2 The Sample selection procedure:

The study used a form of multi- stratified random sampling technique. Sampled farmers were surveyed in Seasons 2002/2003 and Season 2003/2004. Three Blocks from each of the two Groups (W. Shair and El. Huda) were taken as main strata and villages within these blocks as sub-strata. Twenty-five farmers from each three Villages were selected randomly from the three Blocks of insured farmers and the same number of farmers were selected randomly from the three Blocks of uninsured farmers, that is to say 75 of the insured farmers from W. Shair Group (Gezira) and 75 of uninsured farmers from El. Huda Group (Managil extension) to give a total of 150 farmers. The next Season 2003/2004 the same sampling selections were repeated except that all farmers in the two Groups were insured farmers.
3.3 Data collection and sources of information:

Data were collected from various sources. The primary source was direct interviewing, by designing and application of questionnaires, which, were filled by interviewing the insured and uninsured farmers. In addition to the primary source of data the secondary source of data included Published, Unpublished Material, Official records, available documents of Project activities, Annual report of workshops, Conferences, Seminar papers, Journal, Search Computers and Internet (Website) were used to supplement the survey data.

3.4 Data analysis

A number of analytical techniques were used for data presentation and testing of the hypotheses of the study, including.

(1) Descriptive statistics tabular analysis
(2) T. test were used to examine the significance of the differences between groups in adoption of cotton recommendations.
(3) Chi-square test used to measure the association between cotton crop insurance and productivity of cotton.

(4) Chi-square test used to measure the association between cotton crop insurance and net return of cotton.

(5) Correlation was used to measure adoption of some cotton cultural practices with some socio-economic characteristics of farmers.

(6) Descriptive statistics scoring technique, to measure attitude and behavior of the insured farmers towards cotton crop insurance.
Chapter Four

Data analysis and results

This chapter presents the data analysis and results.

It consists of two parts:

**Part one:**
Deals with descriptive analysis of data (in % term) including: Distribution of the farmers by socio-economic characteristic, Distribution of the adoption of cotton cultural practices recommendations. Distribution of cotton productivity, Distribution of cotton net return, Distribution of the attitude and behavior of the insured farmers toward cotton crop insurance.

**Part two:**
Deals with test of significance including. T. test, Chi-square test, Correlation, and Scoring techniques.
Part one:

4.1 Descriptive analysis of data:

4.1.1 Distribution of farmers by socio-economic characteristics

1. Distribution of farmers by size of cotton farm per feddan

The data presented in table (1) shows that 9.3% of the farmers cultivated an area ranging between (1 - 2.5) Feddans. While the majority of the farmers represent 47.3% cultivated, areas between (2.5 - 4) Feddans. About 25.3% of the farmers cultivated areas between (4 - 5.5) Feddans. Only 3.3% of the farmers had land ranging between (5.5 - 7) Feddans as compared to 6.7% of the farmers who cultivated areas between (7 - 8.5) Feddan, of which 8.0% of them possess areas more than 8.5 Feddans. It can conclude that the farmers in both categories (2.5 - 4) and (4 - 5.5) together, may represent a higher percentage of farm size.

<table>
<thead>
<tr>
<th>No.</th>
<th>Size of farm per feddan</th>
<th>Number of farmers</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(1 - 2.5) Feddan</td>
<td>14</td>
<td>9.3</td>
</tr>
<tr>
<td>2</td>
<td>More than (2.5 - 4)</td>
<td>71</td>
<td>47.3</td>
</tr>
<tr>
<td>3</td>
<td>More than (4 - 5.5)</td>
<td>38</td>
<td>25.3</td>
</tr>
<tr>
<td>4</td>
<td>More than (5.5 -7)</td>
<td>5</td>
<td>3.3</td>
</tr>
<tr>
<td>5</td>
<td>More than (7 - 8.5)</td>
<td>10</td>
<td>6.7</td>
</tr>
<tr>
<td>6</td>
<td>More than 8.5</td>
<td>12</td>
<td>8.0</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td><strong>150</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

2. Distribution of farmers by age groups

Table (2) shows that there were no farmers below the age of 20 years, but 8.7% of the farmers fell in the age group 20-29 years. However, 18.7% fell in the age group between 30 - 39, 26.0% of them fell in the age group between 40 - 49 years whereas, 46.7% of the majority of the farmers were above 50 years old. Found from the survey sample that most of the farmers were in old age. It seems that the majority of the youth and the farmers of economic age migrate outside the scheme to study or to work in other occupations rather than work in their farms.

<table>
<thead>
<tr>
<th>No.</th>
<th>Age groups</th>
<th>Number of farmers</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(20 - 29) yrs</td>
<td>13</td>
<td>8.7</td>
</tr>
<tr>
<td>2</td>
<td>(30 - 39) yrs</td>
<td>28</td>
<td>18.7</td>
</tr>
<tr>
<td>3</td>
<td>(40 -49) yrs</td>
<td>39</td>
<td>26.0</td>
</tr>
<tr>
<td>4</td>
<td>More than 50 yrs</td>
<td>70</td>
<td>46.7</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>150</td>
<td>100.0</td>
</tr>
</tbody>
</table>

3. Distribution of farmers by formal years of education:

Table (3) shows the education level of each of the respondent farmers. Only 8.0% were illiterate. Those who had access to (khalwa) education were 14.7%. About 40.7% of the farmers attained (1-4) years of formal Education. This percentage is relatively high compared to, 21.3 % of the farmers who attained 5 to 8 years of formal education. While, those who attained (9 - 12) represent 12.0% years of formal education. However, Four farmers had University degrees, and only one farmer had attained higher education after the University.

Table (3)

Distribution of farmers by formal years of education

<table>
<thead>
<tr>
<th>No.</th>
<th>Years of education</th>
<th>Number of farmers</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Illiterate</td>
<td>12</td>
<td>8.0</td>
</tr>
<tr>
<td>2</td>
<td>Khalwa</td>
<td>22</td>
<td>14.7</td>
</tr>
<tr>
<td>3</td>
<td>(1 - 4) Years of formal Education</td>
<td>61</td>
<td>40.7</td>
</tr>
<tr>
<td>4</td>
<td>(5 - 8) Years of formal Education</td>
<td>32</td>
<td>21.3</td>
</tr>
<tr>
<td>5</td>
<td>(9 - 12) Years of formal Education</td>
<td>18</td>
<td>12.0</td>
</tr>
<tr>
<td>6</td>
<td>University</td>
<td>4</td>
<td>2.7</td>
</tr>
<tr>
<td>7</td>
<td>Above University</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td><strong>150</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

4. Distribution of farmers by family size

Table (4) shows that the family size has been categorized into three groups. Small family size group between (1 - 4) members represents 17.3%. While, 46.0 % of the medium family size ranged between (5 - 8) members. About 36.7% of the large family size group were in nine more members this means that the majority of the farmers have medium family size.

<table>
<thead>
<tr>
<th>No.</th>
<th>Family size</th>
<th>Number of farmers</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(1 - 4) Small family</td>
<td>26</td>
<td>17.3</td>
</tr>
<tr>
<td>2</td>
<td>(5 - 8) Medium family</td>
<td>69</td>
<td>46.0</td>
</tr>
<tr>
<td>3</td>
<td>9 and above Large family</td>
<td>55</td>
<td>36.7</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>150</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

**Sources:** Computed from data collected from W. Shair and El. Huda Groups in Seasons (2002/2003 and 2003/2004)
5. Distribution of farmers by years of experience in agriculture

Table (5) shows that the distribution of the farmers by years of farming experience, 22.0% of the farmers had farming experience of less than 10 years. In comparison, 20.7% of the farmers had farming experience between 10 to 20 years. About 18.0% of the farmers had farming experience between (21 - 30) years. In contrast, 21.3% of the farmers had farming experience between (31 - 40) years. The rest of the farmers who had more than 40 years of experience represent 18.0 percent.

<table>
<thead>
<tr>
<th>No.</th>
<th>Year of experience</th>
<th>Number of farmers</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Less than 10</td>
<td>33</td>
<td>22.0</td>
</tr>
<tr>
<td>2</td>
<td>(10 –20)</td>
<td>31</td>
<td>20.7</td>
</tr>
<tr>
<td>3</td>
<td>(21 –30)</td>
<td>27</td>
<td>18.0</td>
</tr>
<tr>
<td>4</td>
<td>(31 - 40)</td>
<td>32</td>
<td>21.3</td>
</tr>
<tr>
<td>5</td>
<td>More than 40</td>
<td>27</td>
<td>18.0</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>150</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

6. Distribution of farmers by membership in social organizations

Social organization means that farmers do participate in some rural organizations such as agricultural production councils, cooperative societies, and other rural organizations. Table (6) showed that 58.7% of the farmers had memberships, in social organizations while 41.3% had non-membership in social organization. About 21.3% of the farmers participate in one organization compared with 7.3% of who participate in two organizations. The farmers who participate in three social organizations represent 2.7%. While 12.7% of farmers participate in four organizations. (5.3%), of the farmers participate in five organizations farmers participate in six organizations represent 6.0%. Only one farmer participates in seven organizations and 2.7% participate in eight organizations. The nature of work of the organizations is services and administration.

<table>
<thead>
<tr>
<th>No.</th>
<th>Membership</th>
<th>Number of farmers</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Not a member in a social organizations</td>
<td>62</td>
<td>41.3</td>
</tr>
<tr>
<td>1</td>
<td>In one organization (Mosque Committee)</td>
<td>32</td>
<td>21.3</td>
</tr>
<tr>
<td>2</td>
<td>In two organizations</td>
<td>11</td>
<td>7.3</td>
</tr>
<tr>
<td>3</td>
<td>In three organizations</td>
<td>4</td>
<td>2.7</td>
</tr>
<tr>
<td>4</td>
<td>In four organizations</td>
<td>19</td>
<td>12.7</td>
</tr>
<tr>
<td>5</td>
<td>In five organizations</td>
<td>8</td>
<td>5.3</td>
</tr>
<tr>
<td>6</td>
<td>In six organizations</td>
<td>9</td>
<td>6.0</td>
</tr>
<tr>
<td>7</td>
<td>In seven organizations</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>8</td>
<td>In eight organizations</td>
<td>4</td>
<td>2.7</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>150.0</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

4.1.2 Distribution of the farmers by adoption of cultural practices of cotton crop:

4.1.2.1 Distribution of the insured farmers by adoption of cultural practices of cotton in (W. Shair Group) in two Seasons of insurance 2002/2003 and 2003/2004

1. Sowing date:

Item (1) in Table (7) indicated that 70.7% of the insured farmers in season 2002/2003 and 54.7% of the insured farmers in season 2003/2004 in (W. Shair Group) adopted the recommended sowing date for cotton. While 29.3% of the insured farmers and 45.3% of the insured farmers in two season respectively, did not adopt the recommended sowing date. It was clear that the insured farmers in the first season adopted the recommended practice of sowing date at a higher rate than the insured farmers in the second season (70.7% compared to 54.7%).

2. Number of seeds per hole:

Item (2) in Table (7) showed that 60.0% of the insured farmers in season 2002/2003 and 62.7% of insured farmers in season 2003/2004 in (W. Shair Group) adopted the recommended number of seeds per hole for cotton, compared to 40.0% of the insured farmers and 37.3% of the insured farmers in two seasons respectively, did not adopt the recommended number of seeds per hole. It is evident that the insured farmers had a higher rate of adoption in the second season compared, to the insured farmers in the first season.

3. Spacing between plants:

Item (3) in Table (7) shows that 65.3% of both the insured farmers in season 2002/2003, and 70.7% of the insured farmers in season 2003/2004 in (W. Shair Group) adopted the recommended of spacing between plants for cotton, compared to 34.7% of the insured farmers and 29.3% of the insured farmers in two seasons respectively, who did not adopt the
recommended spacing between plants. It may be considered that the insured farmers had a lower rate of adoption in the first season compared, to the insured farmers in the second season.

4. **Time of first irrigation:**

Item (4) in Table (7) shows that 97.3% of both the insured farmers in season 2002/2003 and 96.0% of the insured farmers in season 2003/2004 in (W. Shair Group) adopted the recommended time of first irrigation for cotton, compared to 2.7% of the insured farmers and 4.0% of the insured farmers in two seasons respectively, do not adopt the recommended time of first irrigation. Irrigation administration plays a key role in delaying date of first irrigation through their control of water in canals and hence farmers have no say on water availability in irrigation canals.

5. **Irrigation-intervals:**

Item (5) in Table (7) shows that 25.3% of both the insured farmers in season 2002/2003 and 26.7% of the insured farmers in season 2003/2004 in (W. Shair Group) adopted the recommended irrigation intervals for cotton, compared to 74.7% of the insured farmers and 73.3% of the insured farmers in the two seasons respectively, did not adopt recommended irrigation intervals. Climatic conditions and availability of irrigation water may have contributed to the low level of adoption.

6. **Number of irrigations during the season:**

Item (6) in data presented in table (7) revealed that 14.7% of both the insured farmers in season 2002/2003 and 16.0% of the insured farmers in season 2003/2004 in (W. Shair Group) adopted the recommended number of irrigations during season for cotton, compared to 85.3% of the insured farmers and 84.0% of the insured farmers in two seasons respectively, did not adopt the recommended number of irrigations during the season. Around % 46.7 and 49.3 % of all insured farmers in two seasons mentioned heavy rainfall as a reason for not adopting the recommended number of
irrigations while 25.3% % and 28.0 of them mentioned shortage of irrigation water in the canal.

7. Time of resowing:
Item (7) in Table (7) shows that 77.3% of the insured farmers in season 2002/2003 and 74.7% of the insured farmers in season 2003/2004 in (W. Shair Group) adopted the recommended time of resowing for cotton, compared to none of the insured farmers and 16.0% of the insured farmers in the two seasons respectively, who did not adopt recommended time of resowing. While 22.7% and 9.3% of the insured farmers in the two seasons respectively, did not implement the practice of resowing at all. It may be assumed that both the insured farmers in the two seasons respectively adopted the recommended time of resowing date at a higher rate. 22.7% and 9.3% of the insured farmers in two seasons respectively said that the reasons for not implementing the practice time of resowing are germination of seeds is good, availability of water no logging and flooding, good land preparation, no damage by soil pests.

8. Time of thinning:
Item (8) in Table (7) shows that 41.3 % of both the insured farmers in season 2002/2003 and 37.3 % of the insured farmers in season 2003/2004 in (W. Shair Group) adopted the recommended time of thinning for cotton, compared to 42.7% of the insured farmers and 54.7% of the insured farmers in the two seasons respectively, who did not adopt the recommended time of thinning. While 16.0% and 8.0 % of the insured farmers in the two seasons respectively, did not implement the practice of thinning. It may be assumed that the insured farmers in the first season adopted the recommended time of thinning at a higher rate than the insured farmers in the second season. 16.0 % and 4.0 % of the insured farmers in two seasons respectively said that the reasons for not implementing the time of thinning, was because the plants did not need thinning.
9. Number of plants after thinning:
Item (9) in Table (7) shows that 73.3 % of both the insured farmers in season 2002/2003 and 84.0% of the insured farmers in season 2003/2004 in (W. Shair Group) adopted the recommended number of plants after thinning for cotton, compared to 10.7 % of the insured farmers and 12.0 % of the insured farmers in the two seasons respectively, did not adopt the recommended number of plants after thinning. While 16.0% and 4.0% of, the insured farmers in the two seasons respectively, did not implement of the number of plants after thinning. It is concluded that the insured farmers in second season had adopted this recommendation at a higher rate than in the first season.

10. Specific kind of fertilizer:
Item (10) in Table (7) shows that both the insured farmers in season 2002/2003 and the insured farmers in season 2003/2004 in (W. Shair Group) adopted the recommended specific kind of fertilizer for cotton by 100.0%. Observed that both the insured farmers in W. Shair Group fully adopted the recommended specific kind of fertilizer by 100.0%

11. Dose of urea applied:
Item (11) in Table (7) shows that 90.7 % of both the insured farmers in season 2002/2003 and 98.7% of the insured farmers in season 2003/2004 in (W. Shair Group) adopted the recommended dose of urea applied for cotton, compared to 6.7% of the insured farmers and 1.3% of the insured farmers in the two seasons respectively, did not adopt the recommended dose of urea applied. While 2.7% and none of the insured farmers in the two seasons respectively, did not implement the recommended dose of urea applied.
It is assumed that both the insured farmers in the two seasons had a higher rate of adoption of this recommendation.
12. **Time of urea fertilizer application:**

Item (12) in Table (7) shows that 70.7% of both the insured farmers in season 2002/2003 and 58.7% of the insured farmers in season 2003/2004 in (W. Shair Group) adopted the recommended time of urea fertilizer application for cotton.

It is understood that the insured farmers in the first season had a higher rate of adoption of this recommendation.

13. **Irrigation after fertilizer application:**

Item (13) in Table (7) shows that 96.0% of both the insured farmers in season 2002/2003 and 92.0% of the insured farmers in season 2003/2004 in (W. Shair Group) adopted the recommended irrigation after fertilizer application for cotton, compared to 1.3% of the insured farmers and 8.0% of the insured farmers in the two seasons respectively, did not adopt recommended irrigation after fertilizer application. Only 2.7% of the insured farmers in first season did not implement the practice.

It was obvious that the adoption rate of irrigation after fertilizer application was high in the two seasons.

14. **Methods of urea fertilizer application:**

Item (14) in Table (7) shows that 90.7% of both the insured farmers in season 2002/2003 and 96.0% of the insured farmers in season 2003/2004 in (W. Shair Group) adopted the recommended methods of urea fertilizer application for cotton, compared to 6.7% of the insured farmers and 4.0% of the insured farmers in the two seasons respectively, did not adopt recommended methods of urea fertilizer application. Only 2.7% of the insured farmers in first the season did not implement the practice.

The result shows that both the insured farmers in two seasons respectively have higher rates of adoption of the methods of urea fertilizer application.
15. **Time of green ridging operation:**
Item (15) in Table (7) shows that 70.7% of both the insured farmers in season 2002/2003 and 72.0% of the insured farmers in season 2003/2004 in (W. Shair Group) adopted the recommended time of green ridging operation for cotton, compared to 25.3% of the insured farmers and 24.0% of the insured farmers in the two seasons respectively, did not adopt the recommended time of green ridging operation. While 4.0% of both the insured farmers, in the first and second season respectively, did not implement the practice.

16. **Number (Tagnats and Gadwals):**
Item (16) in Table (7) shows that 98.7% of both the insured farmers in season 2002/2003 and 97.3% of the insured farmers in season 2003/2004 in (W. Shair Group) adopted the recommended number of (Tagnats and Gadwals) for cotton. While 1.3% of the insured farmers in first season and 2.7% of the insured farmers in the second season respectively, did not implement this recommendation.
We observed that a high percentage of the insured farmers in the two seasons adopted this recommendation.

17. **Herbicide application:**
Item (17) in Table (7) shows that 92.0% of both the insured farmers in season 2002/2003 and 76.0% of the insured farmers season in 2003/2004 in (W. Shair Group) adopted the recommended herbicide application for cotton. While 8.0% of the insured farmers in the first season and 24.0% of the insured farmers in the second season respectively, did not implement the practice.
Generally, the insured farmers in the second season had a lower rate of adopting this recommendation.
Graph
Graph
18. **Specific kind of herbicide applied:**
Item (18) in Table (7) shows that only 4.0% of both the insured farmers in seasons 2002/2003 and season 2003/2004 in (W. Shair Group) know the recommended kind of herbicide applied.

19. **Quantity of herbicide applied:**
Item (19) in Table (7) shows that no one of both the insured farmers in seasons 2002/2003 and season 2003/2004 in (W. Shair Group) know recommended quantity of herbicide applied.

20. **Time of herbicide application:**
Item (20) in Table (7) shows that most of the insured farmers in season 2002/2003 and season 2003/2004 in (W. Shair Group) respectively, are aware of the time of herbicide application.

21. **Methods of herbicide application:**
Item (21) in Table (7) shows that both the insured farmers in season 2002/2003 and season 2003/2004 in (W. Shair Group) respectively, are aware of the methods of herbicide application.

22. **Seed dressing application:**
Item (22) in Table (7) shows that 100.0% of the insured farmers in season 2002/2003 and season 2003/2004 in (W. Shair Group) respectively, fully implement the recommended seed dressing application.

23. **Kind of seed dressing:**
Item (23) in Table (7) shows that only 17.3% of both the insured farmers in seasons 2002/2003 and season 2003/2004 in (W. Shair Group) know the recommended kind of seed dressing.

It may be evident that both the insured farmers in seasons 2002/2003 and season 2003/2004 in (W. Shair Group) lack the knowledge of the recommended kind of seed dressing.
24. **Insecticide application:**
Item (24) in Table (7) shows that all the insured farmers in seasons 2002/2003 and season 2003/2004 in (W. Shair Group) respectively, applied the recommended insecticide recommendation by 100.0%.

25. **Specific kind of insecticide applied:**
Item (25) in Table (7) shows that 5.3% of the insured farmers in seasons 2002/2003 and 6.7% of the insured farmers in season 2003/2004 in (W. Shair Group) respectively know the recommended kind of insecticide applied. Meanwhile 94.7% of the insured farmers in season 2002/2003 and 93.3% of the insured farmers in season 2003/2004 did not know the specific kind of insecticide applied.

26. **Quantity of insecticide applied:**
Item (26) in Table (7) shows that no one of both the insured farmers in season 2002/2003 and season 2003/2004 in (W. Shair Group) respectively, know the recommended quantity of insecticide applied.

27. **Time of insecticide application:**
Item (27) in Table (7) shows that only 8.0% of both the insured farmers season in 2002/2003 and season 2003/2004 in (W. Shair Group) respectively, know the recommended time of insecticide application. Meanwhile 92.0% of the insured farmers in season 2002/2003 and season 2003/2004 did not know the recommended time of insecticide application. It may be considered that those who know the recommended time of insecticide application are very few among the both insured farmers in W. Shair Group.

28. **Methods of insecticide application:**
Item (28) in Table (7) shows that all the insured farmers in season 2002/2003 and season 2003/2004 in (W. Shair Group) respectively know the recommended methods of insecticide applications.
29. Number of pickings:
Item (29) in Table (7) shows that 12.0% of the insured farmers in season 2002/2003 and 2.7% season 2003/2004 in (W. Shair Group) respectively, picked in the recommended number of pickings, compared to 88.0% of the insured farmers in season 2002/2003 and 97.3% of the insured farmers in season 2003/2004 who did not practice the recommended number of pickings, It may be concluded that the rate of adoption is low for all the farmers.

30. Irrigation after picking:
Item (30) in Table (7) shows that the majority 94.7% of the insured farmers in season 2002/2003 and 100.0% of the insured farmers in season 2003/2004 in (W. Shair Group) respectively, adopted the recommended irrigation after picking. Only 5.3% of the insured farmers in season 2002/2003 did not adopt the recommended irrigation after picking. It was clear that the adoption of this recommendation is high.

31. Picking intervals:
Item (31) in Table (7) shows that 52.0% of the insured farmers in season 2002/2003 and 54.7% of the insured farmers in season 2003/2004 in (W. Shair Group) respectively, adopted the recommended picking intervals compared to 48.0% of the insured farmers in season 2002/2003 and 45.3% of the insured farmers did not adopt the recommended picking intervals in season 2002/2003. It is evident that the adoption of this recommendation is low.
4.1.2.2 Distribution of the farmers by adoption of cultural practices of cotton in (El.Huda) Group before and after insurance in seasons 2002/2003 and 2003/2004

1. Sowing date:
Item (1) in Table (8) indicated that 30.7% of the uninsured and 34.7% of the insured farmers in (El. Huda Group) in the two seasons 2002/2003 and 2003/2004 respectively, adopted the recommended sowing date for cotton, compared to, 69.3% of the uninsured farmers and 65.3% of the insured farmers who did not adopt recommended sowing date. It is clear that the insured farmer had a higher rate of adoption of this recommendation than the uninsured farmers.

2. Number of seeds per hole:
Item (2) in Table (8) showed that 76.0% of both of the uninsured and the insured farmers in (El. Huda Group) two seasons 2002/2003 and 2003/2004 respectively, adopted the recommended number of seeds per hole for cotton, while 24.0% of both the uninsured farmers and the insured farmers, did not adopt recommended number of seeds per hole.

3. Spacing between plants:
Item (3) in Table (8) showed that 53.3% of both the insured and the uninsured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, adopted the recommended spacing between plants for cotton, while 46.7% of the uninsured and the insured farmers, did not adopt recommended spacing between plants.

4. Time of first irrigation:
Item (4) in Table (8) showed that 97.3% of the uninsured and 96.0% of the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, adopted the recommended time of first irrigation for cotton, while 2.7% of the uninsured farmers and 4.0% of the insured farmers, did not adopt the recommended time of first irrigation.
insured and the uninsured farmers show highest rate of adoption of this recommendation.

5. **Irrigation intervals:**

Item (5) in Table (8) showed that 18.7% of the uninsured and 21.3% of the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, adopted the recommended irrigation intervals for cotton, while 81.3% of the uninsured farmers and 78.7% of the insured farmers, did not adopt the recommended irrigation intervals. Both the insured and the uninsured farmers show lower rate of adoption of irrigation intervals.

6. **Number of irrigations during the season:**

Item (6) in data presented in table (8) revealed that 9.3% of the uninsured and 10.7% of the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, adopted the recommended number of irrigations for cotton, while, 90.7% of the uninsured farmers and 89.3% of the insured farmers did not adopt the recommended number of irrigations during the season. Around 44.0% and 54.7 of all farmers (insured and uninsured) mentioned heavy rainfall as a reason of not implementing the practice of number of irrigations during the season while 38.7% and 29.3% of them mentioned shortage of irrigation water in the canal.

7. **Time of resowing:**

Item (7) in Table (8) shows that 62.7% of the uninsured and 68.0% of the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, adopted the recommended time of resowing for cotton, while, 20.0% of the uninsured farmers and 5.3% of the insured farmers did not adopt the recommended time of resowing. 17.3% and 26.7% of the uninsured and the insured farmers respectively, did not implement the practice of time of resowing at all. Generally, the insured
farmers adopted the recommended the time of resowing at a higher rate than the uninsured farmers. 26.7 % and 17.3% of all farmers (insured and uninsured) said that the reasons for not implementing the practice of time of resowing because the germination of the seeds is good, availability of water, and there is no water logging and flooding.

**8. Time of thinning:**

Item (8) in Table (8). shows that 26.7% of the uninsured and 38.7% of the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, adopted the recommended time of thinning for cotton, while, 65.3% of the uninsured farmers and 53.3% of the insured farmers did not adopt the recommended time of thinning. Only 8.0% of the uninsured farmers and the insured farmers did not thin their crop at all, and may believe that the plant did not need thinning. It is clear that the insured farmer had a higher rate of adoption of this recommendation than the uninsured farmers.

**9. Number of plants after thinning:**

Item (9) in Table (8) shows that 62.7% of the uninsured and 65.3% of the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, adopted the recommended number of plants after thinning for cotton, while 29.3% of the uninsured farmers and 20.0% of the insured farmers, did not adopt the recommended of number of plants after thinning. Only 8.0% of the uninsured farmers and 14.7% of the insured farmers did not implement this recommendation. It is clear that the insured farmers had a higher rate in adopting this recommendation.

**10. Specific kind of fertilizer:**

Item (10) in Table (8) shows that both the uninsured and the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, fully adopted the recommended package fertilizer by 100.0%.
Both the insured and the uninsured farmers in (El. Huda Group) applied phosphorous beside nitrogen.

11. Dose of urea applied:

Item (11) in Table (8) shows that 77.3% of the uninsured and 88.0% of the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, adopted the recommended dose of urea for cotton, compared to 17.3% of the uninsured farmers and 12.0% of the insured farmers did not adopt the recommended dose of urea. Only 5.3% of the uninsured farmers did not implement this recommendation. It is clear that both the insured and the uninsured farmers had a higher rate of adoption of this recommendation.

12. Time of urea fertilizer application:

Item (12) in Table (8) shows that 48.0% of the uninsured and 52.0% of the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, adopt the recommended time of urea fertilizer application for cotton, while, 46.7% of the uninsured farmers and 48.0% of the insured farmers did not adopt the recommended time of urea fertilizer application. only 5.3 of the uninsured farmers did not implement this recommendation. It is clear that the insured farmers adopted the recommended time of urea fertilizer application at a higher rate than uninsured farmers.

13. Irrigation after fertilizer application:

Item (13) in Table (8) shows that 94.7% of the uninsured farmers adopted the recommended of irrigation after fertilizer application. 100.0% of the insured farmers in (El. Huda Group) in the two seasons 2002/2003 and 2003/2004 respectively, fully adopted the recommended irrigation after fertilizer application. It was clear that the adoption rate of irrigation after fertilizer application was high among both groups of farmers.
14. Methods of urea fertilizer application:
Item (14) in Table (8) shows that 85.3% of the uninsured and 96.0% of the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, adopted the recommended method of urea fertilizer application for cotton, while 9.3% of the uninsured farmers and 4.0% of the insured farmers, did not adopt the recommended methods of urea fertilizer application. The result shows that both insured and uninsured farmers have a higher rate of adoption of this recommendation.

15. Time of green ridging operation:
Item (15) in Table (8) shows that 65.3% of the uninsured and 72.0% of the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, adopted the recommended time of green ridging operation for cotton, while, 33.3% of the uninsured farmers and 24.0% of the insured farmers did not adopt the recommended time of green ridging operation.

Small percentage of the uninsured and the insured farmers, 1.3% and 4.0% respectively, did not implement the practice time of green ridging operation at all.

It is evident that the insured farmers had a higher rate of adoption of this recommendation compared, to the uninsured farmers.

16. Number of (Tagnats and Gadwals):
Item (16) in Table (8) shows that, 97.3% of the uninsured and 98.7% of the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, adopted the recommended number of (Tagnats and Gadwals) for cotton, while, 2.7% and 1.3% of the uninsured and the insured farmers respectively, did not adopt the recommended number of (Tagnats and Gadwals). The result shows that both the insured and the uninsured farmers have a high rate of adoption of this recommendation.
17. **Herbicide application:**
Item (17) in Table (8) shows that 77.3% of the uninsured and 89.3% of the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, adopt the recommended herbicide application for cotton, while 22.7% and 10.7% of the uninsured and the insured farmers respectively, did not implement the practice of herbicide application at all. Generally, the insured farmers had a higher rate of adoption compared to the uninsured farmers.

18. **Specific kind of herbicide applied:**
Item (18) in Table (8) shows that only 5.3% of both the uninsured and the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, know the recommended kind of herbicide applied for cotton, compared to 72.0% and 84.0% of the uninsured and the insured farmers respectively, who did not know the specific recommended kind of herbicide applied. 22.7% and 10.7% of the uninsured and the insured farmers respectively, did not implement the recommended kind of herbicide at all.

19. **Quantity of herbicide applied:**
Item (19) in Table (8) shows that no one of the uninsured and the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, know the recommended quantity of herbicide applied for cotton, compared to 77.3% and 89.3% of the uninsured and the insured farmers respectively, did not know the quantity of herbicide applied. 22.7% and 10.7% of the uninsured and the insured farmers respectively did not implement the herbicide application at all.

20. **Time of herbicide application:**
Item (20) in Table (8) shows that most of the farmers are aware of the time of herbicide application. 73.3% of the uninsured and 85.3% of the insured
Graph
Graph
farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, know recommended time herbicide application for cotton. Only 4.0% of both the uninsured and the insured farmers respectively, did not know the time of herbicide application compared to 22.7% and 10.7% of the uninsured and the insured farmers respectively, who did not implement herbicide application at all.

21. Methods of herbicide application:
Item (21) in Table (8) shows that most of the farmers are aware of the methods of herbicide application. 77.3% of the uninsured and 89.3% of the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively know the recommended methods of herbicide application for cotton, compared to 22.7% and 10.7% of the uninsured and the insured farmers respectively, who did not implement the practice of herbicide application at all.

22. Seed dressing application:
Item (22) in Table (8) shows that. 94.7% of the uninsured and 100.0% of the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, adopted the recommended seed dressing application for cotton, compared to 5.3% of the uninsured farmers and no one of the insured farmers respectively, did not implement the practice of seed dressing application at all. It is clear that the adoption of this recommendation was high by the uninsured and the insured farmers.

23. Kind of Seed dressing:
Item (23) in Table (8) shows that. Only 9.3% of both the insured and the uninsured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, know the recommended kind of seed dressing for cotton, Meanwhile 85.3% of the uninsured and 90.7% of the insured farmers respectively, did not know the kind of seed dressing. Only 5.3% of the uninsured farmer did not implement kind of seed dressing. It may be
concluded that both the insured and the uninsured farmers lack the knowledge of the recommended kind of seed dressing.

24. Insecticide application:
Item (24) in Table (8) shows that the uninsured and the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, applied the insecticide recommendation by 100.0%.

25. Specific kind of insecticide applied:
Item (25) in Table (8) shows that only 5.3% of both the uninsured and the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, know the recommended specific of the kind of insecticide applied for cotton, and 94.7% of both the uninsured and the insured farmers did not know. It may be concluded that the uninsured and the insured farmers had little knowledge about the specific kind of insecticide applied.

26. Quantity of insecticide applied:
Item (26) in Table (8) shows that both the uninsured and the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, did not know the recommended quantity of insecticide applied for cotton.

27. Time of insecticide application:
Item (27) in Table (8) shows that only one farmer of both the uninsured and the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, know the recommended time of insecticide application for cotton, meanwhile 98.7% of both the uninsured and the insured farmers did not know time of insecticide application. It concludes that the majority of all the farmers did not know the recommended time of insecticide application.
28. Methods of insecticide application:
Item (28) in Table (8) shows that all the uninsured and the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, know the recommended methods of insecticide application.

29. Number of pickings:
Item (29) in Table (8) shows that only 4.0% of the uninsured and 6.7% of the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, implement the recommended number of pickings for cotton, compared to 96.0% of the uninsured and 93.3% of the insured farmers did not carry out the recommended number of pickings It may be concluded that the rate of adoption is lower in all the farmers.

30. Irrigation after picking:
Item (30) in Table (8) shows that the majority (97.3%) of the uninsured and 100.0% of the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, adopt the recommended irrigation after picking for cotton, compared to only two of the uninsured farmers who did not apply the recommended of irrigation after picking. It was clear that the adoption of irrigation after picking was high in the two groups of the farmers.

31. Picking-intervals:
Item (31) in Table (8) shows that 36.0% of the uninsured and 34.7% of the insured farmers in (El. Huda Group) in two seasons 2002/2003 and 2003/2004 respectively, implement the recommended picking intervals compared to 64.0% of the uninsured and 65.3% of the insured farmers who did not adopt the recommended of picking intervals. It is evident that all the farmers revealed lower adoption of picking-interval.
4.1.3 Distribution of the farmers by cotton productivity:

Table: (9)

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Frequency %</td>
<td>Frequency %</td>
</tr>
<tr>
<td>1</td>
<td>Less than 4</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>Above 4- 6.</td>
<td>22</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>Above 6 -8.</td>
<td>24</td>
<td>26</td>
</tr>
<tr>
<td>4</td>
<td>Above 8 -10.</td>
<td>18</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>10 and above</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>75</td>
<td>75</td>
</tr>
</tbody>
</table>


Table (9), shows the yield in kantar / feddan of cotton, in seasons (2002/2003 - 2001/2002) of farmers in (W. Shair Group) after and before insurance respectively. (8.0%) of the insured farmers after insurance produced more than 10 (k./fed.) While 1.3% was produced by the uninsured farmers, before insurance in (W. Shair Group), (24.0%) of the insured farmers who produced above (8 -10) (k. /fed.) compared with 8.0% of the uninsured farmers in (W. Shair Group). Whereas the majority of the insured and the uninsured farmers in (W. Shair Group), produced 32.0% and 34.7% respectively above (6 - 8) (k. /fed.), the higher percentage (40.0%) of the uninsured farmers and lower 29.3% of the insured farmers produced above (4 -6) (k./fed.), while 6.7% of the insured and 16.0% of the uninsured farmers produced less than 4 (k./fed.),

Last remark: generally, the insured farmers in season of insurance recorded higher productivity in comparison with the same farmers before insurance.
Graph
Table (10)

Distribution of farmers by cotton productivity in kantar per feddan in (El. Huda Group) after and before insurance in Seasons 2003/2004 and 2002/2003

<table>
<thead>
<tr>
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<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Frequency %</td>
<td>Frequency %</td>
</tr>
<tr>
<td>1</td>
<td>Less than 4</td>
<td>28 37.3</td>
<td>20 26.7</td>
</tr>
<tr>
<td>2</td>
<td>Above 4- 6.</td>
<td>26 34.7</td>
<td>23 30.7</td>
</tr>
<tr>
<td>3</td>
<td>Above 6 -8.</td>
<td>16 21.3</td>
<td>20 26.7</td>
</tr>
<tr>
<td>4</td>
<td>Above 8 -10.</td>
<td>2 2.7</td>
<td>9 12.0</td>
</tr>
<tr>
<td>5</td>
<td>10 and above</td>
<td>3 4.0</td>
<td>3 4.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>75 100.0</td>
<td>75 100.0</td>
</tr>
</tbody>
</table>

**Source:** Computed from data collected from El. Huda Groups in (Seasons 2002/2003 and 2003/2004)

Table (10) shows the yield in kantar/feddan of cotton in seasons (2003/2004 - 2002/2003) for farmers in (El. Huda Group) after and before insurance. The same percentage 4.0% of the insured and the uninsured farmers produced more than 10 (k./fed.). Only, 2.7% of the insured farmers after insurance and 12.0% of the uninsured farmers in (El. Huda Group) produced above (8 -10) (k./fed.), in comparison with 21.3% of the insured farmers and 26.7% of the uninsured farmers in (El. Huda Group) produced above (6 - 8) (k./fed.). Whereas the majority of the insured and the uninsured farmers in (El. Huda Group) (34.7% and 30.7%) lower percentage produced (4 - 6) (k./fed. respectively). The high percentage (37.3%) of the insured and 26.7% of the uninsured farmers produced less than 4 (k./fed.).

Last remark: generally, the uninsured farmers recorded higher productivity in comparison with the insured farmers. The reason behind these variations may be attributed attack of the cotton by pests and diseases and the pesticide and insecticide used are invalid as farmers recorded.
Graph

7
Table: (11)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>%</td>
<td>Frequency</td>
</tr>
<tr>
<td>1</td>
<td>Less than 4</td>
<td>5</td>
<td>6.7</td>
</tr>
<tr>
<td>2</td>
<td>Above 4- 6.</td>
<td>22</td>
<td>29.3</td>
</tr>
<tr>
<td>3</td>
<td>Above 6 -8.</td>
<td>24</td>
<td>32.0</td>
</tr>
<tr>
<td>4</td>
<td>Above 8 -10.</td>
<td>18</td>
<td>24.0</td>
</tr>
<tr>
<td>5</td>
<td>10 and above</td>
<td>6</td>
<td>8.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>75</strong></td>
<td><strong>100.0</strong></td>
<td><strong>75</strong></td>
</tr>
</tbody>
</table>

**Source:** Computed from data collected from W. Shair Group in Seasons (2002/2003 and 2003/2004)

Data displayed in table (11) shows the yield in Kantars / feddan to the insured farmers for the two seasons (2002/2003 - 2003/2004 respectively) in (W. Shair Group). It shows that 8.0% of the insured farmers in the first season and 1.3% of the insured farmers in the second season produced more than 10 (k. /fed.), and 24.0% of the insured farmers in the first season and 2.7% in the second season produced above (8 -10) (k./fed.), and 32.0% and 14.7% of the insured farmers in the two seasons respectively, produced above (6 - 8) (k./fed.), 29.3% and 50.7% of the insured farmers of the first and the second seasons produced above (4 -6) (k./fed.). The average productivity was less than 4 (k./fed.), for the two seasons produced by 6.7% and 30.7% respectively.

Last remark: Generally, the insured farmers in the first season maintained high productivity / feddan in contrast to the result in the second season in (W. Shair Group). This was due to cotton attack by diseases, flooding, lack of inputs such as herbicides, fertilizers etc. and low adoption of time of application of urea fertilizer, number of pickings, and because in the first season of implementation of the scheme all parties (Gezira scheme, farmers union, the insurance company) gave enough care for the program.
Graph
8
Table (12)

<table>
<thead>
<tr>
<th>No.</th>
<th>Reasons mentioned</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pest and diseases</td>
<td>66</td>
<td>41.5</td>
</tr>
<tr>
<td>2</td>
<td>Drought</td>
<td>36</td>
<td>22.6</td>
</tr>
<tr>
<td>3</td>
<td>The pesticide is out of date</td>
<td>18</td>
<td>11.3</td>
</tr>
<tr>
<td>4</td>
<td>Unavailability of finance at regular times</td>
<td>10</td>
<td>6.3</td>
</tr>
<tr>
<td>5</td>
<td>Flooding</td>
<td>9</td>
<td>5.7</td>
</tr>
<tr>
<td>6</td>
<td>Delay in sowing date</td>
<td>4</td>
<td>2.5</td>
</tr>
<tr>
<td>7</td>
<td>Unavailability of labors</td>
<td>3</td>
<td>1.9</td>
</tr>
<tr>
<td>8</td>
<td>Fertilizer (Time + Recommended doses)</td>
<td>3</td>
<td>1.9</td>
</tr>
<tr>
<td>9</td>
<td>Weed control (Bad Weed)</td>
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<td>1.9</td>
</tr>
<tr>
<td>10</td>
<td>Seed treatment</td>
<td>3</td>
<td>1.9</td>
</tr>
<tr>
<td>11</td>
<td>Land preparation</td>
<td>2</td>
<td>1.3</td>
</tr>
<tr>
<td>12</td>
<td>Increase in the cost of the production</td>
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<td>1.3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>159</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

**Source:** Computed from data collected from (W. Shair and El. Huda Groups) in Season 2003/2004

Table (12) shows the factors suggested by farmers for low cotton productivity. 41.5% of the farmers suggested pests and diseases attack on the cotton crop, whereas 22.6% of the farmers indicated that the drought was the reason for low productivity, and only 11.3% of the farmers said the pesticide was out of date. Those with lower productivity (6.3%), said the reason were due to unavailability of finance at regular times. Flooding as a reason for low productivity represents 5.7%. Delay in sowing date about 2.5% while 1.9% represent the other four reasons mentioned by the farmers as follows; unavailability of labor, time of fertilizer application recommended doses of fertilizer, and seed treatment. Only 1.3% of the two groups of farmers indicated land preparation and increase in cost of the production.
4.1.4 Distribution of farmers by cotton net return:

Table: (13)

<table>
<thead>
<tr>
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<tbody>
<tr>
<td></td>
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<td>Frequency %</td>
<td>Frequency %</td>
</tr>
<tr>
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<td>Less Than 5000</td>
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<td>14 18.7</td>
</tr>
<tr>
<td>2</td>
<td>&gt;5000 Up to 25000</td>
<td>10 13.3</td>
<td>10 13.3</td>
</tr>
<tr>
<td>3</td>
<td>&gt;25000 Up to 45000</td>
<td>11 14.7</td>
<td>17 22.7</td>
</tr>
<tr>
<td>4</td>
<td>&gt;45000 Up to 65000</td>
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<td>10 13.3</td>
</tr>
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</tbody>
</table>


Table (13) shows the net return in (s.d. /fed.) of cotton crop in seasons (2002/2003 and 2001/2002) in (W. Shair Group) after and before insurance seasons respectively.

Generally it was observed that the insured farmers scored higher percentages with higher brackets of net return (45,000 -125,000) except at the higher level of net return > (105,000 to 125,000) were the uninsured farmers scored 6.7% and the insured farmers scored 4%, respectively.

The result showed that the insured farmers obtain more net return than the uninsured.
Graph 9
Table (14)


<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Frequency</td>
<td>%</td>
</tr>
<tr>
<td>1</td>
<td>Less Than 5000</td>
<td>25</td>
<td>33.3</td>
</tr>
<tr>
<td>2</td>
<td>&gt;5000 Up to 25000</td>
<td>15</td>
<td>20.0</td>
</tr>
<tr>
<td>3</td>
<td>&gt;25000 Up to 45000</td>
<td>14</td>
<td>18.7</td>
</tr>
<tr>
<td>4</td>
<td>&gt;45000 Up to 65000</td>
<td>13</td>
<td>17.3</td>
</tr>
<tr>
<td>5</td>
<td>&gt;65000 Up to 85000</td>
<td>4</td>
<td>5.3</td>
</tr>
<tr>
<td>6</td>
<td>&gt;85000 Up to 105000</td>
<td>1</td>
<td>1.3</td>
</tr>
<tr>
<td>7</td>
<td>&gt;105000 Up to 125000</td>
<td>1</td>
<td>1.3</td>
</tr>
<tr>
<td>8</td>
<td>More than 125000</td>
<td>2</td>
<td>2.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>75</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>


Table (14) shows the net return of cotton in Sudanese dinar per feddan, in seasons (2002/2003 and 2001/2002) of farmers in (El. Huda group) after and before insurance.

It was observed that the net return of cotton in (s.d. /fed.) could vary for the two seasons of El. Huda Group as the table showed. It was also observed that the uninsured farmers scored higher percentages at the higher brackets of net return ranging from > (85000 to more than 125,000) than the insured farmers.
Graph 10
Table: (15)

Distribution of farmers by cotton net return in Sudanese dinar per feddan in (W. Shair Group) in two insured Seasons 2002/2003 and 2003/2004 respectively

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>%</td>
<td>Frequency</td>
</tr>
<tr>
<td>1</td>
<td>Less Than 5000</td>
<td>2</td>
<td>2.7</td>
</tr>
<tr>
<td>2</td>
<td>&gt;5000 Up to 25000</td>
<td>10</td>
<td>13.3</td>
</tr>
<tr>
<td>3</td>
<td>&gt;25000 Up to 45000</td>
<td>11</td>
<td>14.7</td>
</tr>
<tr>
<td>4</td>
<td>&gt;45000 Up to 65000</td>
<td>14</td>
<td>18.7</td>
</tr>
<tr>
<td>5</td>
<td>&gt;65000 Up to 85000</td>
<td>17</td>
<td>22.7</td>
</tr>
<tr>
<td>6</td>
<td>&gt;85000 Up to 105000</td>
<td>12</td>
<td>16.0</td>
</tr>
<tr>
<td>7</td>
<td>&gt;105000 Up to 125000</td>
<td>3</td>
<td>4.0</td>
</tr>
<tr>
<td>8</td>
<td>More than 125000</td>
<td>6</td>
<td>8.0</td>
</tr>
<tr>
<td>Total</td>
<td>75</td>
<td>100.0</td>
<td>75</td>
</tr>
</tbody>
</table>


Table (15) shows net return in (s.d. /fed.) of cotton crop in seasons (2002/2003-2003/2004) in (W. Shair Group) on two insured Seasons, respectively.

The insured farmers at (W. Shair Group) scored higher net returns in the first season of insurance compared to the second season of insurance with higher percentage in the net return brackets > (65.000 up to 125.000) Sudanese dinars per feddan.
Graph 11
4.1.5 Attitude and behavior of the insured farmers towards cotton crop insurance in both Groups (W. Shair and El. Huda):

Table (16)

<table>
<thead>
<tr>
<th>No.</th>
<th>Awareness</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Adequate awareness</td>
<td>82</td>
<td>54.7</td>
</tr>
<tr>
<td>2</td>
<td>Inadequate awareness</td>
<td>63</td>
<td>42.0</td>
</tr>
<tr>
<td>3</td>
<td>I didn’t know of cotton crop insurance</td>
<td>5</td>
<td>3.3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>150</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Source: Computed from data collected from W. Shair and El. Huda Groups in (2002 /2003) Season

Table (16) shows the opinion of the insured farmers about their awareness of the cotton crop insurance. (54.7%) of the insured farmers said that their awareness was adequate, while 42.0% of insured farmers said that their awareness about cotton crop insurance was not adequate. Only 3.3% of the insured farmers said that, they did not know of the cotton crop insurance. According to the above results, a high percentage of the insured farmers 42.0% said that their awareness was inadequate. Therefore, raising farmers’ awareness is important and this will influence positively, the behavior and attitude of the farmers towards insurance.
Table (17)

**Distribution of the insured farmers by reasons for adopting the cotton crop insurance**

<table>
<thead>
<tr>
<th>No.</th>
<th>The reasons</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To avoid risks</td>
<td>60</td>
<td>40.0</td>
</tr>
<tr>
<td>2</td>
<td>The insurance is compulsory</td>
<td>54</td>
<td>36.0</td>
</tr>
<tr>
<td>3</td>
<td>The facilities expected from Sheikan Insurance and Reinsurance Company</td>
<td>20</td>
<td>13.3</td>
</tr>
<tr>
<td>4</td>
<td>The indemnity received in case of loss.</td>
<td>11</td>
<td>7.3</td>
</tr>
<tr>
<td>5</td>
<td>I didn’t know of cotton crop insurance</td>
<td>5</td>
<td>3.3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>150</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>


Table (17) shows the reasons given by farmers for adopting cotton crop insurance, in both W. Shair and El. Huda Groups.

The largest group of farmers (about 40%), mentioned risk-avoidance as the reason for adopting the cotton crop insurance. The second largest group (36%) of farmers were under the impression that insurance was compulsory. Risk avoidance is clearly the largest motivator for the insurance policy adoption.
Graph Source of information
There are different sources of information about cotton crop insurance, in the Gezira Scheme such as Insurance officer, Farmers' Branch Union, Extensionist, Field inspector, Television, and Radio etc.

Table (18) shows the classification of information by farmers, according to the sources of information about cotton crop insurance. (26.7%) of respondents classified the insurance officer as their first source of information, while 20.0% classified the field inspector as the first source of information.

The farmers branch union and neighbor were classified as first source of information by the same percentage, (14.0%). and, 13.3% of respondent classified the radio as their first source of information respectively.

Only the percent that ranged between (1.3% - 3.3%), classified by the farmers as first source of information, included the Extensionist, Television, Bulletin, and others.

From the table one may conclude that extension is not the first source of information about cotton crop insurance.
Table (19)

**Distribution of the insured farmers by benefits of cotton crop insurance**

<table>
<thead>
<tr>
<th>No.</th>
<th>The type of benefits</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very substantial</td>
<td>28</td>
<td>18.7</td>
</tr>
<tr>
<td>2</td>
<td>Substantial</td>
<td>79</td>
<td>52.7</td>
</tr>
<tr>
<td>3</td>
<td>Not substantial</td>
<td>31</td>
<td>20.7</td>
</tr>
<tr>
<td>4</td>
<td>Not substantial at all</td>
<td>7</td>
<td>4.7</td>
</tr>
<tr>
<td>5</td>
<td>I didn’t know of cotton crop insurance</td>
<td>5</td>
<td>3.3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>150</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

**Source:** Computed from data collected from W. Shair and El. Huda Groups in (2002/2003) Season

Table (19) shows that only 18.7% of the insured farmers said they had benefited very substantially from the cotton crop insurance. The majority of the farmers (52.7%), said that they got substantial benefits from the cotton crop insurance. Only 20.7% of the insured farmers said that they did not get any substantial benefits, and 4.7% of the insured farmers said they did not get any benefits at all from the cotton crop insurance. A minor percentage of the insured farmers, 3.3% said they did not know the cotton crop insurance. This means that the insured farmers felt the benefits of cotton crop insurance.
Crop insurance has played an important role in protecting the farmers against natural risks in the seasons of poor crop yields. Table (20) shows that 77.4% of the insured farmers said that cotton crop insurance provides protection against risks and catastrophes, whereas a low percentage (19.3%) of the insured farmers said cotton crop insurance does not provide any protection. This high percentage (77.4%) tells us that the farmers appreciate the protection got from the cotton crop insurance.
Table (21)

**Distribution of the insured farmers by beliefs about the level of contributions by the insurer in solving irrigation problems**

<table>
<thead>
<tr>
<th>No.</th>
<th>The level of contributions</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very high level of contributions</td>
<td>8</td>
<td>5.3</td>
</tr>
<tr>
<td>2</td>
<td>High contributions</td>
<td>21</td>
<td>14.0</td>
</tr>
<tr>
<td>3</td>
<td>Low contributions</td>
<td>74</td>
<td>49.3</td>
</tr>
<tr>
<td>4</td>
<td>Very low contributions</td>
<td>2</td>
<td>1.3</td>
</tr>
<tr>
<td>5</td>
<td>No contributions</td>
<td>40</td>
<td>26.7</td>
</tr>
<tr>
<td>6</td>
<td>I didn’t know cotton crop insurance</td>
<td>5</td>
<td>3.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>150</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

**Source:** Computed from data collected in W. Shair and El. Huda Groups in (2002 / 2003) Season

Table (21) shows the level of contributions of the insurer in solving irrigation problems. 69.9% of the insured farmers said the type of contributions offered by the insurer ranged between very high level of contributions to very low contributions as shown by table no. 21, and 26.7% of them did not notice any contributions in solving irrigation problem. The rest of the farmers representing (3.3%) said that they did not know about the cotton crop insurance. The result shows that there is need for the company to contribute and is expected to play a big role in solving the irrigation problems because irrigation is the most important factor in reducing the farmers’ risks.
Table (22)

Distribution of the insured farmers by the type of contributions in solving their irrigation problems

<table>
<thead>
<tr>
<th>No.</th>
<th>Type of contributions</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Contribute</td>
<td>105</td>
<td>69.9</td>
</tr>
<tr>
<td>2</td>
<td>No contribution</td>
<td>40</td>
<td>26.7</td>
</tr>
<tr>
<td>3</td>
<td>I didn’t know cotton crop insurance</td>
<td>5</td>
<td>3.3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>150</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

**Source:** Computed from data collected from W. Shair and El. Huda Groups in (2002 / 2003) Season

Table (22) shows the type of contributions offered by Sheikan to the insured farmers. About 69.9% of the insured farmers mentioned the contributions as follows:

1/ The company contributes to cleaning ditches and canals and in the removal of clays.

2/ They proposed that the company should also offer patrolling and up-keeping of the irrigation system of the insured farmers and to provide fuel to facilitate monitoring of the irrigation system.

3/ To gives loan, to the Farmers Branch Union to extend the major canal.
Table (23)

**Distribution of the insured farmers by beliefs about the level of contributions by insurer in solving their credit problems**

<table>
<thead>
<tr>
<th>No.</th>
<th>The level of contributions</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very high level of contributions</td>
<td>11</td>
<td>7.3</td>
</tr>
<tr>
<td>2</td>
<td>High contributions</td>
<td>28</td>
<td>18.7</td>
</tr>
<tr>
<td>3</td>
<td>Low contributions</td>
<td>16</td>
<td>10.7</td>
</tr>
<tr>
<td>4</td>
<td>Very low contributions</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>5</td>
<td>No contributions</td>
<td>89</td>
<td>59.3</td>
</tr>
<tr>
<td>6</td>
<td>I didn’t know cotton crop insurance</td>
<td>5</td>
<td>3.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>150</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

**Source:** Computed from data collected from W. Shair and El. Huda Groups in (2002/2003) Season

Table (23) shows the level of contributions extended by Sheikan Company to insured farmers to solve their credit problems. Only 37.4% of the insured farmers said they received contributions. From this percentage, 26% got high contributions while 11.4% had low contributions. Also 59.3% of the insured farmers did not received any contributions for solving their credit problems and 3.3% of the insured farmers did not know cotton crop insurance. From the above results, one may conclude that the percentage of the farmers, who got contributions for solving their credit problems, was not very high. This may be attributed to the fact that the pilot scheme was in its first years.
Table (24)

Distribution of the insured farmers by the type of contributions in solving their credit problems

<table>
<thead>
<tr>
<th>No.</th>
<th>The type of contributions</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Contribute</td>
<td>56</td>
<td>37.4</td>
</tr>
<tr>
<td>2</td>
<td>No contribution</td>
<td>89</td>
<td>59.3</td>
</tr>
<tr>
<td>3</td>
<td>I didn’t know cotton crop insurance</td>
<td>5</td>
<td>3.3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>150</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

**Source:** Computed from data collected from W. Shair and El. Huda Groups in (2002/2003) Season

Table (24) shows the type of contributions the insured farmers had from the cotton crop insurance in solving their credit problem by Sheikan Company. 37.4% of the insured farmers mentioned the contributions they got as follows:

1/ Gives loan to the farmers for weeding and cleaning operations.
2/ Promote credit availability through insurance.
Table (25)  

Distribution of the insured farmers by beliefs about the level of contributions by the insurer in solving their inputs problems

<table>
<thead>
<tr>
<th>No.</th>
<th>The level of contributions</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Very high level of contributions</td>
<td>10</td>
<td>6.7</td>
</tr>
<tr>
<td>2</td>
<td>High contributions</td>
<td>24</td>
<td>16.0</td>
</tr>
<tr>
<td>3</td>
<td>Low contributions</td>
<td>8</td>
<td>5.3</td>
</tr>
<tr>
<td>4</td>
<td>Very low contributions</td>
<td>3</td>
<td>2.0</td>
</tr>
<tr>
<td>5</td>
<td>No contributions</td>
<td>100</td>
<td>66.7</td>
</tr>
<tr>
<td>6</td>
<td>I didn’t know cotton crop insurance</td>
<td>5</td>
<td>3.3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>150</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Source: Computed from data collected from W. Shair and El. Huda Groups in (2002-2003) Season

Table (25) shows the level of contributions offered to the insured farmers by Sheikan to help solving their input problems. Only 30% of the insured farmers received contributions of which 6.7% received very high contributions, 16.0% received high contributions and only 5.3% received low contributions. The very low contributions represent 2.0%. However, a highest percentage (66.7%) of the insured farmers said, they did not receive any contribute. 3.3% of the insured farmers said that they did not know of the cotton crop insurance.
Table (26)

Distribution of the insured farmers by the type of contributions in solving their input problems

<table>
<thead>
<tr>
<th>No.</th>
<th>The type of contributions</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Contribution by providing seeds, fertilizers, herbicides</td>
<td>45</td>
<td>30.0</td>
</tr>
<tr>
<td>2</td>
<td>No contribution</td>
<td>100</td>
<td>66.7</td>
</tr>
<tr>
<td>3</td>
<td>I didn’t know cotton crop insurance</td>
<td>5</td>
<td>3.3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>150</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

**Source:** Computed from data collected from W. Shair and El. Huda Groups in (2002 / 2003) Season

Table (26) shows the type of contributions the insured farmers got from the cotton crop insurance to solving their input problems executed by Sheikan Insurance and Reinsurance Company. (30.0%) of the insured farmers received contributions in the form of seeds, fertilizers, and herbicides. The high percentage of the insured farmers (66.7%) said that the cotton crop insurance did not contribute towards solving their inputs problems. and 3.3% of insured farmers said, they did not know of the cotton crop insurance.
Table (27)

**Distribution of the insured farmers by the type of services provided by the insurance officers**

<table>
<thead>
<tr>
<th>No.</th>
<th>Type of services</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Extension services</td>
<td>60</td>
<td>40.0</td>
</tr>
<tr>
<td>2</td>
<td>Protection services</td>
<td>13</td>
<td>8.7</td>
</tr>
<tr>
<td>3</td>
<td>Reducing risks</td>
<td>21</td>
<td>14.0</td>
</tr>
<tr>
<td>4</td>
<td>1+2</td>
<td>6</td>
<td>4.0</td>
</tr>
<tr>
<td>5</td>
<td>1+2+3</td>
<td>45</td>
<td>30.0</td>
</tr>
<tr>
<td>6</td>
<td>Didn’t receive any services</td>
<td>5</td>
<td>3.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>150</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** Computed from data collected from W. Shair and El. Huda Groups in (2002/2003) Season

Table (27) shows the services the insured farmers got from the cotton crop insurance through the insurance officers. (40.0%) of the insured farmers, reported receiving extension services compared to 8.7% of the insured farmers who got protection services. Those who reported receiving services to reduce risks constitute about 14.0%. Only 4.0% of the insured farmers reported getting services of both extension services and protection services. (30.0%) of the insured farmers reported they receive extension services plus protection services in addition to reduction of risks. 3.3% of the insured farmers did not know of cotton crop insurance. We observed that most of the type of services the farmers got though insurance is extension services (40.0%).
Table (28)

**Distribution by major problem facing the insured farmers from the cotton crop insurance**

<table>
<thead>
<tr>
<th>No.</th>
<th>Problems</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Annual premium paid is high</td>
<td>33</td>
<td>22.0</td>
</tr>
<tr>
<td>2</td>
<td>Lack of awareness of agricultural insurance among farmers</td>
<td>30</td>
<td>20.0</td>
</tr>
<tr>
<td>3</td>
<td>The insurers may cover some of the risks and leave others for farmers to care for</td>
<td>25</td>
<td>16.7</td>
</tr>
<tr>
<td>4</td>
<td>Amount of indemnity received by the insured farmers is low</td>
<td>14</td>
<td>9.3</td>
</tr>
<tr>
<td>5</td>
<td>The compensation is not paid in time</td>
<td>11</td>
<td>7.3</td>
</tr>
<tr>
<td>6</td>
<td>I didn’t face any problem</td>
<td>10</td>
<td>6.7</td>
</tr>
<tr>
<td>7</td>
<td>The cotton crop insurance is not linked with financing</td>
<td>8</td>
<td>5.3</td>
</tr>
<tr>
<td>8</td>
<td>Crop insurance does not insure yield levels.</td>
<td>5</td>
<td>3.3</td>
</tr>
<tr>
<td>9</td>
<td>The productive farmers are not compensated and paid premium</td>
<td>5</td>
<td>3.3</td>
</tr>
<tr>
<td>10</td>
<td>The insurance type is compulsory</td>
<td>3</td>
<td>2.0</td>
</tr>
<tr>
<td>11</td>
<td>The coverage in the crop establishment period dose not include time of harvesting</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>12</td>
<td>I didn’t know cotton crop insurance</td>
<td>5</td>
<td>3.3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>150</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

**Source:** Computed from data collected from W. Shair and El. Huda Groups in (2002 / 2003) Season

Table (28) shows the major problems the program had to face in the cotton crop insurance pilot project from the point view of the insured farmers. One problem according to 22.0% of the insured farmers, was that the annual premium paid by farmers was 7% of the sum insured, high, in spite of the government contributes 50% i.e. The farmers pay only 3.5% of the insured sum, of the premium and the other half 50% paid by the government. Premium collecting from the farmer’s is essential for paying the desired indemnity to the affected farmers. 20.0% of the insured farmers said that the second problem was the lack of awareness and proper understanding of the crop insurance among the farmers. 16.7% of the insured farmers think
that the insurers may cover some of the risks and leave others for farmers to take care of thereby reducing the insurance coverage. To avoid these problems it is proposed that the insurance coverage should be expanded to include other unavoidable natural hazards. 9.4% of the insured farmers emphasized that the amount of indemnity received by the insured farmers was low. 7.4% of the insured farmers said that the compensation was not paid in time of loss. 6.7% of the insured farmers said they did not face any problems. 5.3% said that the cotton crop insurance should be linked with credit and other insured farmers who represent 3.3% said that, the productive farmers are not compensated for the premium. 3.3% noted that crop insurance does not insure the yield level, and is confined to insure only the costs of production. 2.0% of the insured farmers thought that the insurance was compulsory. Few farmers 0.7% said that the coverage period from crop emergence until the end of the vegetative stage did does not include the harvest stages. The rest of the farmers (3.3%) said that they did not know of cotton crop insurance.
Table (29)

<table>
<thead>
<tr>
<th>No.</th>
<th>Farmers adopting of cotton crop insurance</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes</td>
<td>131</td>
<td>87.3</td>
</tr>
<tr>
<td>2</td>
<td>No</td>
<td>19</td>
<td>12.7</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>150</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Computed from data collected from W. Shair and El. Huda Groups in (2002 / 2003) Season

Table (29) shows the reasons behind the willingness or unwillingness of the insured farmers to adopt cotton crop insurance in the next season. As seen from the data 87.3% of the insured farmers said that they were willing to adopt cotton crop insurance, whereas only 12.7% of the insured farmers said they would not adopt cotton crop insurance in the next season.

The reasons behind the willingness as mentioned by the insured farmers are:
1. To solve the problems of irrigation, credit and input
2. Because it is compulsory, 3. To obtain services. 4. For compensation

The reasons for the negative response as mentioned by the insured farmers are:
1. Did not get any benefit 2. Not rational 3. Did not achieve the objectives.

The rest of the insured farmers, representing 3.3% did not know of the cotton crop insurance.

From the data, see that the majority of the farmers were willing to participate in the next season of cotton crop insurance scheme. i.e. they appreciate the benefits which indicate the positive attitude of the farmers toward the cotton crop insurance.
Part two:
4.2 Test of significant
4.2.1 T- test comparison of mean by adoption of cotton cultural practices:

Table: (30)


<table>
<thead>
<tr>
<th>No.</th>
<th>Cultural Practices</th>
<th>Mean value</th>
<th>Mean value</th>
<th>Std. deviation</th>
<th>T-test</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Insured farmers (W. Shair) N =75</td>
<td>Insured farmers (W. Shair) N =75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Sowing date</td>
<td>1.55</td>
<td>1.71</td>
<td>0.68</td>
<td>-0.204</td>
<td>*0.045</td>
</tr>
<tr>
<td>2</td>
<td>Number of seeds per hole</td>
<td>1.63</td>
<td>1.60</td>
<td>0.66</td>
<td>0.351</td>
<td>0.726</td>
</tr>
<tr>
<td>3</td>
<td>Spacing between plants</td>
<td>1.71</td>
<td>1.65</td>
<td>0.46</td>
<td>1.00</td>
<td>0.321</td>
</tr>
<tr>
<td>4</td>
<td>Irrigation intervals</td>
<td>1.27</td>
<td>1.25</td>
<td>0.63</td>
<td>0.18</td>
<td>0.854</td>
</tr>
<tr>
<td>5</td>
<td>Number of irrigations during season</td>
<td>1.16</td>
<td>1.15</td>
<td>0.53</td>
<td>0.22</td>
<td>0.829</td>
</tr>
<tr>
<td>6</td>
<td>Time of resowing</td>
<td>2.07</td>
<td>2.23</td>
<td>0.59</td>
<td>-2.33</td>
<td>*0.022</td>
</tr>
<tr>
<td>7</td>
<td>Time of thinning</td>
<td>1.53</td>
<td>1.73</td>
<td>0.85</td>
<td>-2.03</td>
<td>*0.046</td>
</tr>
<tr>
<td>8</td>
<td>Number of pants after thinning</td>
<td>1.80</td>
<td>1.57</td>
<td>0.89</td>
<td>2.20</td>
<td>*0.031</td>
</tr>
<tr>
<td>9</td>
<td>Dose of urea applied</td>
<td>1.99</td>
<td>1.88</td>
<td>0.39</td>
<td>2.38</td>
<td>*0.020</td>
</tr>
<tr>
<td>10</td>
<td>Time of urea fertilizer application</td>
<td>2.59</td>
<td>2.76</td>
<td>0.45</td>
<td>-3.36</td>
<td>**0.001</td>
</tr>
<tr>
<td>11</td>
<td>Irrigation after fertilizer</td>
<td>1.08</td>
<td>0.99</td>
<td>0.29</td>
<td>2.76</td>
<td>**0.007</td>
</tr>
<tr>
<td>12</td>
<td>Methods of urea fertilizer application</td>
<td>2.96</td>
<td>2.88</td>
<td>0.46</td>
<td>1.51</td>
<td>0.135</td>
</tr>
<tr>
<td>13</td>
<td>Time of green ridging operation</td>
<td>1.80</td>
<td>1.79</td>
<td>0.69</td>
<td>0.168</td>
<td>0.867</td>
</tr>
<tr>
<td>14</td>
<td>Herbicide application</td>
<td>0.76</td>
<td>0.92</td>
<td>0.49</td>
<td>-2.80</td>
<td>**0.006</td>
</tr>
<tr>
<td>15</td>
<td>Specific kind of herbicide</td>
<td>0.80</td>
<td>0.96</td>
<td>0.57</td>
<td>-2.43</td>
<td>*0.018</td>
</tr>
<tr>
<td>16</td>
<td>Quantity of herbicide applied</td>
<td>1.52</td>
<td>1.84</td>
<td>0.93</td>
<td>-2.97</td>
<td>**0.004</td>
</tr>
<tr>
<td>17</td>
<td>Time of herbicide application</td>
<td>2.28</td>
<td>2.76</td>
<td>1.48</td>
<td>-2.80</td>
<td>**0.006</td>
</tr>
<tr>
<td>18</td>
<td>Numbers of picking</td>
<td>1.03</td>
<td>1.12</td>
<td>0.37</td>
<td>2.16</td>
<td>*0.034</td>
</tr>
<tr>
<td>19</td>
<td>Picking intervals</td>
<td>1.55</td>
<td>1.52</td>
<td>0.46</td>
<td>0.497</td>
<td>0.620</td>
</tr>
</tbody>
</table>


**Significant at the probability level of 0.01

*Significant at the probability level of 0.05
Table (30) shows that there is a significant difference between the respondents means in adoption of the cotton cultural practices of the insured farmers in (W. Shair) in two seasons of insurance (2002/2003 and 2003/2004). In the following variable of: sowing date, time of resowing, time of thinning, number of plants after thinning, dose of urea applied, time of urea fertilizer application, irrigation after fertilizer, herbicide application, specific kind of herbicide, quantity of herbicide applied, time of herbicide application, and number of pickings.

There is no significant difference in the mean values of the following variables. In number of seed per hole, spacing between plants, irrigation intervals, number of irrigations during the season, methods of urea fertilizer application, time of green ridging operation, and picking intervals. Also the table show that the means of insured farmers in (W. Shair) in first season were higher than the means in second season in terms of sowing date, time of resowing, time of thinning, time of urea fertilizer application, herbicide application, specific kind of herbicide, quantity of herbicide applied, time of herbicide application, and number of pickings. While the means of insured farmers in (W. Shair) in second season were higher than the means in first season in terms of number of plants after thinning, dose of urea applied, and irrigation after fertilizer.
Table: (31)

**T- test comparison of mean by adoption of cotton cultural practices of the insured farmers in (El. Huda Group) after and before insurance in seasons 2003/2004 and 2002/2003**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sowing date</td>
<td>1.35</td>
<td>1.31</td>
<td>0.65</td>
<td>0.54</td>
<td>0.593</td>
</tr>
<tr>
<td>3</td>
<td>Irrigation intervals</td>
<td>1.21</td>
<td>1.19</td>
<td>0.61</td>
<td>0.38</td>
<td>0.708</td>
</tr>
<tr>
<td>4</td>
<td>Number of irrigations during season</td>
<td>1.11</td>
<td>1.09</td>
<td>0.65</td>
<td>0.26</td>
<td>0.798</td>
</tr>
<tr>
<td>5</td>
<td>Time of resowing</td>
<td>2.21</td>
<td>1.97</td>
<td>0.87</td>
<td>2.40</td>
<td>*0.019</td>
</tr>
<tr>
<td>6</td>
<td>Time of thinning</td>
<td>1.55</td>
<td>1.43</td>
<td>0.88</td>
<td>1.18</td>
<td>0.244</td>
</tr>
<tr>
<td>7</td>
<td>Number of pants after thinning</td>
<td>1.51</td>
<td>1.55</td>
<td>0.92</td>
<td>-0.38</td>
<td>0.708</td>
</tr>
<tr>
<td>8</td>
<td>Dose of urea applied</td>
<td>1.88</td>
<td>1.72</td>
<td>0.62</td>
<td>2.25</td>
<td>*0.027</td>
</tr>
<tr>
<td>9</td>
<td>Time of urea fertilizer application</td>
<td>2.52</td>
<td>2.59</td>
<td>0.70</td>
<td>0.82</td>
<td>0.415</td>
</tr>
<tr>
<td>10</td>
<td>Methods of urea fertilizer application</td>
<td>2.96</td>
<td>2.80</td>
<td>0.57</td>
<td>2.43</td>
<td>*0.018</td>
</tr>
<tr>
<td>11</td>
<td>Time of green ridging operation</td>
<td>1.80</td>
<td>1.68</td>
<td>0.52</td>
<td>2.00</td>
<td>*0.049</td>
</tr>
<tr>
<td>12</td>
<td>Herbicide application</td>
<td>0.89</td>
<td>0.77</td>
<td>0.52</td>
<td>2.00</td>
<td>*0.049</td>
</tr>
<tr>
<td>13</td>
<td>Specific kind of herbicide</td>
<td>0.95</td>
<td>0.83</td>
<td>0.66</td>
<td>1.58</td>
<td>0.118</td>
</tr>
<tr>
<td>14</td>
<td>Quantity of herbicide applied</td>
<td>1.79</td>
<td>1.55</td>
<td>1.04</td>
<td>2.00</td>
<td>*0.049</td>
</tr>
<tr>
<td>15</td>
<td>Time of herbicide application</td>
<td>2.64</td>
<td>2.28</td>
<td>1.56</td>
<td>2.00</td>
<td>*0.049</td>
</tr>
<tr>
<td>16</td>
<td>Methods of herbicide application</td>
<td>3.57</td>
<td>3.09</td>
<td>1.97</td>
<td>2.11</td>
<td>*0.038</td>
</tr>
<tr>
<td>17</td>
<td>Kind of seed dressing</td>
<td>1.09</td>
<td>1.04</td>
<td>0.23</td>
<td>2.04</td>
<td>*0.045</td>
</tr>
<tr>
<td>18</td>
<td>Number of pickings</td>
<td>1.07</td>
<td>1.04</td>
<td>0.33</td>
<td>0.705</td>
<td>0.483</td>
</tr>
<tr>
<td>19</td>
<td>Picking intervals</td>
<td>1.35</td>
<td>1.36</td>
<td>0.42</td>
<td>-0.276</td>
<td>0.784</td>
</tr>
</tbody>
</table>

**Source:** Computed from data collected from El. Huda Group in seasons (2002/2003 and 2003/2004)

**Significant at the probability level of 0.01**

*Significant at the probability level of 0.05
Table (31) shows that there is a significant difference between the respondents means in a (El. Huda group) before and after insurance in seasons 2002/2003 and 2003/2004. In the following variables of time of resowing, dose of urea applied, methods of urea fertilizer application, time of green ridging operation, herbicide application, quantity of herbicide application, time of herbicide application, methods of herbicide application, and kind of seed dressing.

There is no significant difference in the mean values in the following variables of. Sowing date, irrigation intervals, number of irrigations during season, time of thinning, number of plants after thinning, time of urea fertilizer application, specific kind of herbicide, numbers of pickings and picking intervals.

The table shows that the means of insured farmers in (El. Huda Group) after insurance were higher than the means of uninsured farmers before insurance. In terms of time of resowing, dose of urea applied, methods of urea fertilizer application, time of green ridging operation, herbicide application, quantity of herbicide applied, time of herbicide application, methods of herbicide application, and kind of seed dressing.
### 4.2.2 Correlation analysis of socio-economic characteristic of the insured farmers on the cotton cultural practices

Table (32)

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Variables (1)</th>
<th>Variables (2)</th>
<th>Pearson correlation</th>
<th>Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Farm size of cotton</td>
<td>(1)</td>
<td>0.221</td>
<td>0.007**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2)</td>
<td>0.210</td>
<td>0.010*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3)</td>
<td>0.079</td>
<td>0.338</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4)</td>
<td>0.792</td>
<td>0.016*</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>(5)</td>
<td>0.016</td>
<td>0.024*</td>
</tr>
<tr>
<td></td>
<td>Age groups</td>
<td>(1)</td>
<td>-162</td>
<td>0.047*</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>(2)</td>
<td>0.080</td>
<td>0.332</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3)</td>
<td>-0.032</td>
<td>0.701</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4)</td>
<td>-0.022</td>
<td>0.792</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(5)</td>
<td>0.092</td>
<td>0.263</td>
</tr>
<tr>
<td></td>
<td>Years of formal education</td>
<td>(1)</td>
<td>0.230</td>
<td>0.005**</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>(2)</td>
<td>0.188</td>
<td>0.022*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3)</td>
<td>0.175</td>
<td>0.032*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4)</td>
<td>0.166</td>
<td>0.042*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(5)</td>
<td>-0.042</td>
<td>0.612</td>
</tr>
<tr>
<td></td>
<td>Family size</td>
<td>(1)</td>
<td>0.175</td>
<td>0.032*</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>(2)</td>
<td>0.002</td>
<td>0.983</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3)</td>
<td>-0.092</td>
<td>0.262</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4)</td>
<td>0.180</td>
<td>0.028*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(5)</td>
<td>0.024</td>
<td>0.775</td>
</tr>
<tr>
<td></td>
<td>Years of experience in agriculture</td>
<td>(1)</td>
<td>-0.201</td>
<td>0.014*</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>(2)</td>
<td>-0.165</td>
<td>0.044*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3)</td>
<td>-0.058</td>
<td>0.479</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4)</td>
<td>-0.031</td>
<td>0.708</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(5)</td>
<td>0.102</td>
<td>0.215</td>
</tr>
<tr>
<td></td>
<td>Membership in social organization</td>
<td>(1)</td>
<td>0.160</td>
<td>0.05*</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>(2)</td>
<td>0.164</td>
<td>0.044*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3)</td>
<td>0.019</td>
<td>0.814</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4)</td>
<td>0.174</td>
<td>0.033*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(5)</td>
<td>-0.055</td>
<td>0.502</td>
</tr>
</tbody>
</table>


**Correlation is significant at the 0.01 level**

* Correlation is significant at the 0.05 level

(1) Sowing date (2) Time of resowing
(3) Time of thinning (4) Time of urea fertilizer application
(5) Number of pickings

Table (32) is shows the degree of correlation of selected some socio-economic characteristics of farmers, Farm size of cotton, Age groups, Years of formal education, Family size, Years of experience in agriculture, and Membership in social organizations, on some of the selected cotton cultural practices of the insured farmers (Sowing date, Time of resowing, Time of Thinning, Time of urea fertilizer application, and Number of pickings).

**Item (1)**
Farm size of cotton is highly significant and positively correlated with sowing date at a level of sig. of 0.007.
Farm size of cotton is significant and positively correlated with time of resowing at a level of sig. of 0.010.
Farm size of cotton is insignificant and not correlated with time of thinning at a level of sig. of 0.338.
Farm size of cotton is significant and positively correlated with time of urea fertilizer application at a level of sig. of 0.016.
Farm size of cotton is significant and positively correlated with number of pickings at a level of sig. of 0.024.

**Item (2)**
Age groups are significant and negatively correlated with sowing date at a level of sig. of 0.047.
Age groups are insignificant and not correlated with time of resowing at a level of sig. of 0.332.
Age groups are insignificant and not correlated with time of thinning at a level of sig. of 0.701.
Age groups are insignificant and not correlated with time of of urea fertilizer application at a level of sig.0.792.
Age groups are insignificant and not correlated with number of pickings at a level of sig. of 0.263.

**Item (3)**
Years of formal education are highly significant and positively correlated with sowing date at a level of sig. of 0.005.
Years of formal education are significant and positively correlated with time of resowing at a level of sig. of 0.022.
Years of formal education are significant and positively correlated with time of thinning at a level of sig. of 0.032.
Years of formal education are significant and positively correlated with time of urea fertilizer application at a level of sig. of 0.042.
Years of formal education are insignificant and no correlated with number of pickings at a level of sig. of 0.612.

**Item (4)**
Family size was significant and positively correlated with sowing date at a level of sig. of 0.032.
Family size was insignificant and not correlated with time of resowing at a level of sig. of 0.983.
Family size was insignificant not correlated with time of thinning at a level of sig. of 0.262.
Family size was significant and positively correlated with time of urea fertilizer application at a level of sig. of 0.028.
Family size was insignificant and not correlated with number of pickings at a level of sig. of 0.775.

**Item (5)**
Years of experience in agriculture are significant and negatively correlated with sowing date at a level of sig. of 0.014.
Years of experience in agriculture are significant and negatively correlated with time of resowing at a level of sig. of 0.044.
Years of experience in agriculture are insignificant and not correlated with time of thinning at a level of sig. of 0.479.

Years of experience in agriculture are insignificant and not correlated with time of urea fertilizer application at a level of sig. of 0.708.

Years of experience in agriculture are insignificant and not correlated with number of pickings at a level of sig. of 0.215.

**Item (6)**

Membership in social organizations is significant and positively correlated with sowing date at a level of sig. of 0.05.

Membership in social organizations is significant and positively correlated with time of resowing at a level of sig. of 0.044.

Membership in social organizations is insignificant and not correlated with time of thinning at a level of sig. of 0.814.

Membership in social organizations is significant and positively correlated with time of urea fertilizer application at a level of sig. of 0.033.

Membership in social organizations is insignificant and not correlated with number of pickings at a level of sig. of 0.502.
4.2.3 Chi-square test:

4.2.3.1 Chi-square test of productivity for cotton crop by adopting of insurance policy:

Table (33)

**Chi-square test of cotton productivity by adopting agricultural insurance by the farmers in W. Shair Group**

<table>
<thead>
<tr>
<th>Productivity (kan./fed.)</th>
<th>Insured farmers</th>
<th>Uninsured farmers</th>
<th>Total</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W. Shair (after)</td>
<td>W. Shair (before)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 4</td>
<td>5 (3.3%)</td>
<td>12 (8.0%)</td>
<td>17</td>
<td>(11.3%)</td>
</tr>
<tr>
<td>Above 4 - 6</td>
<td>22 (14.7%)</td>
<td>30 (20.0%)</td>
<td>52</td>
<td>(34.7%)</td>
</tr>
<tr>
<td>Above 6 - 8</td>
<td>24 (16.0%)</td>
<td>26 (17.3%)</td>
<td>50</td>
<td>(33.3%)</td>
</tr>
<tr>
<td></td>
<td>*0.008</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Above 8 - 10</td>
<td>18 (12.0%)</td>
<td>6 (4.0%)</td>
<td>24</td>
<td>(16.0%)</td>
</tr>
<tr>
<td>Above 10</td>
<td>6 (4.0%)</td>
<td>1 (0.7)</td>
<td>7</td>
<td>(4.7%)</td>
</tr>
<tr>
<td>Total</td>
<td>75 (50.0%)</td>
<td>75 (50.0%)</td>
<td>150</td>
<td>100.0</td>
</tr>
</tbody>
</table>

**Source:** Computed from data collected from W. Shair pre and after insurance in Seasons (2002/2003 and 2003/2004)

Chi-square value of 13.8 with degree of freedom 4

Table (33) shows that the cotton productivity was highly significantly dependent on the agricultural insurance in (W.Shair Group) after and before insurance at a level of significance of 0.008.
Chi -square test of cotton productivity by adopting agricultural insurance by the farmers in El. Huda Group

<table>
<thead>
<tr>
<th>Productivity (kan./fed.)</th>
<th>Insured farmers</th>
<th>Uninsured farmers</th>
<th>Total</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>El. Huda (after)</td>
<td>El. Huda (before)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 4</td>
<td>28 (18.7%)</td>
<td>20 (13.3%)</td>
<td>48    (32.0%)</td>
<td></td>
</tr>
<tr>
<td>6 –Above 4</td>
<td>26 (17.3%)</td>
<td>23 (15.3%)</td>
<td>49    (32.7%)</td>
<td></td>
</tr>
<tr>
<td>8 –Above 6</td>
<td>16 (10.7%)</td>
<td>20 (13.3%)</td>
<td>36    (24.0%)</td>
<td></td>
</tr>
<tr>
<td>Above 8 - 10</td>
<td>2 (1.3%)</td>
<td>9 (6.0%)</td>
<td>11    (7.3%)</td>
<td></td>
</tr>
<tr>
<td>Above 10</td>
<td>3 (2.0%)</td>
<td>3 (2.0%)</td>
<td>6     (4.0%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>75 (50.0%)</td>
<td>75 (50.0%)</td>
<td>150   (100.0%)</td>
<td></td>
</tr>
</tbody>
</table>


Chi-square value 6.4 of with degree of freedom 4

Table (34) shows that the cotton productivity was not significantly dependent on agricultural insurance in (El. Huda Group) before and after insurance at a level of significance of 0.170
4.2.3.2 Chi-square test of net return for cotton crop by adopting of insurance policy:

Table (35)

Chi-square test of cotton net return by adopting agricultural insurance by the farmers in W. Shair Group

<table>
<thead>
<tr>
<th>Cotton return in (s. d./fed.)</th>
<th>Insured farmers</th>
<th>Uninsured farmers</th>
<th>Total</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W.Shair (after)</td>
<td>W.Shair (before)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less Than 5000</td>
<td>2 (1.3%)</td>
<td>14 (9.3%)</td>
<td>16   (10.7%)</td>
<td></td>
</tr>
<tr>
<td>&gt;5000 Up to 25000</td>
<td>10 (6.7%)</td>
<td>10 (6.7%)</td>
<td>20   (13.3%)</td>
<td></td>
</tr>
<tr>
<td>&gt;25000 Up to 45000</td>
<td>11 (7.3%)</td>
<td>17 (11.3%)</td>
<td>28   (18.7%)</td>
<td></td>
</tr>
<tr>
<td>&gt;45000 Up to 65000</td>
<td>14 (9.3%)</td>
<td>10 (6.7%)</td>
<td>24   (16.0%)</td>
<td>*0.021</td>
</tr>
<tr>
<td>&gt;65000 Up to 85000</td>
<td>17 (11.3%)</td>
<td>10 (6.7%)</td>
<td>27   (18.0%)</td>
<td></td>
</tr>
<tr>
<td>&gt;85000 Up to 105000</td>
<td>12 (8.0%)</td>
<td>5 (3.3%)</td>
<td>17   (11.3%)</td>
<td></td>
</tr>
<tr>
<td>&gt;105000 Up to 125000</td>
<td>3 (2.0%)</td>
<td>5 (3.3%)</td>
<td>8    (5.3%)</td>
<td></td>
</tr>
<tr>
<td>More than 125000</td>
<td>6 (4.0%)</td>
<td>4 (2.7%)</td>
<td>10   (6.7%)</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>75 50.0%</strong></td>
<td><strong>75 50.0%</strong></td>
<td><strong>150 100.0%</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Source:** Computed from data collected from W.Shair Group in Seasons (2002/2003 and 2003 / 2004)

Chi-square value of 16.6 with degree of freedom 7

Table (35) shows that the cotton net return was significantly dependent on agricultural insurance in W.Shair Group before and after insurance at a level of significance of 0.021.
**Table (36)**

**Chi-square test of cotton net return by adopting agricultural insurance by the farmers in El. Huda Group**

<table>
<thead>
<tr>
<th>Cotton return in (s.d./fed.)</th>
<th>Insured farmers</th>
<th>Uninsured farmers</th>
<th>Total</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>El. Huda (After)</td>
<td>El. Huda (before)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less Than 5000</td>
<td>25 (16.7%)</td>
<td>13 (8.7%)</td>
<td>38</td>
<td>0.327</td>
</tr>
<tr>
<td>&gt;=5000 Up to 25000</td>
<td>15 (10.0%)</td>
<td>19 (12.7%)</td>
<td>34</td>
<td>0.327</td>
</tr>
<tr>
<td>&gt;=25000 Up to 45000</td>
<td>14 (9.3%)</td>
<td>17 (11.3%)</td>
<td>31</td>
<td>0.327</td>
</tr>
<tr>
<td>&gt;=45000 Up to 65000</td>
<td>13 (8.7%)</td>
<td>12 (8.0%)</td>
<td>25</td>
<td>0.327</td>
</tr>
<tr>
<td>&gt;=65000 Up to 85000</td>
<td>4 (2.7%)</td>
<td>3 (2.0%)</td>
<td>7</td>
<td>0.327</td>
</tr>
<tr>
<td>&gt;=85000 Up to 105000</td>
<td>1 (0.7%)</td>
<td>3 (2.0%)</td>
<td>4</td>
<td>0.327</td>
</tr>
<tr>
<td>&gt;=105000 Up to 125000</td>
<td>1 (0.7%)</td>
<td>2 (1.3%)</td>
<td>3</td>
<td>0.327</td>
</tr>
<tr>
<td>More than 125000</td>
<td>2 (1.3%)</td>
<td>6 (4.0%)</td>
<td>8</td>
<td>0.327</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>75 50.0%</strong></td>
<td><strong>75 50.0%</strong></td>
<td><strong>150 100.0%</strong></td>
<td></td>
</tr>
</tbody>
</table>


Chi-square value of 8.1 with degree of freedom 7

Table (36) shows that the cotton net return was not significantly dependent on agricultural insurance in (El. Huda Group) before and after insurance at a level of significance of 0.327.
4.2.4  $t$ - test comparison of mean of cotton productivity to the farmers in (W. Shair Group) in two seasons of insurance

Table (37)

$t$ - test comparison of mean of cotton productivity to the farmers in (W. Shair Group) in two seasons of insurance

<table>
<thead>
<tr>
<th>Categories</th>
<th>Std. Deviation</th>
<th>$T$-test</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insured Farmers (2002/2003) M. Value 2.97</td>
<td>1.16</td>
<td>7.450</td>
<td>*0.000</td>
</tr>
<tr>
<td>N =75</td>
<td>N =75</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Table (37) shows that there is difference between the means of cotton productivity (in kan. per fed.) of the insured farmers in (W. Shair Group) in Seasons (2002/2003 and 2003/2004) the difference was significant at the level of the *0.000 t. value of 7.450 with degree of freedom 74.

4.2.6  $t$ - test comparison of mean of cotton net return to the Farmers in (W. Shair Group) two seasons of insurance

Table (38)

$T$ - test comparison of mean of cotton net return to the farmers in (W. Shair Group) two seasons of insurance

<table>
<thead>
<tr>
<th>Categories</th>
<th>Std. Deviation</th>
<th>T-test</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insured Farmers (2002/2003) M. Value 4.49</td>
<td>1.81</td>
<td>4.917</td>
<td>*0.000</td>
</tr>
<tr>
<td>N =75</td>
<td>N =75</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Table (38) shows that there is difference between the means of cotton net return in (S.D per fed.) of the insured farmers in (W. Shair Group) in Seasons (2002/2003 and 2003/2004) the difference was significant at the level of the *0.000 t. value of 4.917 with degree of freedom 74.
4.2.6 Test of scoring technique of attitude and behavior of the insured farmers toward cotton crop insurance

Table (39)

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Type of contribution</th>
<th>No. of respondents</th>
<th>Range</th>
<th>Min.</th>
<th>Max.</th>
<th>Mean</th>
<th>S.d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>To get the benefits</td>
<td>145</td>
<td>2</td>
<td>-1</td>
<td>3</td>
<td>1.62</td>
<td>1.16</td>
</tr>
<tr>
<td>2.</td>
<td>To protect against risk and catastrophes</td>
<td>&quot;</td>
<td>2</td>
<td>-1</td>
<td>3</td>
<td>1.58</td>
<td>1.04</td>
</tr>
<tr>
<td>3.</td>
<td>To solve the problems related to irrigation</td>
<td>&quot;</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>1.35</td>
<td>1.47</td>
</tr>
<tr>
<td>4.</td>
<td>To solve the problems related to credit</td>
<td>&quot;</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>1.11</td>
<td>1.48</td>
</tr>
<tr>
<td>5.</td>
<td>To solve the problems related to input</td>
<td>&quot;</td>
<td>4</td>
<td>0</td>
<td>4</td>
<td>0.88</td>
<td>1.38</td>
</tr>
</tbody>
</table>


Based on the scoring technique, the groups with mean score of more than 2.5 were classified as a good level, groups with mean score in the range of (1.5 - 2.5) were considered as average level and groups, which had a mean score less than 1.5, were considered as low-level score.

Item (1) and (2) in table (39) show that they were measured in terms of a score ranging from (-1 to 3), not substantial at all, not substantial, less substantial, substantial, very substantial. Item (2) No protection at all, No protection, provide less protection, provide protection, provide more protection regarding the four alternatives given to the respondents to select the one, which is more suitable for them. Both item (1) and (2) had an average level scored 1.62, and 1.58 respectively.

Item (3), (4) and (5) in Table (49) show that they were measured in terms of a score ranging from (0 to 4) no contribution, very low contributions, low contribution, high contributions, very high contributions. The respondents in item (3), (4) and (5) have the low level scored of 1.35, 1.11 and 0.88 respectively.
Chapter Five

Summary, finding of results, conclusion and recommendations

5.1 Summary:
The main objectives of this study were to assess the impact of agricultural insurance on the rate of adoption of technical packages of cotton crop, and the effect of agricultural insurance on cotton productivity and net return. Finally, to assess the attitude and behavior of the farmers towards cotton crop insurance.

The study hypothesized that:
1- Insurance of cotton has no significant effect on adoption of recommended cotton cultural practices, productivity, and net return.
2- Socio-economic characteristics were not correlated with some of the cotton cultural practices.
3- Holding of farmers to agricultural insurance for the cotton crop, contributes to their benefits, protection the farmers against risk and catastrophe, and solving problems related to irrigation, credit, and input.

Field survey was utilized as research method; selecting three villages represent each of the two Groups using a stratified sampling technique. Farmers from each village were selected by a random sampling procedure; a questionnaire consisting (55) questions. The data were analyzed and presented. Testing of hypotheses of the study using frequencies, percentages, and test of significance including (t. test, Chi-square test, correlation and scoring techniques).

5.2 Finding of results:

5.2.1 On frequencies:

5.2.1.1 Socio-economic characteristics of the farmers

The study show that:
- (47.3%) of the farmers have a farm size of 2.5 to 4 feddans.
-(46.7%) of the sample are above 50 years old.
-(40.7%) of the farmers had only one to four years of formal education, and only eight percent were illiterate.
-As many as (46.0%) of the farmers have medium family size, ranging between 5-8 individual.
-All farmers have years of experience in agriculture is ranging between (18.0-22.0) years.
-About 58.7% of the sample has membership in social organizations.

5.2.1.2 The cultural practices in which both insured and uninsured farmers scored similar rates of adoption for cotton as follow:

-All farmers (insured and uninsured) adopted the recommended time of first irrigation for cotton at a high rate of adoption.
-All farmers (insured and uninsured) adopted both the recommended number of irrigations during season for cotton and irrigation intervals at a low rate of adoption. All farmers mentioned heavy rainfall, as the first reason of not implementing the number of irrigations while second reason was shortage of irrigation water in the canal.
-All farmers (insured and uninsured) indicated that the reasons of not implementing the time of resowing for cotton where germination of seeds was good, availability of water, no logging and flooding, no damage by soil pest, good land preparation.
-All farmers (insured and uninsured) had a low rate of adoption of the recommended time of thinning and some of them believed that the cotton plant did not need thinning.
-All farmers (insured and uninsured) fully adopted the recommended specific kind of urea fertilizer for cotton. Within those of uninsured farmers, a small percentage applied phosphorous beside nitrogen. All farmers adopted the recommended dose of urea fertilizer at a high rate. Some farmers applied lower dose of urea apart than the recommended rate.
and sold the rest of the fertilizer commercially. The adoption rate of recommended irrigation after fertilizer application, was high for all farmers, and all farmers had a high rate of adoption of the recommended methods of urea fertilizer application.

- All farmers (insured and uninsured) adopted the recommended number of (Tagnats and Gadwals) for cotton at a high rate.

- Very few numbers of farmers knew the recommended kind of herbicide for cotton, and no one of the farmers knew the recommended quantity of herbicide, but all farmers were aware of the recommended time of herbicide application, and knew the recommended methods of herbicide application.

- The adoption of the recommended seed dressing application for cotton was high by the farmers but the farmers lacked the knowledge about the recommended kind of seed dressing).

- All farmers (insured and uninsured) applied the recommended insecticide for cotton and a large numbers of the farmers did not know the recommended kind of insecticide applied. No one of the farmers knew the recommended dose of insecticide applied, and very few farmers knew the recommended time of insecticide application. All farmers knew the recommended methods of insecticide applications.

- Adopting the recommended number of pickings and picking intervals were low for all farmers, while the adoption of irrigation after picking was high for all farmers.

5.2.1.3 The following summaries the rate of adoption among the insured farmers of cotton cultural practices in W. Shair after two seasons of insurance 2002/2003 and 2003/2004:

- The insured farmers in first season adopted the recommended sowing date for cotton at a higher rate than in the second season in (W. Shair) (70.7% compared to 54.7%).
- The insured farmers in second season adopted the recommended number of seeds per hole for cotton at a higher rate than in the first season in (W. Shair) (62.7% compared to 60.0%).
- In the second season of insurance, the insured farmers reported a higher rate of adoption the spacing between plants than in the first season in W.Shair (70.7% compared to 65.3).
- The insured farmers in first season adopted the recommended time of resowing for cotton at a higher rate than in the second season in (W. Shair) (77.3 compared to 74.7%).
- The insured farmers in the first season adopted the recommended time of thinning for cotton at a higher rate than in the second season in (W. Shair) (41.3 % compared to 37.3 %).
- In the second season of insurance, the insured farmers reported a higher rate of adoption the number of plants after thinning than in the first season in W.Shair (84.0% compared to 73.3).
- The insured farmers in the first season had a higher rate of adoption of the recommended time of urea fertilizer application for cotton than in the second season of insurance in (W. Shair) (70.7 % compared to 58.7%).
- In the second season of insurance, the insured farmers adopted the recommended time of green ridging operation for cotton at a higher rate than in the first season of insurance in W.Shair (72.0% compared to 70.7).
- The insured farmers in the second season had a lower rate of adopting the recommended herbicide application for cotton than in the first season in (W. Shair) (76.0% compared to 92.0%).
5.2.1.4 The following summarizes the rate of adoption of cotton cultural practices in El. Huda before and after insurance in seasons 2002/2003 and 2003/2004:

- The insured farmers adopted the recommended sowing date for cotton at a higher rate than the uninsured farmers for cotton in (El. Huda Group) (34.7% compared to 30.7%).

- Both the uninsured farmers and the insured adopted the recommended number of seeds per hole for cotton by the same percentage before and after the insurance in (El. Huda Group) (76.0%).

- Both the uninsured farmers and the insured adopted the recommended spacing between plants for cotton by the same percentage before and after the insurance (53.3%).

- The uninsured farmers adopted the recommended time of resowing for cotton at a lower rate than the insured farmers in (El. Huda Group) (62.7% compared to 68.0%).

- The insured farmers adopted the recommended time of thinning for cotton at a higher rate than the uninsured farmers in (El. Huda Group) (38.7% compared to 26.7%).

- The insured farmers adopted the recommended number of plants after thinning for cotton at a higher rate than the uninsured farmers in (El. Huda Group) (65.3% compared to 62.7%).

- The insured farmers adopted the recommended time of urea fertilizer application for cotton at a higher rate than the uninsured farmers in (El. Huda Group) (52.0% compared to 48.0%).

- The uninsured farmers adopted the recommended time of green ridging operation at a lower rate than the insured farmers for cotton in (El. Huda Group) (65.3% compared to 72.0%).
The uninsured farmers adopted the recommended time of herbicide application at a lower rate than the insured farmers for cotton in (El. Huda Group) (77.3% compared to 89.3%).

5.2.1.5 Distribution of farmers by cotton productivity:

- W. Shair Group after and before insurance in Seasons 2002/2003 and 2001/2002, the insured farmers in the season of insurance recorded higher productivity kan./fed. in comparison with the same farmers before insurance.

- In El. Huda Group after and before insurance in Seasons 2003/2004 and 2002/2003, the uninsured farmers recorded higher productivity kan./fed. in comparison with the insured farmers.

- In W. Shair Group in two insured Seasons 2002/2003 and 2003/2004 respectively, insured farmers in the first season maintained high productivity kan./fed. in contrast the result with the second season.

- The major reasons for the lower productivity in the season (2003/2004) was disease attack the cotton crop whereas 22.6% of the farmers cited, drought as reason of low productivity.

5.2.1.6 Distribution of farmers by cotton net return

- In W. Shair Group after and before insurance in Seasons 2002/2003 and 2001/2002, the insured farmers scored higher percentages with higher brackets of net return (45.000 -125.000) S.D / Fed. Except at the higher level of net return (105.000 to 125.000), where the uninsured farmers scored 6.7% and the insured farmers scored 4%, respectively. The result showed that the insured farmers obtain more net return than uninsured.

- In (El. Huda) Group after and before insurance in Seasons 2003/2004 and 2002/2003. The uninsured farmers scored higher percentages at higher brackets of net return ranging (85.000 to more than 125.000) S.D / Fed. than the insured farmers.
-In W. Shair Group in two insured Seasons 2002/2003 and 2003/2004 respectively the insured farmers in (W. Shair Group) scored higher net returns in the first season of insurance compared to the second season of insurance with higher percentage in the net return brackets (65.000 up to 125.000) S.D / Fed.

5.2.1.7 Attitude and behavior of the insured farmers toward cotton crop insurance:
- The opinion of the insured farmers regarding awareness of cotton crop insurance is favorable since about 54.7% expressed adequate awareness.
- Forty percent of the insured farmers mentioned avoiding risks as the reason for adopting cotton crop insurance.
- Most of the insured farmers depended on the insurance officer, field inspector, farmers branch union and the radio for obtaining their agricultural information.
- About (71.4%) of the insured farmers, got substantial benefits from cotton crop insurance.
- About 77.4% of the insured farmers trusted the protection offered to them by the cotton crop insurance coverage.
- About 69.9% of the insured farmers stated that, the insurer contributed to solving the irrigation problems.
- Only 37.4% of the insured farmers received contributions, which helped in solving their credit problems.
- Thirty percent of the insured farmers received contributions for solving their input problems.
- About 40.0% of the insured farmers received extension services.
- The major problem facing cotton crop insurance is the high premium. About 22.0% of the insured farmers who complained about the annual premium paid, stated, that it is costly and 20.0% said they lack awareness about agricultural insurance.
-(87.3%) of the majority of the farmers were willing to participate in the next season of cotton crop insurance program.

5.2.2 On test of significances:

5.2.2.1 T-test comparison of mean by adoption of cotton cultural practices

-There is a significant difference between the respondents means in adoption of the cotton cultural practices between the insured farmers in W. Shair in two Seasons of insurance (2002/2003 and 2003/2004). In the following variables of sowing date, time of resowing, time of thinning, number of plants after thinning, dose of urea applied, time of urea fertilizer application, irrigation after fertilizer application, herbicide application, specific kind of herbicide, quantity of herbicide applied, time of herbicide application, and number of pickings.
There is no significant difference in the mean values of the variables. In number of seeds per hole, spacing between plants, irrigation intervals, number of irrigations during the season, methods of urea fertilizer application, time of green ridging operation, and picking intervals.

-There is a significant difference between the respondents means in adoption of the cotton cultural practices between the insured and the uninsured farmers in El. Huda group Seasons 2002/2003 and 2003/2004. In the following variables, time of resowing, dose of urea applied, method of urea fertilizer application, time of green ridging operation, herbicide application, quantity of herbicide applied, time of herbicide application, methods of herbicide application, and kind of seed dressing.
There is no significant difference in the mean values of the variables. In sowing date, irrigation intervals, number of irrigations during the season, time of thinning, number of plants after thinning, time of urea fertilizer application, specific kind of herbicide, number of pickings and picking intervals.
5.2.2.2 Correlation:
-Farm size of cotton is highly significant and positively correlated with sowing date, time of resowing, and significant and positively correlated with time of urea fertilizer application, number of pickings, and insignificant not correlated with time of thinning.
-The age groups are significantly and negatively correlated with sowing date, and insignificant not correlated with time of resowing, time of thinning, time of urea fertilizer application, and number of pickings.
-The years of formal education are highly significant and positively correlated with sowing date, and significantly and positively correlated with time of resowing, time of thinning, time of urea fertilizer application, and insignificant and not correlated with the number of pickings.
-Family size is significant and positively correlated with sowing date, time of urea fertilizer application, and insignificant not correlated with time of resowing, time of thinning and number of pickings.
-Years of experience in agriculture are significant and negatively correlated with sowing date, time of resowing, and insignificant not correlated with time of thinning, time of urea fertilizer application, and number of pickings.
- Membership in social organizations is significant and positively correlated with sowing date, time of resowing, time of urea fertilizer application, and insignificant not correlated with time of thinning, and number of pickings.

5.2.2.3 Chi-square test:
-The cotton productivity and net return was highly significantly dependent on agricultural insurance in W.Shair Group after and before insurance.
-The cotton productivity and net return was not significantly dependent on agricultural insurance in El. Huda Group after and before insurance.
5.2.2.4 T-test of cotton productivity and net return of the farmers in (W. Shair Group) in two seasons of insurance:

There was significant difference between the mean of cotton productivity and net return of the insured farmers in W. Shair Group two seasons of insurance the mean in first season is more than second season.

5.2.2.5 On test of scoring technique of the attitude and behavior of the insured farmers toward cotton crop insurance

- In contributing to get the benefits the result of scoring technique, the farmers’ gains, the average level of mean scored mean 1.62.
- In contributing to protect the farmers against risk and catastrophes. The result of scoring technique the farmers’ gains the average level scored mean 1.58.
- In contributing to solving problems related to irrigation by the insurer, the result of scoring technique, the farmers’ gains the low level scored mean 1.35.
- In contributing to solving problems related to credit by the insurer, the result of scoring technique, the farmers gains the low level scored 1.11.
- In contributing to solving problems related to inputs by the insurer, the result of scoring technique, the farmers have the low level scored mean 0.88.

5.3 Conclusions:

The agricultural insurance program had a significant impact on the first season of insurance in W.Shair. Productivity during the first season increased as a result of the collective efforts of the insuring company, the Gezira administration and the farmers. In the second season of insurance 2003/2004, the productivity and the net return of cotton declined because of the severe attack of the crop by pests and diseases. (11.3 %) farmers claimed that the pesticides and insecticide used in that season were not
effective, the crop suffered from logging and unavailability of optimal inputs. Some farmers did not adopt the recommended cultural practices that season. (87.3%) of the farmers showed high positive attitude and willingness to subscribe in cotton insurance next season. Farmers showed moderate confidence in the ability of the insurance to help them get benefits and protection against risks, but they showed lower confidence in the insurance ability to contribute to solving problems related to irrigation, credit, inputs and provision to services.

5.4 Recommendations:
Based on the results obtained from the data analysis, the study recommends the following:

5.4.1 General recommendations
Serious emphasis should be given to encourage the farmers to adopt cotton cultural practices because most of them in the Gezira scheme continue to adopt the technical packages of the Akala varities rather than the Barakat varieties in most cultural practices. Strengthening and improvement of the irrigation system to cope with the introduction of the agricultural insurance. Irrigation water should be available and continued at the recommended numbers and intervals between irrigations because the adoption of these recommendations by the farmers are at lower rates due to the insufficient supplies of the irrigation water in the late season and availability of rainfall in the beginning of the season.

Recommendation also indicate that farmers tend to adopt the recommended cultural practices such as time of thinning, number of pickings and picking intervals in a lower rate. Moreover, these recommendations may be major cause of declining in yield as planned, one of the important items for
agricultural insurance would be to encourage farmers to improve their agricultural practices, to give them confidence in adopting new techniques of agriculture that would result in increased production and more farmers return.

It was clear that the majority of the farmers whether insured or uninsured, lacked the knowledge of pesticides application. It was only those farmers who were provided with plant protection operations, were in a position to understand what was associated with pesticides applications. Thus, it is necessary to furnish all farmers with the information regarding pesticides issues, explaining the importance of plant protection, the impact of rational use, and or misused. In addition, orientation of the farmers to the impact of the pesticides on environmental and health issues is extremely important and needed.

It's important to have a link, between Agricultural Research and Technology Corporation and the Agricultural Insurance Company to train the farmers to improve the adoption of the recommended cultural practices of cotton crop.

**5.4.2 Recommendations dealing with agricultural insurance:**
The success or failure of the agricultural insurance in the Gezira scheme, depends on the cooperation of all parties (Insurance company, Gezira administration and Farmers) involved in the program, and to what extent they fulfill their obligations.

It was observed that a large numbers of the insured farmers lacked knowledge about cotton crop insurance and it is therefore important to promote insurance awareness among them so that they may understand the insurance advantages.
Agricultural insurance is a desirable mechanism because it provides farmers with sustained means to protect them against catastrophes, and extraordinary losses caused by natural hazards beyond their control that might rescue them from needing relief.

It is necessary for the insurance company to maintain the sustainability of insurance projects, providing always contributions as required for solving difficult irrigation problems, and to encourage farmers to organize themselves into insurance groups.

The importance and availability of cash credit to the insured farmers is necessary because most farmers are poor and are unable to finance the needed in agricultural inputs and operations. Therefore, if insurance does help farmers to obtain the required credit facilities and create a linkage between the cotton crop insurance and credit, agricultural production can be developed and improved.

Services play a special role in helping to achieve the insurance program. The study therefore recommends continuous provision of all services such as extension, crop protection and reducing risks, which are very essential. Agricultural insurance should, therefore, provide services to farmers.

Farmers should only be compensated for actual crop damage or inputs lost, and not for their failure to achieve target yield. In addition, compensation should be immediate and paid in time to farmers suffering from serious crop losses caused by climatic factors.

The study suggests that the insurer should be developing the types of insurance the farmers want.
The desire of farmers to adopt insurance in the next season, is when farmers feel the benefits of cotton crop insurance and compensation after natural hazards and disasters have effect on the farmers and their economy. This would indicate the positive attitudes of the farmers towards cotton crop insurance policy.

The Extensionist is not an important source of agricultural insurance information. Attention should instead be devoted to promoting better and effective communication with farmers by the Insurance Company and to intensify the use of the available media needed to inform, the farmers e.g. radio and T.V.
References


AFRE CA. RE, (may 2002). Seminar Khartoum

ARM. (December 1995). Crop Insurance pilot project planning Proposal Sheikan insurance and reinsurance company LTD.


Fair seminar on agricultural insurance, (10-15 Nov. 1997). Agricultural insurance in developing countries Havana, Cuba (October 2, 1996) Volume (1) Background Literature National Insurance Academy. 411045 Baner Road Nia Po Pune (India).


Feasibility Study (ARM), (10/07/1996). Sudan Agricultural Insurance Agricultural risk Management (LTD).


Gebauer: Die Sogennante, (1885). lebensversicherung (Jena), quoted by Barou, op. cit, p.17 F.N.


Hamrik Kirk, and et. il (1975), relationship among knowledge beliefs attitudes and behavior. In Nestor, J.P. and J.A.


Insurance statute of, (1601). The first preamble to the first English marine


Mclntosh W.M.A. (1983), Farmers as organizational types, characteristics and their relation to the adoption of farm technology paper presented at the annual meeting of the (USDA) Regional project, NC, 162, St. Lous, Mo


Marija J. N. Norusis The SPSS Guide to data Analysis.


Partner Re Agricultural Services, (2July 2001). Proposal for the design of a cotton insurance policy and implementation planning. Technical Partener Agriculture Partener Re Zurich Branch.


Report of one-man committee (1950), Problems of Crop Insurance under Indian Conditions (Government of India, Ministry of Agriculture, New Delhi,)


Sharma. V.P., Kumar. A., (2000). Factors influencing adoption of agro forestry program: a case study from North-west India Ind. J. Agric. Econ.


Wagner' adolf: Versicherungswesen In Schonberg's Handbuch der politischen Oekonomie, Vol.11 p, 359, as quoted by N.Barou, op.cit.p.12.). Italics are these authors.


مرجع باللغة العربية:


سليمان سيد أحمد السيد، يوليو (2004). نحو تعميم خدمات التأمين الزراعي في السودان مستشار التأمين الزراعي لشركة شيكان للتأمين وإعادة التأمين المحدودة (طبيعة أولي).


عثمان الهادي إبراهيم، (2002). التأمين الزراعي – نظرة تأصيلية مؤتمر اتحاد عام مزارعي السودان المنعقد في الخرطوم (مدير عام شركة شيكان للتأمين وإعادة التأمين المحدودة).


التأمين الزراعي واثره في توجهات المزارعين وتطبيق التوصيات الزراعية والانتاجية والإعداد لمحصول القطن بمشروع الجزيرة (للموسمين 2002/2003 و 2003/2004م)

من فضلك املأ كل البيانات للاستبيان شكرًا لتعاونك معنا

اولًا: البيانات الشخصية:

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س1: هل انت مزارع مؤمن على محصول القطن؟
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س2: ما هي مساحة حواشتكم؟

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س4/ مستوى التعليم:
1/ أمي
2/ خلوة
3/ 1- 4 سنة قبل الجامعة
4/ 5- 8 سنة قبل الجامعة
5/ 9- 12 سنة قبل الجامعة
6/ جامعي
7/ فوق الجامعي

س5/ عدد أفراد الأسرة:
1/ أسرة صغيرة (1- 4)
2/ متوسطة (5- 8)
3/ كبيرة (9 فما فوق)

س6/ عدد السنوات التي عملت بها في الزراعة:
1/ أقل من 10 سنوات
2/ من 10- 20 سنة
3/ من 21- 20 سنة
4/ من 31- 40 سنة
5/ أكثر من 40 سنة

س7/ هل لديك عضوية مع المنظمات الاجتماعية التالية؟
نعم ( ) لا ( )

المنظمة
1. اتحاد المزارعين
2. مجلس إنتاج القرية
3. اللجنة الشعبيّة
4. الجمعيات التعاونية
5. نادي القرية
6. لجان محلية (وضح)
7. لجان إرشادية
8. مجلس الآباء
9. لجنة المسجد
10. أخرى

ش8/ متى قمت بزراعة محصول القطن؟
1/ من 7/10 إلى 7/20
2/ من 7/21 إلى 31/7
3/ من 8/1 إلى 8/10

س9/ كم من البذور رميت في الحفرة الواحدة لمجتمع القطن؟
1/ أقل من 5 بذور في الحفرة
2/ من 5 إلى 7 بذور
س 10 / ما هي المسافة التي تمكنها بين النباتات لمحصول القطن؟
1 / أقل من 50 سم ( )
2 / 50 سم ( )
3 / أكثر من 50 سم ( )

س 11 / متى قمت بالرية الأولى؟
1 / مباشرة بعد الزراعة ( )
2 / بعد أسبوعين من الزراعة ( )
3 / أكثر من ذلك ( )

س 12 / ما هي الفترة بين الريات الأخرى لمحصول القطن؟
1 / أقل من 14 يوم ( )
2 / 14 يوم ( )
3 / أكثر من 14 يوم ( )

س 13 / كم عدد الريات التي قمت بتنفيذها لمحصول القطن؟
1 / أقل من 16 رية ( )
2 / 16 رية ( )
3 / أكثر من 16 رية ( )

س 14 / ما هي أسباب استخدامك لعدد من الريات قليلة؟
1 / توافق نزول الأمطار في وقت الريات الناقصة عن العدد الموسمي ب ( )
2 / عدم توفر المياه في الزراعة ( )
3 / إندلاع أبوستة أو أبوهشرين ( )
4 / لم أرو أي الريات الناقصة بدون أي من الأسباب السابقة ( )

س 15 / متى قمت بالرقعة لمحصول القطن؟
1 / بعد الرية الأولى ( )
2 / بعد الريات المباشرة وقبل الرية الثانية ( )
3 / بعد الرية الثانية ( )
4 / لم أطبق الرقعة ( )

س 16 / ما هي أسباب عدم الريات؟
1 / جفاف الرياح عالية ( )
2 / توفر مياه الري لنباتات الرياح ( )
3 / لم تتعرض الرياح المزرعة للغزو ( )
4 / جودة التحضير ( )
5 / خلو الرياح من الأمراض بالآفات والدفقات ( )
6 / أخرى ( )

س 17 / متى قمت بالرش للرش لمحصول القطن؟
1 / أقل من 6 أسابيع من الرية الأولى ( )
2 / 6 – 8 أسابيع من الرية الأولى ( )
3 / أكثر من 8 أسابيع من الرية الأولى ( )
4 / لم أشيئ ( )

س 18 / ما هي أسباب عدم الشكل لمحصول القطن؟
س 19 / كم نباتات شجيرة في الحفرة بعد الشغل لمصوح القطن؟
1/ أقل من ثلاث نباتات ( )
2/ ثلاث نباتات ( )
3/ أكثر من ثلاث نباتات ( )

س 20 / ما نوع السماد الذي استخدمته لمصوح القطن؟
1/ بوريا ( )
2/ سيوبر فوسفيت ( )
3/ الستين معا ( بوريا + سيوبر فوسفيت ) ( )
4/ نتروفساكا ( )
5/ أخر حديد ( )
6/ لم استعمل أي نوع من السماد ( )

س 21 / إذا استخدمت سماد البيوريا ما هي الكمية التي استخدمتها لمصوح القطن؟
1/ أقل من الحوار للفدان من البيوريا ( )
2/ 1.6 جوال للفردان ( )
3/ أكثر من 1.6 جوال للفردان ( )

س 22 / متي تم إضافة السماد لمصوح القطن؟
1/ أقل من 6 أسابيع من تاريخ الزراعة ( )
2/ 6 – 8 أسابيع من تاريخ الزراعة ( )
3/ بعد 8 أسابيع من تاريخ الزراعة ( )
4/ لم السماد ( )

س 23 / هل رويت بعد السمادة؟
نعم ( )
لا ( )

س 24 / كيف قمت بإضافة السماد لمصوح القطن؟
بالدبي نثر ( )
2/ بالدبي وضع على السراب ( )
3/ بالاله ( )
3/ مخلوط مع مياه الري ( )

س 25 / متي تم تعي النطر الداخلي?
1/ أقل من 6 أسابيع من تاريخ الزراعة الأولي ( )
2/ 6 – 8 أسابيع من تاريخ الزراعة الأولي ( )
3/ أكثر من 8 أسابيع من تاريخ الزراعة الأولي ( )
4/ لم أطب النطر الداخلي ( )

س 26 / كم عدد النقاط والجداول في الحواشة؟
1/ أقل من 7 نقاط و7 جداول ( )
س 27 / هل استخدمت مبيدات الحشائش لمحرضك؟
( ) نعم ( ) لا

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س 28 / هل استخدمت مبيدات لتعفير البذور لمحرض القطن؟
( ) نعم ( ) لا

س 29 / ما نوع المبيد الذي استخدمته لتعفير البذور لمحرض القطن؟
( ) قاوشو /3
( ) قاوشو + راكسيل /7/2
( ) قاوشو + استارنر /3
( )crest /4
( ) كروزور + استارنر /5
( ) لعفر البذور /6

س 30 / هل استخدمت مبيدات لمكافحة الآفات لمحرض القطن؟
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س 31 / ما عدد مرات اللقيط لمحصول القطن؟

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س 32 / هل رويت مباشرة بعد اللقيط؟

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س 33 / ما الفترة بين اللقحة والآخرى؟

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ثالثاً / الاتفاقية لمحصول القطن:

س 34 / كم إنتاجتك من القنطار للفردان (المتوسط) في موسم 2001-2002؟

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س 35 / كم إنتاجتك من القنطار للفردان (المتوسط) في موسم 2002-2003؟

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س 36 / كم إنتاجتك من القنطار للفردان (المتوسط) في موسم 2003-2004؟

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س 37 / ما هو العائد من إرباحك من ملحوظ القطن موسم 2001 – 2002م

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<td>جنية</td>
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س 38 / ما هو العائد من إرباحك من ملحوظ القطن موسم 2002 – 2003م

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</table>
س 39/ ما هو العائد من إرباحك من محصول القطن موسم 2003 – 2004م

1/ دينار دينار

س 40/ هل تدنت الإنتاجية للموسم الأخير 2003/2004؟

نعم ( )
لا ( )

س 41/ ما هي الأسباب التي أدت إلى تدني الإنتاجية؟

1/ الغرق ( )
2/ العطش ( )
3/ عدم نظافة الحشائش ( )
4/ عدم توفير التمويل بصورة منتظمة ( )
5/ الآفات والأمراض ( )
6/ تاريخ الزراعة ( )
7/ عدم انتظام اللفق ( )
8/ التسميد (التقسيط + الجرعة الموصى بها) ( )
9/ تواجد العمال المؤلمة ( )
10/ أخرى عدد ( )

رابعاً: الجزء الخاص بالمزارع المؤمن لمحصول القطن:

س 42/ هل تلتقي تنويراً عن التأمين الزراعي؟

1/ تنوير كافي ( )
2/ تنوير غير كافي ( )
3/ لم أتلقى أي نوع من التنوير ( )

س 43/ لماذا أمنت على محصول القطن؟

1/ تشجيع الخسائر ( )
2/ التسهيلات المقدمة من الشركة ( )
3/ التأمين إجباري ( )
4/ التوعية عند فقد المحصول ( )
5/ أخرى ( )

س 44/ ما هي أهم مصادر التنبور التي سمعت منها عن سياسة التأمين (رتب حسب الأهمية)؟

1/ المرشد
2/ مكتب الزراعة
3/ الجار
4/ مراقب التأمين (شركة شيكان)
5/ الندوات والاجتماعات الإرشادية
6/ الراديو
7/ التلفزيون
8/ النشرات الزراعية
9/ الاتحادات الفرعية
س 45 / هل تعتقد أن التأمين يحقق لك فوائد ملموسة؟

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<td>4/ غير ملموسة</td>
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<td>5/ غير ملموسة على الإطلاق</td>
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س 46 / هل تشعر بأن التأمين يوفر لك حماية ضد المخاطر والكوارث التي تحدث احياناً للمحصول؟

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س 47 / هل تعتقد أن تطبيق التأمين الزراعي في محصول القطن ساهم في حل مشاكل الري في حوالتك؟

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س 48 / وضح نوع هذه المساهمة؟

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س 49 / هل تعتقد أن تطبيق التأمين الزراعي في محصول القطن ساهم في حل مشكلة التمويل؟

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س 50 / وضح نوع هذه المساهمة؟

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س 51 / هل تعتقد أن تطبيق التأمين الزراعي في محصول القطن ساهم في توفير مدخلات الإنتاج؟

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5/ لم يساهم

52/ وضح نوع هذه المساهمة؟

53/ ما نوع الخدمات التي قدمها مراقب التأمين؟

54/ أي من المشاكل التالية قابلتك؟

55/ هل تتوى تأمين محصول القطن في العام القادم؟