EFFECT OF CHANGES IN CROP PRODUCTION PATTERN ON INCOME OF SMALL HOLDER FARMERS IN KATSINA-ALA LOCAL GOVERNMENT AREA OF BENUE STATE

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ABSTRACT
*The study examined the effect of changes in crop production pattern on the income of smallholder farmers in Katsina-Ala Local Government Area of Benue State. The researcher adopted a descriptive survey design where three hundred (300) copies of semi-structured questionnaire were distributed using disproportionate stratified random sampling. The research was premised on two hypotheses: Ho₁ - there is no significant difference between the crop types cultivated now and thirty years ago in the study area and **Ho₂ -** the change in crop production pattern has no significant effect on the income of smallholder farmers in Katsina-Ala Local Government Area. These hypotheses were tested using standard deviation and student t-test. The result revealed that there is a significant difference between the crop types cultivated by farmers thirty years ago and now. The result further indicated that the change in crop production pattern has significantly contributed to increasing income levels of the farmers in the study area. It was therefore, concluded that change in crop production pattern has occurred in Katsina-Ala Local Government Area and that marketability is the prime factor occasioning the change from the production of one crop to another in the study area. The formation of co-operative societies and local thrift societies by the farmers as well as the practice of dry season farming along the extensive flood plains of the rivers found in the study area through the construction of a multi-purpose dam were among some of the recommendations raised.*

Keywords: Change, crop production pattern, income, smallholder farmers.

Introduction: The change in cropping pattern in terms of acreage allocation among different crops is the integral part of agricultural development the world over. Ansari (2018), observed that agriculture is based upon introduction, replacement and successful adaption of crop species. Thapa, Kumar, Roy and Joshi (2017) also opined that the behavioral response of farmers in allocating areas to major crops was motivated by costs and returns, and that the farmers acted rationally and desire to maximize their net returns. He further stressed that given the possibilities of crops substitution farmers acting rationally and desiring to maximize returns would expand area under crops whose yield increased and which positively respond to favorable price expectations. Todaro (2020) observed that evidence from such diverse countries as Columbia. Mexico, India, China, Nigeria, Ghana, Pakistan, Thailand and the Philippines shows that under proper conditions, small farmers are responsive to price incentives and economic opportunities and will make radical changes in what they produce and how they produce. In the same vein, Ikpe, Sawa, Idoma, Ejeh and Meshubi (2016), noted that farmers choices about what crops to grow depend only partly on climate, and year-to-year crop choice decisions are likely dictated much more by expected prices at harvest than by climate concerns. In Nigeria and Benue State particularly, majority of the rural population is engaged in farming. It has been the main source of income of the rural farmers. This rural landscape is dominated by smallholder farming system where most farm sizes are less than two hectares (Samberg, Gerber, Ramankutty, Herrero & West, 2016). The advent of colonization changed the pattern of agricultural production from subsistence agricultural production to commercial production in order to provide raw materials for foreign industries. Important export crops such as cocoa, oil palm produce, rubber products, groundnut benniseed, and others suddenly gained importance and production. This phenomenon of change in crop production

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pattern was also observed in Egbaland, Oke-Igbo and Abeokuta (Zhu, Duan, Dai & Feng, 2022).

The crop production pattern of Katsina-Ala Local Government Area is a microcosm of the national agricultural production. It is affected by the changes in Nigeria's agricultural production pattern as typified by "extinction" and replacement of other traditional crops. The study area has witnessed both spatial (space) and temporal (time) changes in the pattern of crop production. The Tiv people who are the major ethnic group occupying these areas were very famous as benniseed producers during the colonial era. Other traditional (subsistence) crops of the area during this era included Yams, Guinea com and Millet (Ortserga, Kwaghsende, Dam, Kile, Ujoh & Gyuse, 2019). Today, the pattern of crop production is different in the area under study. Benniseed has since declined in production. In some places, it has even gone out of production completely. In its stead are crops like yams, guinea com, rice, maize, cassava, and groundnuts. These crops have steadily grown in importance both in terms of acreage and time devoted to their production. Millet which was a major staple food crop in the study area has also lost its prestige and acreage under cultivation (Naimur, 2019). Also in the same area, there has been an introduction of tree crop economy. The establishment of Taraku Mills and several other markets in the early eighties contributed to the increase in acreage under cultivation of soya beans. Today, the commercial value of soya beans and benniseed has been taken over by yams and groundnuts in the area. Also the current efforts by the Buhari administration to boost rice production in the country have stimulated interest and area under cultivation of rice in the study area (Obi, Chika, Effiong, 2022). The level of income of the smallholder farmers in Katsina-Ala Local Government Area is linked to the changing patterns of crop production. It is on this premise that this study examines the effect of change in crop production pattern on the income of smallholder farmers in Katsina-Ala Local Government Area of Benue State from 1991 – 2022.

Materials and Methods: **The Study Area**: Katsina-Ala Local Government Area (LGA) which is one of the twenty three (23) Local Government Areas (LGAs) that make up Benue State in North-Central Nigeria is the location of the study. Katsina-Ala Local Government Area lies approximately between latitude 7°5'and 7°30' north of the equator and longitude 9°15' and 9°55' east of the Greenwich Meridian. The Local Government area covers an area of about 2972 square kilometers (National population commission 2006). Katsina-Ala Local Government Area, situated in the lower Benue valley, is traversed by many flowing streams and rivers that empty into the river Benue.

Katsina-Ala Local Government Area is made up of twelve (12) council wards namely, Katsina-Ala Township, Michihe, Yooyo, Mbacher, Utange, Mbayongo, Mbatyula/Mberev, Mbajir, Tiir, Iwar, Ikurav Tiev I and Ikurav-Tiev II (see figure 1). The local government area has a population of about 225,471 persons (National population Commission, 2006)..The prevailing tropical wet and dry climates as well as the hydrographic condition have a lot of influence on the nature of the soils and the agricultural economy. These ecological conditions permitted the predominantly rural population of the area to take part in both the grain crop economy of the North and the root crop economy of the south (Hundu, Anule, Kwanga, & Dam, 2021).

Sampling and Data Collection Methods: The researcher used a descriptive survey design to undertake the study. Copies of semi-structured questionnaire were randomly administered to three hundred smallholder farmers to obtain information on demographic, socio-economic characteristics, change in crop production, patterns of change, reasons for change, common crops involved in the change and income, covering the period from 1991 - 2022. Disproportionate stratified random sampling technique was used to collect data on the above mentioned variables. Katsina-Ala Local Government Area was divided into 12 units based on the number of existing council wards. To ensure that at least 5 respondents were selected from each of the five kindred areas that make up the wards, 25 smallholder farmers (respondents) were randomly selected from each of the 12 council wards. The disproportionate distribution of questionnaires across the council wards was due to the non-availability of population figures for each ward from the 1991 and 2006 census data.

For the purpose of administering the questionnaire, small holder farmers older than thirty (30) years of age and who must have been into farming and must have lived for at least twenty (20) years within the study area were identified through the village heads (Tor Kpande). This was done by asking the farmers of their age and how long they have lived in the area. Thereafter, the copies of the questionnaire were issued. The reason for this decision was that those within this age bracket have the information needed about the change in cropping pattern. It must be noted however, that data analysis was based on two hundred and eighty four (284) questionnaire as the remainder were either not recovered or not fully completed. The data was

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summarized and presented in tables. The two hypotheses formulated were tested using the student t-test.

Figure 1: Map of Katsina-Ala Local Government Area
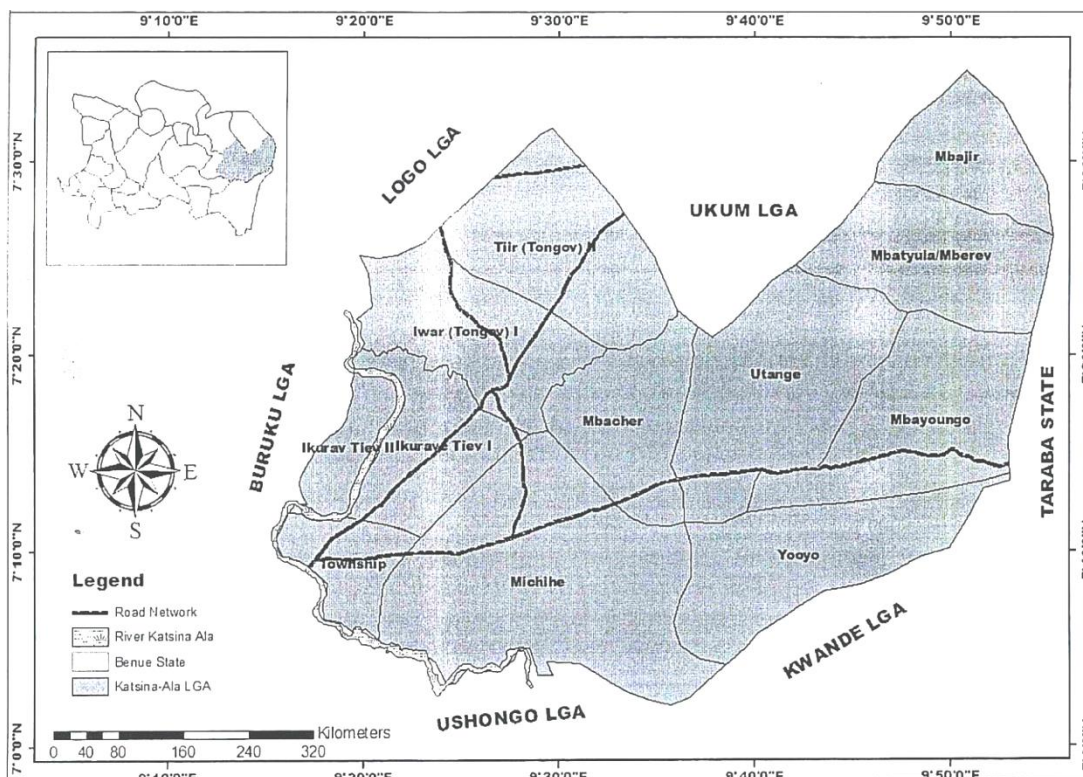
2.3 Research Hypotheses

The following hypotheses were stated and tested:

Ho1: There is no significant difference between the crop types cultivated now and thirty years ago in the study area.

Ho2: The change in crop production pattern has no significant effect on the income of smallholder farmers in Katsina-Ala Local Government Area.

Results: Patterns of Change in Crop Production in Katsina-Ala Local Government Area.

Table 1: Number of respondents indicating change and those not indicating change in crop production since 1991.

Responses	No. of respondents	Percentage
Changed	222	78
No change	62	22
Total	284	100

Source: Author's Fieldwork, 2022

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It is evident from the table above that 78% (222) of the respondents indicated that they changed their crops over the past thirty years. While only 22% (62) indicate that they have not changed crop within the period under review.

Table 2: The rate of change and percentage change in crop production between 1991 and 2022 in Katsina-Ala Local Government Area.

Crops	No. of Farmers cultivating 30years ago	Percentage 30 years	No. of farmers at present	Percentage At present	Rate of Change	Percentage Rate of Change
Yam	222	100%	222	100%	0	0%
Groundnut	48	21.62%	208	93.69	160	72.07%
Guinea corn	222	100%	222	100%	0	0%
Cassava	92	41%	130	58.56%	38	17.12%
Rice	78	35.14%	144	64.87%	78	35.14%
Soya beans	82	36.94%	140	63.06%	58	26.13%
Pepper	100	45.04%	122	54.96%	22	9.91%
Millet	192	86.40%	30	13.51%	-162	-72.97%
Benniseed	222	100%	76	34.23%	-146	-65.77%
Tree Crop	28	12.61%	52	23.42%	24	10.81%

Source: Author's Fieldwork, 2022

It is clearly discernible from the above table that the most dominant crops produced in the area 30 years ago were Benniseed, Guinea Com and Yam with 100% as first grade crops both in terms of importance and acreage under cultivation. These crops were followed by Millet (86.49%), Pepper (45.04%), Cassava (41%), Soya beans (36.94%) and Rice (35.14%) in that order. It is also glaring that Yam (100%) Guinea-corn (100%), Groundnuts (93.69%), Rice (64.87%), Soya beans (63.06%), cassava (58.56%) and Pepper (54.96%) are the crops dominating production at present. One can also infer that Yam and Guinea com have continued to dominate production both in the past and at present. This is due to the traditional value attached to them as food crops, and they have also continued to find good and easy market in the country. It is noticeable that benniseed and millet have declined in production and waned in importance due to diminishing market demand or soil deterioration. Tree crop economy is gradually gaining importance in the area because of increasing population pressure on land and market demand.

The Dynamics of Change in Crop Production Pattern in the Study Area

Table 3: Reasons for the change in crop production.

Reasons for change	No. of respondents	Percentage
Good market price/demand	106	477%
Higher yield	44	198%
Cheaper cost of production	31	14%
Soil suitability	41	18.5%
Total	222	100%

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Source: Author's Fieldwork, 2022

It is obvious from the above table that the dominant factor that informed the change from one crop type to another in the area is good market price with 47.7% followed by higher yields (19.8%); the third is soil suitability with 18.5% and lastly cost of production with 14.0%. The percentage of market price and higher yield put together in (67.5%) which are pointers to increasing income to farmers is higher than when you add that of cheaper cost of production and soil suitability (32.5%). This result tend to corroborate the view of Deogharia (2018) who in their separate observations stated that change in cropping pattern were triggered by market conditions and most important structural change in the relative decline in the proportion of food grains. However, ecological conditions in this area, particularly soils cannot be said to be the same within the period under consideration largely due to population changes. Field observations revealed that increased population densities have led to the shortening of fallow periods and reduced farm sizes which has also given rise to the intensive cultivation of soils without being allowed to regain its fertility naturally. This is in agreement with researches conducted by Smith, House, Bustamante, Sobocká, Harper, Pan & Pugh (2016) and Stotzky (2018).

Effect of Change in Crop Production Pattern on Income of Small-holder Farmers in Katsina-Ala Local Government Area

Table 4: Comparison of income of farmers that have changed crops with those that have not changed crops within the thirty year period.

Annual income classes ₦	No. of farmers not changed	%	No. of farmers changed	Percentages
Less than 250,000	30	48.39%	42	18.92%
250,000-500,000	21	33.87%	60	27.03%
500.000-750.000	4	6.45%	75	33.78%
750.000-1000.000	5	8.06%	33	14.86%
Above 1000.000	2	3.23%	12	5.41%
Total	62	100%	222	100%

Source: Author's field work 2022

Table 4 above shows majority of the farmers interviewed who did not changed crops have their income levels fall within the lowest income class while those farmers that switched to new crops had their annual income appreciated with most of them falling within the middle income classes and higher

3.3 Hypotheses Testing

Ho₁: There is no significant difference between crop types cultivated by the farmers now and thirty years ago in the study area.

Table 5: Table showing the mean change in cropping pattern, standard deviation and t-test of smallholder farmers in Katsina-Ala Local Government Area.

Variable	N	X	SD	Df	T-Cr	T-Cal	Level of sig.
Crops cultivated 20 years ago	10	128.60	-6739	17.994	-0.211	0.983	005
Crops cultivated at present	10	129.28	66.04				

Source: Author's Fieldwork, 2022

N = Number of crops cultivated.　　　　　　　DF = Degree of Freedom

X = Mean number of farmers cultivating crops　　t-Cal = the calculated t-test value

SD = Standard Deviation　　　　　　　　　　t-Cr = Critical (table) value of t-test.

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Data presented in the table 5 above shows the calculated value of t as 0.98. This value when compared with the table value of 0.211 at 0.05 confidence level revealed that the calculated value of t is greater than the critical value oft, hence the null hypothesis is rejected and the alternative hypothesis which states that there is a significant difference between the crop types cultivated now and thirty years ago by farmers in Katsina-Ala Local Government Area is accepted.

Ho2: Change in crop production pattern has no significant effect on the income of smallholder farmers in Katsina-Ala Local Government Area.

Table 6: Table showing the effect of change in crop production pattern on the income of farmers in Katsina-Ala Local Government Area.

N	X	SD	Df	T-Cal	T-Cr	Level of significance
5	12.5	-61.93	5.95	2.62	0.040	0.05
5	44.4	-2.064				

Source: Author's Fieldwork, 2022

N = number of income classes

X = mean number of farmers in each income class

SD = standard Deviation

t-Cal = the calculated t-test values

t-Cr = critical (table) value of t-test

It is glaring from table 6 above that the calculated t-test value (2.62) is greater than the critical table value (0.040) at 0.05 level of significance, it therefore means that change in crop production has a significant effect on the income of small holder farmers in Katsina-Ala Local Government Area.

Discussion: This study has shown that farmers in the study area have continued to switch from the production of one crop type to the other within the period under review. This result agrees with the views of Delbridge, and King (2016), who stated that crop production is dynamic. The result revealed that commercial crops such as soya beans, groundnuts, pepper, rice and benniseed are the major crops affected by the changes in the cropping pattern of the area whereas major food crops such as yam and guinea com have maintained steady production. You, Tian, Pan, Shi, Bian, Gurgel & Zhang (2022), in their work shared the same view that, in developing countries cropping pattern has changed from cultivating traditional crop to high valued crops because of their high potential in income generation, employment augmentation, poverty alleviation and export promotion.

This study validates the views of Debasis, Kumarjit & Lakshmikanta (2018), Deogharia (2018) and Thapa, Kumar, Roy & Joshi (2017) that smallholder farmers depending on a small piece of land and having no alternative sources of employment and income would try to produce the maximum output on the given piece of land. They would always try to cultivate as many crops as possible and choose such high valued crops which after meeting their consumption needs would meet their minimum cash requirement for the maintenance of their daily life. The result in tables 5 and 6 shows that the null hypotheses used for the study were all rejected at 5 percent confidence level. The result indicated that there is a significant difference between the crop types cultivated by farmers thirty years ago and now in the study area. The result further revealed that the change in the cropping pattern has significantly contributed to increasing the income levels of the farmers in the study area. These results are consistent with the findings of Johnson (2018), Emran, Krupnik, Aravindakshan, Kumar & Pittelkow (2021), Pan, Du, Dong, Kuang, De Maeyer & Kurban (2019), Delbridge & King (2016) and Vishwambhar, (2017) which indicate that changes in price will provide incentives for agricultural production and specialization which in turn may lead to growth and distribution of income through employment generation and revenue enhancement and consequently poverty reduction.

Conclusion: The findings of the study revealed that, change in crop production has taken place in Katsina-Ala local government area. Marketability is the prime factor informing the change from the production of one crop to another in the study area. Crops that attracted higher prices and demand are produced in larger quantities while those that attracted lower prices were dropped. The level of income of the farmers in Katsina-Ala Local Government Area is linked to the change in crop production pattern. The change in cropping pattern has increased the income levels of the farmers in the study area.

Recommendations: Based on the findings of this study the following recommendations were made:

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Attaining food security is one of the ways of raising farmer's income which needs adequate farm inputs. In this light, farmers can form cooperative societies or local thrift societies that will be recognized by government to enable them evade the exploitative tendencies of the middle men and also enable the indigent farmers obtain loans to improve their farms.; Dry season farming should be practiced using the extensive flood plains of rivers Katsina-Ala, Yooyo and Loko with their numerous tributaries to produce cassava, rice, tobacco and vegetables, some of which can be sold at hand some prices. This system of farming can be promoted by government through dam construction at Gugur water fall (Michihe ward) which can store water for

irrigation, and as well supply the neighbouring settlements with portable water and electricity.; Government should revive agricultural extension services and extend it to cover the hinterlands of the study area, to demonstrate the benefits of adopting new crops and farming techniques; and Further research should be undertaken in Katsina-Ala Local Government Area to establish chemical characteristics of soils to make it possible in recommending the appropriate fertilizer that can be applied to these soils. Since change in crop production pattern has gone a long way in improving incomes of the smallholder farmers, it can be harnessed as a strategy for rural development.

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