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The impact of the farmer input support program on crop Diversification among small-scale farmers in Zambia: A case study of nega-nega agricultural camp

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Abstract
Agriculture is one of Zambia's economic drivers and a mainstay of the livelihood of a larger proportion of the country's population. Agricultural production is mainly dependent on seasonal rain-fed cultivation with maize as the principal staple food crop. Crop diversification can be used as a tool to augment farm income, generate employment, alleviate poverty and conserve soil and water resources. In striving to improve food security and minimize risks associated with heavy dependence on maize monoculture, the Zambian government has been gradually promoting diversification into high-value crops of late. The Farmer Input Support Program has led to reduced crop diversification rates because of its biased support towards maize production. There is no access to subsidised inputs and government-driven consumption market as well as substantial extension service for non-staple food crops.

Keywords: crop diversification, monoculture, small-scale farmers, stakeholders

1. Introduction

1.1 Background

Agriculture is the mainstay of the livelihood of a large proportion of the population of Zambia. There is correlation in literature that Zambia's potential in agriculture has not yet been fully exploited. If well managed, the sector could contribute to substantial improvements in the Gross Domestic Product (GDP), employment and tax revenue. It is in this regard that the Zambian government seeks to position the agricultural sector as one of the economic spinners that will foster economic growth and poverty reduction in the country. The Agricultural sector is one of the sectors that contribute significantly to the growth of Zambia's economy. The sector's contribution to the Gross Domestic Product (GDP) currently stands at about 18% to 23% (CSO, 2015) [1]. Agricultural activities in Zambia are characterized by the production of food crops that include maize, sorghum, cassava, millet and groundnuts (The IDL Group, 2002) [2]. Maize alone accounted for about 76% of the total value of smallholder crop production in 1990/91 farming season and the subsequent farming seasons, while cassava has been around 10%, and all other crops trailing below 3% (Jayne et' al., 2007)[3]. Successful and profitable participation in the agricultural sector and crop diversification in particular, has always been hindered by the many constraints that smallholder farmers face. Some of these constraints include high cost of inputs, limited access to credit, poor or insufficient market facilities, poor information dissemination, poor infrastructure and many more. As long as these constraints remain present, smallholder farmers cannot significantly improve their income base through agriculture.

For many years, maize has been the commonest crop being produced by almost all small-scale farmers in Zambia. The over-dependency on maize farming, by the Zambian farming community, has compromised the anticipated growth of the sector due to increasing costs of maize production (Matandiko, 2010) [4].

Farmers face risk from bad weather and from fluctuating prices. Crop diversification is thus a logical response to both threats. A diversified portfolio of products should ensure that farmers do not suffer complete ruin when the weather is bad. Similarly, crop diversification can manage price risk, on assumption that not all products will suffer low prices at the same time (Hazra, 2002) [5].

1.2 Problem statement

The problem that was identified is the inadequate participation in crop diversification by small-scale farmers, following the introduction of the Farmer Input Support Program, which exacerbates food insecurity. The rate of small-scale farmer participation in crop diversification, in Zambia, currently stands at 0.01% (ZNFU, 2016) [6].

1.3 Objectives

1.3.1 General Objective:

The general objective of this research was to assess the impact of the Farmer Input Support Program on Crop Diversification among small-scale farmers in Zambia.

1.3.2 Specific Objectives:

The specific objectives of the study were:

1. To investigate the effect of uncertain market for non-staple food crops on crop diversification.
2. To establish whether government subsidised inputs have an influence on crop diversification.
3. To determine the impact of agricultural extension service provision on crop diversification.

1.4 Hypotheses

$H_0$1: There is no significant association between uncertain

market for non-staple food-crops and crop diversification.

$H_0$2: There is no significant relationship between government-subsidised inputs and crop diversification.

$H_0$3: There is no significant correlation between extension service provision and crop diversification.

2. Literature Review

2.1 Definition and Scope of Crop Diversification

Crop diversification refers to the shift from the regional dominance of one crop to regional productivity of a number of crops, which takes into account the economic returns from different value-added crops with complementary marketing opportunities (Hazra, 2002) [5]. Crop diversification is a collection of all programs of expanding the number of crops in a region in the hope of increasing overall productivity and marketability (Small, 1995) [7].

2.2 Global Perspective of Crop Diversification

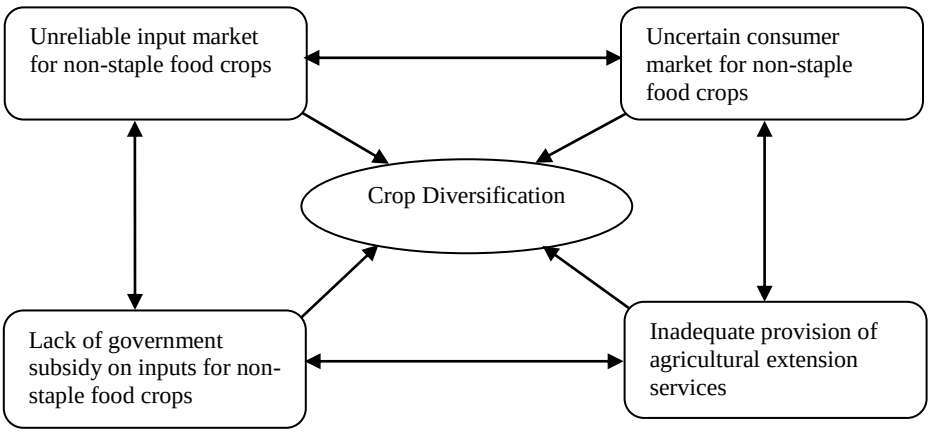
Crop diversification has been viewed as a practice that has great potential in fostering agricultural productivity, food security, ecological biodiversity, land and soil fertility maintenance and economic growth, stability and resilience world over. It is a pity that despite huge investment in research, crop diversification has generally been neglected throughout the world. A few countries that have taken the challenge to try diversified cropping have enjoyed tremendous economic benefits from the practice. The challenge of agricultural sustainability has become more intense in recent years with the sharp rise in the cost of food, energy and production inputs, climate change, water scarcity, degradation of ecosystem services and biodiversity, and the financial crisis. In response to this, action has been promoted internationally at all levels and yet, as witnessed in the Millennium Ecosystem Assessment (MEA, 2005), the World Development Report 2008 (WDR, 2008) and the IAASTD reports (McIntyre *et al.*, 2008) [8], some agricultural systems are still being promoted with unacceptably high environmental, economic and social implications, albeit with the promise of increased production yields. Consequently, business-as-usual with regards to agricultural development is increasingly considered inadequate to deliver sustainable production intensification to meet future needs in terms of food security, poverty alleviation and economic growth and ecosystem services (Friedrich *et al.*, 2009 [9]; Kassam *et al.*, 2009) [10].

2.3 The Zambian Perspective of Crop Diversification

Crop diversification in Zambia has not yet been fully embraced by most small-scale farmers. There are several perceived factors that may be attributed to this scenario. Matandiko, (2010) [4], noted that Zambia's agricultural sector has continued to record substantial growth in recent years as evidenced by successive bumper harvests. The growth is largely due to various government policies such as the Farmer Input Support Program (FISP), which accords small-scale farmers, across the nation, access to fertiliser and seed for their farming activities. He further recognizes the fact that the sector's growth is coiled around maize cultivation, which should raise concern as there are other cash crops like cassava, sorghum and millet that need to be promoted to ensure sustainable national food security. Matandiko, 2010 [4], highlights that farming has become a money-spinner, hence the need for diversification to ensure crops that are required on both the local and international markets are readily available.

There has been a country-wide promotion of maize cultivation without due consideration of agronomic suitability for a long time. Since maize is susceptible to drought, agricultural production can be drastically low in case of adverse weather conditions. Because of this situation, the government formulated the Food-Crop Diversification Support Project (FCDSP) through the Zambia Agricultural Research Institute (ZARI) with a view of enhancing food security by promoting drought tolerate food crops (Ngosa, 2009) [11].

2.4 Conceptual Framework



The above framework proposes that the adoption and practise of crop diversification among small-scale farmers has some negative influence from the Farmer Input Support Program (FISP). The inadequate small-scale farmer participation in crop diversification may be influenced by four major variables. These variables include; unreliable input market for non-staple food crops, uncertain consumer market for non-staple food crops, the lack of government subsidy on inputs for non-staple food crops and inadequate provision of agricultural extension services.

3. Materials and Methods

3.1 Research Site: Description of the Research Area

The study was conducted in Mazabuka district of Southern province, Zambia. The targeted area was Nega-nega Agricultural Camp, located about forty-two kilometres to the north-east of Mazabuka town. The research area lies in zone 2 of the Zambia's three distinct agro-ecological zones. The area has an average altitude of 950 m above sea level, with annual temperatures ranging from 0^0C to 38^0C, and average annual rainfall of 850 mm. The soils of this area are reddish loamy clay, deep well structured and well drained, with a sandy clay top soil of pH 5.5 to 6.0 (ZARI, 2015) [12]. The district's population is 261, 268 (CSO, 2010) [13].

Nega-nega Agricultural Camp covers an average of 150 km^2 and has a total registered farmer population of Six hundred thirty-eight (638), 289 females and 349 males. The camp's farmer population is divided into five (5) zones of uneven population (AEO, 2016) [14].

3.2 Methodology and Research Design

The research design used in this study is a survey.

3.3 Target Population

The target population summed up to 638 farmers (AEO, 2016) [14].

3.4 Sample Size and Sampling Procedures

The selection of the camp was done using purposive or non-probability sampling, owing to the observations made. Proportional Stratified Sampling was used in the selection of the sample to ensure that every stratum or sub-group of the entire target population was represented. To this effect, each of the five zones provided an average of forty-nine (49) respondents. The sample that was selected comprised two hundred forty-five (245) farmers out of the six hundred thirty-eighty (638). The sample size was determined as follows;

$$n = N / 1+N(e)^2$$

Where

n = sample size,
N = population and
e = margin of error.

Total camp sample:

$$n = N / 1+N(e)^2$$
$$= 638 / 1+638\ (0.05)^2$$
$$= 638 / 1+638 \times 0.0025$$
$$n = 638 / 1+1.595$$
$$= 638 / 2.6$$
$$= 245.38$$
$$= 245. \quad \text{Eq. (1)}$$

Total zone sample:

$$n = [N/1+N(e)^2] / 5$$
$$= [638/1+638\ (0.05)^2] / 5$$
$$= [638/2.595] / 5$$
$$n = 245 / 5$$
$$= 49. \quad \text{Eq. (2)}$$

Sampling factor =

$$N / n = 638 / 245$$
$$= 2.6 = 3. \quad \text{Eq. (3)}$$

3.5 Data Collection Instruments

The study relied on questionnaires and interviews to gather primary data. Secondary data was obtained from the local Agricultural Extension Office (AEO), Farmers' Training Centre (FTC), Zambia National Farmers' Union (ZNFU) and other sources that were deemed relevant, including publications.

3.6 Validation of the Data Collection Instruments

The data collection instruments were both face and content validated. They were submitted to the research supervisors for scrutiny and authentication. The research instruments were further validated by means of a pilot study.

3.7 Data Analysis

The gathered data was systematically coded in Microsoft Excel spread sheets and then subjected to statistical analysis using STATA to generate tabulations, cross tabulations and charts for easy data representation. The hypotheses were tested using the Chi Square test of association.

4. Research Findings

4.1 Crop Diversification Adoption Rates.

4.1.1 Crop Diversification Adoption Rates before the Farmer Input Support Program.

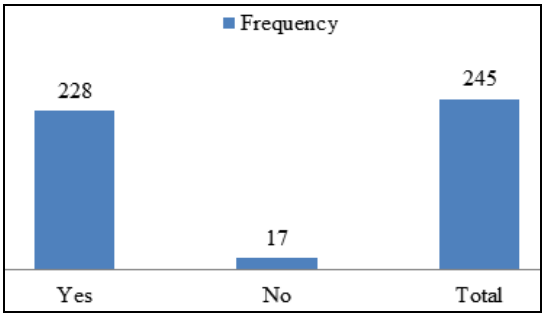


Fig 1: Crop Diversification Adoption Rates before the Introduction of FISP.

Fig. 1 shows that out of a total of 245 valid responses, 17 (6.94%) respondents were not practising crop diversification before the introduction of the Farmer Input Support Program. The majority of the respondents in the camp, 228 (93.06%), were practising diversified cropping prior to the introduction of the Farmer Input Support Program.

4.1.2 Crop Diversification Adoption Rates after FISP Introduction.

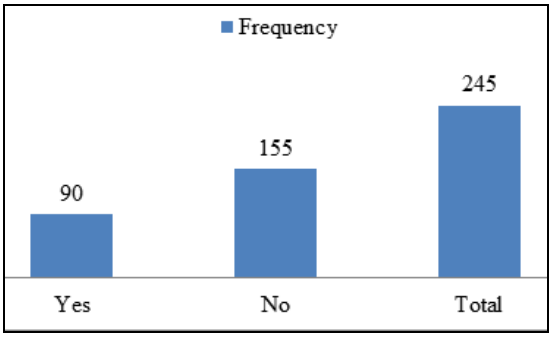


Fig 2: Crop Diversification Adoption Rates after FISP Introduction.

Fig. 2 shows that out of a total of 245 valid responses, 90 (36.73%) respondents had been practising crop diversification after the introduction of the Farmer Input Support Program. 155 (63.27%) of the respondents have not been practising diversified cropping since the introduction of the Farmer Input Support Program.

4.2 Input Supply by the Farmer Input Support Program.

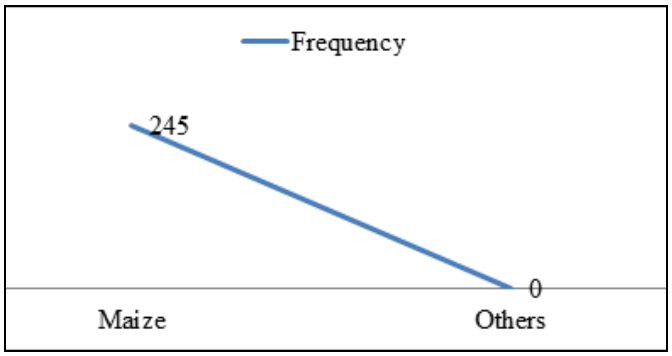


Fig 3: Input Supply by the Farmer Input Support Program.

Fig. 3 depicts that the Farmer Input Support Program does not and has never supplied inputs for any non-staple food crop from its inception. This was evidenced by no 'yes' response from all the 245 respondents. All the 245 respondents, representing 100.00%, indicated that the Farmer Input Support Program has only been supply inputs for maize since its inception.

4.3 Government Market for Crop Produce.
4.3.1 Government Market for All Crop Produce.

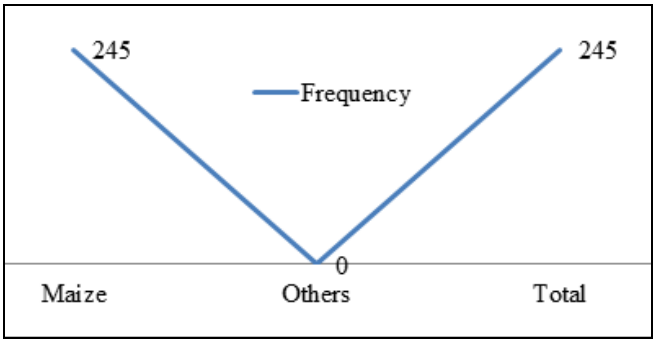


Fig 4: Government Market for All Crop Produce

Fig. 4 shows that no respondent indicated that the government had a marketing system for non-staple food crop produce while all the 245 (100.00%) responses showed that the government provided small-scale farmers with market for the staple food crop, maize.

4.4 Statistical Tests of the Hypotheses.
4.4.1 Chi Square Test of Association.

$H_0$1: There is no significant association between uncertain market for non-staple food crops and crop diversification.

Table 1: Chi Square Test of Association; $H_0$1

(Uncertain Market) Response	(Crop Diversification) Yes	No	Total
High	204	0	204
Low	0	41	41
Total	204	41	245

Pearson chi 2 (1) = 245.0000, Pr = 0.000.

The statistics showed that the calculated Pearson Chi-Square result was at p = 0.000, measured with the assumed α = 0.05 (at 95% level of significance). The calculated probability is less than α = 0.05, we reject the null hypothesis and accept the alternative hypothesis. Therefore, there is a significant association between uncertain market for non-staple food crops and the success of crop diversification.

4.4.2 Chi Square Test of Association.

$H_0$2: There is no significant relationship between government-subsidised inputs for non-staple food crops and crop diversification.

Table 2: Chi Square Test of Association; $H_0$2

(Govt. Subsidised Inputs) Response	(Crop Diversification) Yes	No	Total
Very High	81	123	204
High	41	0	41
Total	122	123	245

Pearson chi 2 (1) = 49.6438 Pr = 0.000

The statistics showed that the calculated Pearson Chi-Square result was at p = 0.000, measured with the assumed α = 0.05 (at 95% level of significance). The calculated probability is less than α = 0.05, we reject the null hypothesis and accept the alternative hypothesis. Therefore, there is a significant relationship between government-subsidised inputs for non-staple food crops and the success of crop diversification.

4.4.3 Chi Square Test of Association.

$H_0$3: There is no significant correlation between extension service provision and crop diversification.

Table 3: Chi Square Test of Association; $H_0$3

(Extension Service) Response	(Crop Diversificat.) Yes	No	Total
Very High	121	0	121
High	83	41	124
Total	204	41	245

Pearson chi 2 (1) = 49.6438 Pr = 0.000

The statistics showed that the calculated Pearson Chi-Square result was at p = 0.000, measured with the assumed α = 0.05 (at 95% level of significance). The calculated probability is less than α = 0.05, and in this regard, the corresponding specific objective was achieved and we reject the null hypothesis and accept the alternative hypothesis. Therefore,

there is significant correlation between the provision of extension service for non-staple food crops and the success of crop diversification.

5. Discussion

The study findings show that the government does not provide market for both produce consumption and inputs for non-staple food crops. Further indications are that the introduction of the Farmer Input Support Program, whose input supply is coiled around maize, led to drastic reductions in crop diversification and the provision of extension services is equally inadequate. The findings of this study revealed that the provision of consumer market and the supply of inputs for non-staple food crops by government have a significant influence on the participation of small-scale farmers in crop diversification.

The results of the statistical tests conducted on the hypotheses fostered the coming up of the above facts. With reference to specific objective number one, to investigate the effect of uncertain market for non-staple food crops on crop diversification, the research findings have shown that uncertain market hindered the practice of crop diversification. $H_0$1: There is no significant association between uncertain market for non-staple food crops and crop diversification, had all the 245 responses in support, with 204 and 41 responses rating the influence of a stable and guaranteed consumer market for non-staple food crops as high and low respectively (table 1). The findings from these responses indicated that government had not provided market for non-staple food crops. The Pearson's Chi Square Test of Association result was at $p = 0.000$ (table 1). The second specific objective, to establish whether government subsidised inputs have an influence on crop diversification, was investigated and findings suggested the presence of a significant influence. $H_0$2: There is no significant relationship between government-subsidised inputs for non-staple food crops and crop diversification, obtained 245 responses out of 245 valid responses against, with 204 giving a 'very high influence rating' and the other 41 rated the influence as just high (table 2). These results indicated that government had not provided inputs for non-staple food crops and still did not subsidise such inputs despite the recorded availability of outlets. The Pearson's Chi Square Test of Association result was at $p = 0.000$ (table 2). According to investigations on specific objective number three, to determine the impact of agricultural extension service provision on crop diversification, it was revealed that extension service influenced crop diversification. $H_0$3: There is no significant correlation between extension service provision and crop diversification, had 121 'very high' ratings and 124 'high' ratings, giving a total of 245 valid responses (table 3). The Pearson's Chi Square Test of Association result was at $p = 0.000$ (table 3).

According to Matandiko, (2010) [4], Zambia's agricultural sector has continued to record substantial growth in recent years as evidenced by successive bumper harvests. The growth is largely due to various government policies such as the Farmer Input Support Program (FISP), which accords small-scale farmers, across the nation, access to fertiliser and seed for their farming activities. He further recognizes the fact that the sector's growth is coiled around maize cultivation, which should raise concern as there are other cash crops or high-value crops like cassava, sorghum and millet that need to be promoted to ensure sustainable national food security. It is indeed true and evident in the findings that the current cropping system is not diversified. The many high-value crops have been neglected. Such crops, which might not be food crops, have the potential to give farmers substantial marginal earnings.

Matandiko (2010) [4], further highlights that farming has become a money-spinner, hence the need for diversification to ensure crops that are required on both the local and international markets are readily available. The researcher agrees with Matandiko on his observations about the nature of the growth of Zambia's agricultural sector and the state of the market and marketing infrastructure for non-staple food crops. It is true that crop diversification has not been supported in terms of the creation and provision of consumer market as well as the supply of inputs for non-staple food crops. According the generated statistics, there is need for huge investment in subsidised inputs and market establishment for non-staple food crops if crop diversification is to be enhanced.

6. Conclusion

The study revealed that the area (Nega-nega Agricultural Camp) is dominated by small-scale farmers of low economic status. This was vindicated by the low average annual income for the farmers in the area. The participation rate of small-scale farmers in crop diversification is very low and it is affected by the lack of government initiated and supported market and input supply mechanisms for non-staple food crops. It was also revealed that the provision of extension services was not adequate. Poor quality extension services, given only during the farming season, do not favour or support the competitive involvement of small-scale farmers in crop diversification.

7. Recommendations

Having successfully conducted the study and understood the interpretations of the findings, the researcher recommends that;

1. Individual farmers take keen interest and initiative in adopting crop diversification.
2. The government initiates the designing and creation of consumer market and input supply mechanisms for non-staple food crops, in order to encourage small-scale farmers' involvement in crop diversification.
3. The government, in partnership with other stakeholders, re-designs the extension services provision framework such that there will be an improvement in the extension officers' attitude towards work, which may facilitate the delivery of good quality and up-to-date technical information on agriculture to farmers.
4. The government introduces and improves agricultural media programmes and facilitate farmers' access to information.
5. The government reforms and restructures the Farmer Input Support Program (FISP) and the Food Reserve Agency (FRA) into full-scale government entities that will supply subsidised inputs for high-value crops and provide market for all crop produce beyond the staple food crop.

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