

Risk Management in the Rain-fed Farming of Gedaref Area, Eastern Sudan

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Abstract

The rain-fed mechanized agricultural sub-sector of the Sudan has high potential of building a national food stock and foreign exchange earnings, which could contribute substantially to agricultural development and hence the development of the whole economy as well. However, the agricultural production in this sub-sector is generally characterized by a high degree of instability, which arises from the nature of the agricultural production that is dependent on uncontrollable weather conditions and unpredictable input and output prices, resulting in instable farm income. It is argued that the adoption of the recommended improved technologies in the mechanized rain-fed sub-sector of Gedaref in Eastern Sudan can increase farm income while diversifying by introducing sheep and gum arabic enterprises to sorghum monoculture may lead to farm income stability. Under these arguments in favor of diversification and use of improved technology, this paper therefore, evaluated different management strategies in this sub-sector under uncertainty. The financial feasibility of different investment and management strategies was evaluated under both; the current traditional and some improved cultural practices. The stochastic budgeting technique using the NPV of farm income as a measure of performance was used in this study to simulate production and market risk over a twenty-years planning horizon on an average farm in Gedaref area. Empirical results showed that the introduction of forest and livestock activities contribute substantially to farm income stability with very low probability of loss at the end of the planning period while the adoption of the new recommended technology also stabilize farm income and guarantee the profitability of the business at the end of the same planning period.

Keywords: Gedaref, Mechanized, Rain-Fed, risk Management, Stochastic Budgeting

Introduction

In developing countries where farming is particularly weather-dependent, farmers face substantial risk of farm income fluctuations originated mainly from yield and price uncertainties. Therefore, risk considerations in these areas are more important especially for poor farmers. Moreover, increased income risk is considered itself a loss of welfare to risk-averse farmers. It might make modern crop technology less attractive to farmers and hence decelerate agricultural development (HAZELL and NORTON, 1986).

It is confirmed that the mechanized rain-fed agricultural sub-sector in Sudan has considerable potential for building a national food stock and for generating

foreign exchange through export which could contribute substantially to agricultural development and hence the development of the economy as a whole (OMER, 1989).

The agricultural production in this sub-sector of Gedaref area in eastern Sudan is generally characterized by a high degree of instability. This is mainly attributed to the nature of the agricultural production in this system which associated with high degree of uncertainty. The uncertainty arises from dependency of the agricultural production on uncontrollable weather conditions (erratic and variable rainfall) which cause great fluctuations on crops yield at one hand, and the large fluctuations in input and output prices which restrict the reliability on price predictions on the other hand. The instable farm income resulting from business and financial risk coupled with lack of infrastructure in the area may affect production decisions, delay adoption of the new technology, prohibit long-term investment in agriculture and hence delay the agricultural development in this sub-sector. It is argued that the adoption of the recommended improved technology in the area can increase farm income while diversifying by introducing sheep and gum arabic enterprises to sorghum monoculture of Gedaref may lead to farm income stability. Under these arguments in favor of diversification and use of improved technology, this paper aims mainly at studying and analyzing the performance of the mechanized rain-fed sector of Gedaref under uncertainty. Specifically, the study seeks to evaluate different production strategies in terms of risk efficiency under both the current traditional and the proposed improved cultural practices.

Methodology

The analysis was based mainly on secondary data for the period 1990-2004. The stochastic budgeting approach was applied to evaluate the current and the proposed production strategies under the traditional and improved cultural practices. The analysis was based on a deterministic budget analysis which used NPV of farm income as a measure of performance over twenty years planning horizon. The strategies under investigation include the options of growing sorghum and sesame in the total farm area, incorporating gum arabic and/or sheep enterprises to the current farming system of growing sorghum and sesame under both traditional and some improved cultural practices. Sources of uncertainty considered in the stochastic budget were the gross margins of the traditional sorghum and sesame, prices of gum arabic and sheep and the yield, prices and variable costs of improved sorghum and sesame. These stochastic variables were integrated in the budget as probability distributions obtained from

BestFit software from Palisade. The simulation was done for 2200 iterations using @ Risk software that allows the representation of uncertainty as probability distributions and then performs the results also as probability distributions.

Results and discussion

Figure (1) compares the four production alternatives under traditional practices according to their CDFs. From this figure it can be seen that the CDFs graphs of strategies three and four lie to the right of those of strategies one and two. Thus, according to the stochastic dominance criteria, strategies three and four are preferred to strategies one and two in a first degree stochastic sense, i.e. they are preferable for a wide range of absolute risk aversion levels ($+\infty > r_a < -\infty$).

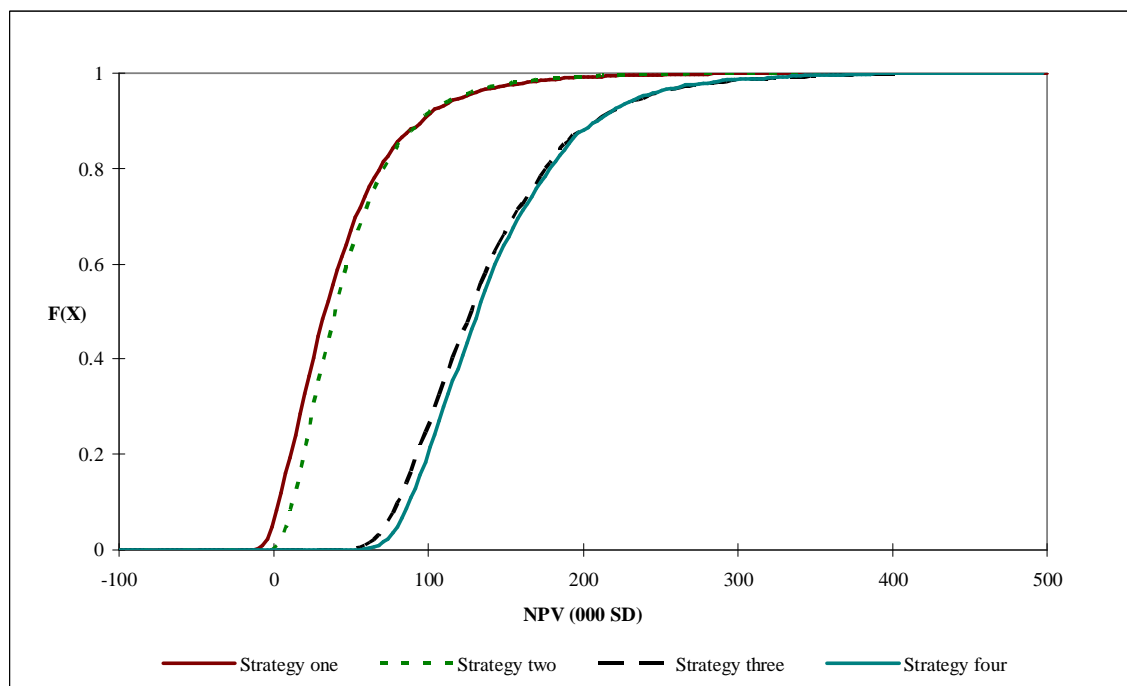


Figure (1): CDF Graphs Comparison among the Four Strategies under the Traditional Practices, Gedaref Area, Sudan

On the other hand, figure (2) compares the four production risky prospects under the improved practices according to their CDFs. The figure indicates that the CDFs graphs of strategies seven and eight lie below and to the right of the CDFs graphs of strategies five and six. According to the stochastic dominance criteria,

strategies seven and eight dominate strategies five and six in a first degree stochastic sense, i.e. they are preferable for a wide range of absolute risk aversion level ($+\infty > ra < -\infty$).

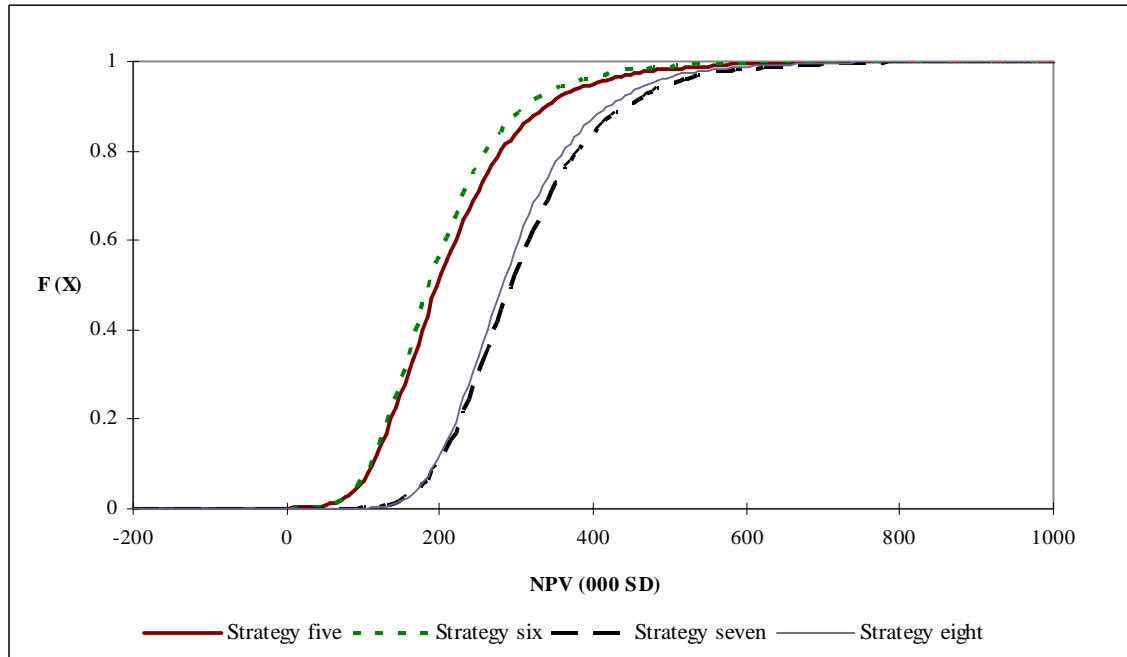


Figure (2): CDF Graphs Comparison for the Different Strategies under Improved Practices, Gedaref Area, Sudan

Therefore based on the above results, it can be concluded that the risk efficiency achieved in strategies three and four in the first case (traditional strategies) and in strategies seven and eight in the second case (improved strategies) may be attributed to the introduction of animals (sheep) to the prevailing farming systems, whose characteristics as an effective risk mitigating enterprise were discussed by Anderson and Dillon (1992). They attained the same results and further argued that better results can be attained when different animals with different characteristics are introduced to any farming system.

Conclusion

Sheep and gum arabic production was proved to have favorable economic and environmental characteristics both in the short and long-term. Therefore, government intervention by subsidizing gum arabic tree establishment during the first four years of the tree life and by providing facilitated special credit program for these purposes could help in adopting this activity by farmers in the

Gedaref area. To motivate sheep production adoption by farmers, initial subsidies and special facilitated credit programs are also helpful. Moreover, other services like drinking water availability during the dry season and better veterinary services should also be provided.

On the other hand, the application of the recommended improved cultural practices was found to be useful in various aspects in the study area. Therefore, efforts to share risk with farmers by the state through promoting the new technology use could be one of the solutions.

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