
Sustainable Climate change Adaptation in Agriculture: Social capital and Cost-effectiveness analysis of crop diversification in Semi-arid areas of Kenya

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Résumé

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Abstract

Agricultural systems have been threatened by climate change with crops exhibiting responses to decreasing rainfall and increasing temperatures. In addition, the transition from traditional farm practices to new improved farming innovations that take into account climate variability and extreme weather conditions such as drought, pests and disease shocks, has not been fully implemented due to the low adaptive capacity of farmers in developing countries. However, some households have insufficiently responded to these shocks raising the concerns of the long-term sustainability of their individual actions in reducing the risks associated with climate change in Agriculture. Imperfect markets in developing countries have locked research, new ideas and experiences in the agricultural sector especially in sub-Saharan Africa from reaching farmers. One can therefore, conclude that, lack of public policy to deliver the justified sustainable climate change adaptation methods to farmers, has in turn confined poor resource farmers in a food insecurity problem leading to social crisis (global poverty, inequity and poor governance), economic and environmental collapse.

Kenya being one of the sub-Saharan African countries, is struggling amid a weak climate change policy, to transit from the confines of poor farm practices to enhanced technologies that guarantee higher environmental resilience and productivity. Some of the hindrances

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to its constant efforts include; its aridity problem (84 percent Arid and Semi-Arid Agro-ecological zones) and gradual increasing temperatures with an expected temperature increase of 40C in the next century. It's not possible to discuss the dilemma that Kenya finds itself at the moment in the face of climate change impacts without mentioning; price distortions, ineffective land distribution, unfavorable land tenure, and inappropriate research and development policies in its agriculture sector.

Kenya Agricultural Research Institute (KARI) has therefore sought solutions on the premise of its national mandate to necessitate sustainable solutions that shift farmers from the traditional farming systems to improved farm practices. KARI in search of its solutions recognizes the potential of social capital in form of farmer groups (bonding capital) in providing sustainable crop seed bulking that help shift farmers to new innovations in semi-Arid counties of Kenya. KARI-McGill food security project was therefore introduced in Semi-Arid areas of Kenya, allowing farmer groups with the help of their social, cultural and human capital to volunteer, to experiment the improved farm practices which they would later transfer in their individual farms. This approach raises an urgent need to elucidate the cost relationships between farming practices and opportunity costs of social capital (farmer groups). This study was therefore carried out with the objectives of: (1) identifying opportunity costs of land incurred by farmer groups in seed bulking experimentation trials (2) assessing the cost-effectiveness of cereals and legumes. To meet these objectives KARI-McGill Food Security Research Project introduced different farming practices among farmers in Machakos, Makueni and Tharaka-Nithi Counties in Kenya.

Data used to achieve these objectives were obtained from households in the three counties who participated in the KARI-McGill project during its implementation period in two main sampling stages. Initial sampling stage involved random identification of farmer groups and their willingness to contribute land and labour for trial experiments of farm practices, prior to project implementation. The second sampling stage was done using a combination of purposive and multi-stage simple random sampling techniques. Purposive sampling involved selection of Counties, sub-counties, locations and villages where the technologies had been extended. From the sampling frame of the households using the technologies, a sample of 240 households was selected randomly. This was done for long rains (October-December 2013) and short rains (March-May 2014). Crop enterprises of interest were cereals (maize, sorghum and millet) and legumes (beans, cow peas, pigeon peas, and green grams and Dolichos lablab). Data collected from households growing these crops was based on the socio-economic, farm and institutional aspects.

Descriptive and inferential statistics will be analyzed using SPSS. Inferential statistics involves ANOVA, F-test, p-values and Tukey HSD's test. To meet the first objective, social capital (farmer groups) opportunity costs will be calculated based the land size in acres donated by farmers to experiment farm practices, multiplied by their prevailing market prices at the period of study. The second objective will be achieved using the Cost-effectiveness Analysis (CEA). The theoretical framework of cost-effectiveness analysis allows decisions to be made on the basis of a comparison between alternative farming practices in achieving the goal of resource utilization (costs) and outcomes (effectiveness). That is, in this study, cost-effectiveness of adaptation will be referred to the cost needed to enhance the adaptation of a particular farming practice expressed as the Cost Effectiveness ratio (CER). CER will be analyzed by expressing the total production costs as a percentage of total revenues. The assumption made in this study is, the costs of production of the new farming practices are implementation costs incurred by farmers in facing climate change shocks. Costs will be discounted to adjust for inflationary effects.

Cereals will be compared separately from legumes and findings are expected to show which crops among these categories are cost effective for farmers in Semi-Arid areas. These results are also expected to avail the farm practices to farmers that maximize revenues at least costs. Findings are further expected to guide public policy in providing the support for community based seed bulking as a sustainable way to achieve crop diversification to adapt to climate change in developing countries. The study is further expected to present

an opportunity to evaluate the contribution of farmer groups (bonding capital) in the overall climate change adaptation context in developing countries, where farmers cannot pay cash to adapt to climate change but can make a contribution in kind (through bonding social capital) in unlocking the dilemma posed by global commons externalities.

Keywords: Social capital, transition, farm practices, sustainable methods, cost-effectiveness

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Mots-Clés: Keywords: Social capital, transition, farm practices, sustainable methods, cost, effectiveness