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Production Decisions and Costs - Returns Analysis of Poor Resource Cereals – Legumes Farmers in Adamawa State, Nigeria

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Abstract

The study assessed production decisions and evaluates cost - returns on investment of poor resource cereals – legumes farmers in Adamawa State, Nigeria. Multi-stage, purposive and random sampling techniques were used to draw 200 poor resource cereals – legumes farmers in the state. Descriptive statistics (frequency count, percentages and means), gross margin (GM), likert – scale and chi – square were used to analyze the data generated through the use of questionnaire from primary source. The result reveals that majority (80%) of the respondents were males, majority (75%) were within the age limit of 50 years, majority (60%) were married, majority (40%) had 6-10 members in their house and majority (70%) had educational level ranging from primary education to ordinary diploma and national certificate of education, (10%) had no formal education; while 15% and 5% were graduates and post graduates respectively. The study identified thirteen (13) different cereals – legumes combinations practiced by the poor resource farmers in the area. The result further shows that, household's food security motives, market price of commodities, availability of capital, managerial skills, government policies and income generation motives were factors that influenced decisions. Furthermore, the result reveals that low returns from investment, conflict between farmers and herders, inadequate capital, inadequate labour, high price of inputs and poor road network were the problems affecting poor resource cereals – legumes farmers' performance. The study, therefore, conclude that, cereals – legumes farming practiced by poor resource farmers in the area is profitable and can serve as means of employment, beneficial to food security, means for minimizing crime in both rural and urban areas through its value –chain economic activities and hence could be used as a poverty alleviation tool. The study recommended that; low profit should be improved through adoption of modern practices, conflict between farmers and herders should be minimized through clear demarcation of grazing routes, inadequate capital should be improved through formation of co-operatives and provision of affordable and accessible credit facilities, inadequate labour should be minimized through the use of labour saving devices, high price of inputs should be minimized through bulk purchase, transportation and distribution. Similarly, Government, Non – Governmental Organizations (NGOs) and communities should rehabilitate, upgrade and construct new roads.

Keywords: Decisions, Costs, Returns, Poor – Resource, Cereals, Legumes and Farmers

Introduction

The contributions of Agriculture to the Nigerian economy in terms of Gross Domestic Product (GDP), employment generation, source of raw materials and market for other sector of the economy as well as export has been well reported (Lawan and Adigun, 2012).

Decision Making Unit (DMU) according to Ottawa *et al*. (2012) is any entity that designs and controls the process that coverts inputs into output and outcomes, usually with certain objective in mind. Such objective (s) could be to generate revenue and profit, supply food stuffs to the family, make certain commodities available within the community or a mixed of these and other motives (Shiwa, 2019). Arene (2008) reported that, in developing countries, the units of production are very small, where it is made up of very many numbers of relatively smaller units. For instance, in Nigeria, in our homes, the farmer normally owns all the capital or part of the capital invested in the farm and he and his family supply virtually all the labour force (household or family labour). The small size of the farming unit in

Nigeria which dominate the agricultural production limits the degree of specialization, the amount of capital invested, the amount of labour employed and the amount of output (Arene, 2008).

Similarly, the biological nature of agriculture; dealing with living things (plants and animals) makes it difficult to be predicted unlike the manufacturing industry that can be easily handled, controlled and predicted at almost all the times. Agricultural production has been subjected to vagaries of nature and hence only partial control can be devised to control and handle the nature, therefore, decision making under this circumstance is almost difficult and very unpredictable (Arene, 2008). Additionally, the Broadness of agriculture to the effect of climatic conditions, seasonality of agricultural production and inelasticity of agricultural products demand good attention to forestall envisaged negative consequences. Accordingly, in as much as the circumstances surrounding agricultural production is concern, the decision to mobilize and allocate production resources (inputs) to produce output/products (produce) becomes inevitable as far as human beings coexist.

Production resources according to Arene (2012) can be classified as land, labour, capital, entrepreneurship/management and technology. He asserted the reason for considering technology as a factor of production been in a jet age and it refers to new, better and cheaper ways of doing things. Further, since levels of technology and methods of producing various commodities vary, the decision to identifying better options of production and more profitable enterprises is a worthwhile exercise that needs to be pursuits empirically.

Small scale farm operators are always confronted with problems and various production decisions,such decisions include; Why to produce? What to produce? How to produce? When to produce and for whom to produce? These critical questions and crucial decisions are frequently asked and taken daily by poor resource crop farmers and their households' members in most farming communities in Adamawa State. However, there are scanty empirical data that summaries this information for scholarly consumption, planning by policy makers and implementers and hence constitute the nexus for this research work. The outcome of this research is expected to explain how decision is taken by poor resource farmers and how to improve the quantity and quality of output, incomes of poor resource (crop) farmers, better the conditions and standard of their living which at the moment is abysmal. It will also guide them on how best to mobilize, and allocate their scarce resources more effectively, efficiently and profitably.

Questions addressed by this study include:What are the socio-economic characteristics of poor resource cereals – legumes farmers in the study area? What are the various enterprises engaged by the poor resource cereals – legumes farmers in the study area? What are the profit levels or margins of the various cereals – legumes enterprises in the study area? What are the factors influencing production decision of poor resource cereals – legumes farmers in the area?What are the challenges and opportunities of poor resource cereals – legumes farmers in the study area?

The main objective of the study was to analyze production decision of poor- resource cereals – legumes farmers in the study area. Specific objectives were to; describe the socio-economic characteristics of poor resource cereals – legumes farmers in the study area, identify the various enterprises engaged by the poor resource cereals – legumes farmers in the study area, estimate the profit levels of the various enterprises engaged by the poor resource cereals – legumes farmers in the study area, determine the factors influencing production decisions of the poor resource cereals – legumes farmers in the study area and identify challenges and opportunities of the poor resource cereals – legumes farmers in the study area.

The study hypothesized that individuals farm level factors such as availability of land, labour, capital, managerial skills and capacity building of the farmers does not influence the decisions of poor-resource cereals – legumes farmers in the study area. Also that other factors such as food security motives, income generation, price of agricultural inputs, market price of agricultural commodities and government policies does not influence the decisions of poor -resource cereals – legumes farmers in the study area.

Materials and Methods

Study Area

The State is located between latitude7and 11º North and longitude 11ºand 14º East. It has a land mass of 42,158 sq. km. The state is bounded by the Cameroun Republic to the east, to the south and to the west by parts of Taraba State and Gombe State (Adamawa State Planning Commission (ASPC), 2004). The state is a picturesque mountainous land transverse by River Benue, Gongola and Yadzaram(this rivers are good sources of irrigation and other agricultural activities such as livestock and fisheries). It has a tropical climate marked by distinct dry and rainy seasons. The rainy season starts in the month of April and ends in October. The average rainfall is 79mm in the north and 101mm in the south, the wettest months are August and September and ends in April.Relative humidity is 13 percent and average temperature is 15.2ºC and maximum of 39.7ºC (this are favorable to support the cultivation of so many crops). There are two vegetation zones namely the Sub-Sudan Zone and the Northern Guinea Savannah. The sub – Sudan Zone is marked by short grasses interspersed by short trees found in the northern part. To the south, the vegetation is thick, with tall grasses and trees.

Sampling Techniques

The target population was poor resource cereals – legumes farmers in the state.

Multi-stage, purposive and random sampling techniques were used to select the respondents. The state has four (4) Agricultural Zones demarcated by Adamawa State Agricultural Development Project (ADADP). All the four Zones were considered at the first stage. At second stage, two Local Government Area (LGAs) were purposively selected from each of the zone because of their high concentration of cereals-legumes farmers. At the third stage one (1) farming community waspurposively selected from each of the local government Area given a total of 8 farming communities. At the final stage, 25 farmers were randomly selected from each of the farming community which gave a total of 200 sampled respondents for the study. The sampling distribution is presented below:

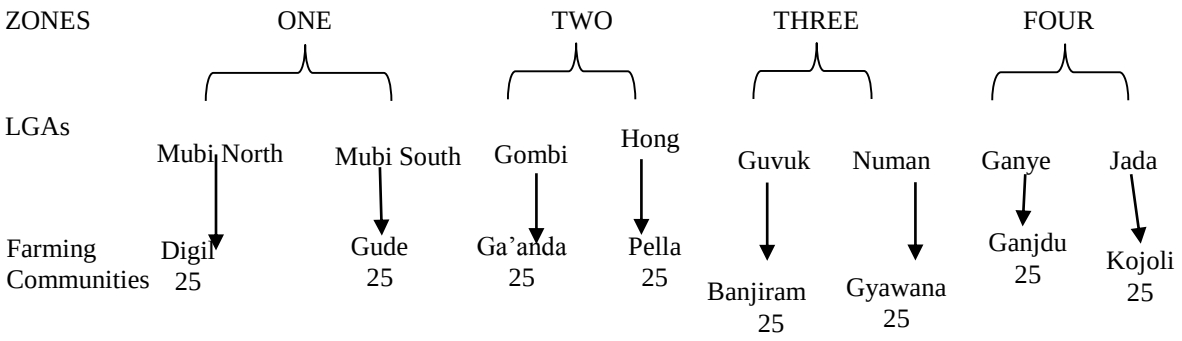

Figure. 1: A chart showing sampling distribution of the respondents

Method of Data Collection

Data for the study were collected using structured questionnaire supported with interviews which guided the respondents to fill the questionnaire.

Data Analysis

Descriptive statistics (frequencies and percentages) were used to discuss the socio- economic characteristics of poor resource cereals – legumes farmers, 3 points likert scale and chi – square analysis were used to determine the factors influencing production decisions while budgeting technique (Gross margin) was used to determine the profitability of the farmers.

Model Specification

The Farm Budgeting Technique

Net Farm Income (NFI) and Gross margin were used to determine the profit margin of poor resource cereals-legumes farmers. For this study the farm income per hectare were determined.

The farm budget model was specified as follows:

$$NFI = TR - TC$$

$$TC = TVC + TFC$$

Therefore

$$NFI = TR - (TVC + TFC)$$

Where

NFI = Net Farm Income
TR = Total Revenue
TVC = Total Variable Cost
TC = Total Cost

The components of (TVC) include: seed, fertilizer, herbicide and labour while the components of (TFC) include: land, knapsack, hoes, cutlasses and bicycles/motorcycles. The components of (TR) is the quantity of output produced Q in kg multiplied by unit price P in naira (PQ).

The above model was reduced to Gross margin due to insignificant (TFC) associated with small scale farm operation. The Gross margin model is specified as follows:

GM = TR – TVC

Where

TR and TVC as defined earlier

The Likert Scale

The 3 points-Likert scales were rated based on very significant, significant and not significant. The magnitude is trending from high to low opinion (1, 2 and 3) respectively.

The Chi – Square Analysis

Chi – square analysis was used to test the hypotheses of the study which were stated earlier in null forms. The formula for the chi – square is presented below:

$$x^2 = \sum \frac{(o-e)^2}{e}$$

Where

x^2 = Chi =square

o = observe response

e = expected response

Results and Discussion

Table 1: Socio-economic characteristics of the respondents

Characteristics	Frequency	Percentage (%)
Gender		
Male	160	80
Female	40	20
Total	**200**	**100**
Age		
< 20years	30	15
20 – 30	20	10
31 – 40	40	20
40- 50	60	30
> 50	50	25
Total	**200**	**100**
Marital Status		
Single	40	20
Married	120	60
Divorced	10	5
Widow	10	5
Widower	20	10
Total	**200**	**100**
Family size		
< 5	40	20
6-10	80	40
11-15	35	17.5
16-20	30	15
> 20	15	7.5
Total	**200**	**100**
Educational Background		
No formal	20	10
Primary	30	15
Secondary	50	25
OND/NCE	60	30
Undergraduate	30	15

Post – graduate	10	5
Total	**200**	**100**
Farming Experience		
< 5 years	30	15
6-10	70	35
11-15	40	20
16-20	35	17.5
> 20	25	12.5
Total	**200**	**100**
Income		
< 50,000	-	-
50,000 – 100,000	15	7.5
101,000 – 150,000	60	30
151, 000 – 200,000	70	35
201,000 – 250,000	30	15
> 250,000	25	12.5
Total	**200**	**100**
Farm Assets (Networth)		
< 100,000	5	2.5
101,000 – 150,000	15	7.5
151, 000 – 200,000	50	25
201,000 – 250,000	50	25
251,000 – 300,000	60	30
>300,000	20	10
Total	**200**	**100**

Source: Survey data, 2019

Table 1 presents result on socio-economic characteristics of poor resource cereals – legumes farmers in the study area. It shows that majority (80%) of the respondents were males while 20% were females. This result is in agreement with Anozie *et al*. (2012) who conducted a study on the effects of socio-economic characteristics of farmers on rice production in Ivo Local Government Area of Ebonyi State Nigeria and reported that majority (65%) of the farmers were male while the remaining 35% were females.

The result on age of the farmers reveals that majority (30%) were at their middle age (40-50 years). This result agree of with Anozie *et al.* (2012) who reported that, majority (50%) the farmers were within the age range of 51 – 60 years. Since majority of the farmers fell within the age bracket of 20-50 years, this implied that they were within their economically active age and Rhman *et al*. (2002) reported that, this category of farmers will respond positively to any intervention aimed at improving their productivity. The results also show that majority (60%) was married and majority (40%) had 6-10 persons as family members. The result also agree with Anozie*et.al*(2012) who reported that majority (57%) were married and had 5-8 persons in their household. The result on educational background of the farmers reveals that majority (30%) had OND/NCE as their highest qualification, (25%) had secondary education as highest qualification, (5%) had Post-graduate as highest qualification, while (10%) had no formal education. This implied that they had fair level of educational background.Since their educational level/background is fair, according to Anozie *et al.* (2012) it may enhance adoption of new technologies in production. Similarly, the result on farming experience of the farmers reveals that most of them (35%) had 6-10 years of experience. This implied that they have moderate farming experience. This also agree with Anozie *et al.* (2012) who reported that his respondents had above 10 years' experience in farming, meaning they must have acquired sufficient skills in production. It also shows that majority (30%) had moderate educational background (OND/NCE). Further, the results indicated that, morethan (60%) had an annual income generating capacity from farming of more than ₦150,000.00 and majority (90%) had a farm Assets (Net worth)of more than (₦150,000.00)

Table 2: Types of enterprise engaged by poor resource cereals – legumes farmers

Enterprise	Frequency	Percentage (%)
Maize	32	16
Rice	28	14
Sorghum	20	10
Millet	5	2.5
Sesame	7	3.5
Soya	10	5
Maize and cowpea	40	20
Maize and g/nut	12	6
Sorghum and cowpea	13	6.5
Sorghum and G/nut	11	5.5
Millet and G/ nut	4	2
G/nut and cowpea	8	4
Total	**200**	**100**

Source: Survey data, 2019

Table 2 presents result on the different types of cereals – legumes enterprises practiced by poor-resource farmers in the area. It showed that thirteen (13) different cereals- legumes enterprises were practiced by the poor- resource farmers in the study area. The result reveals that majority (20%) of the farmers practiced maize intercropped with cowpea, followed by sole maize (16%) and the sole rice (14%). The least practiced enterprises were millet intercropped with G/nut (2%), Groundnut intercropped with cowpea (4%) and millet and cowpea and sole soya beans (5%) respectively. The result indicated that cereals such as maize, rice and sorghum were commonly cultivated while legumes such ascowpea and G/nut were also cultivated but usually intercropped with other cereals. However, soya beans and sesame were commonly cultivated as sole crops in the area.

This result has shown that, the awareness of the importance of cereals in the food economy of Nigeria is on the increase. The result is in agreement with Ibrahim *et al*. (2012) who reported that cereals such as rice, sorghum, millet and maize accounted for about 72% of the area devoted to this food crops in 2005. However, Food and Agricultural Organization (FAO, 2010) also reported that in terms of area cultivated and volume of production maize comes third after sorghum and millet.

Ibrahim *et al.* (2012) further stressed that maize is particularly important for its velocity both in growth and uses. The study posited that, it is grown both in south – western and northern Nigeria. Furthermore,the study stressed that, the cultivation, processing and marketing of maize provide employment opportunities for several farming and non- farming households. He also reported that employment opportunities in turn provide important source of income and livelihood to growers, processors and the market women who engage in maize marketing activities.

This numerous importance of maize in the Nigerian economy could have been the reason why the Economic and Agricultural Transformation Agenda (ATA) policies put maize on the prominent position in the countries food economy. Additionally, maize is very important raw materials being sought after by several feed mills, flour mills and breweries in Nigeria. It is also being considered as a close substitute to wheat and rice. In supporting this assertion, Osundare (2008) had reported that, the import substitution policy in Nigeria had encouraged using maize as substitute for wheat in flour industry while maize and sorghum as substitute for barley in the brewery industry.

Similarly, the reason why rice ranked second as the most common cereal grown in the area could be due to the ban placed on rice and wheat importation to Nigeria.

Chianu (2000) reported, that the labour requirement for maize have been found to be lower than some root crops and the use of important seed varieties as well as the application of fertilizers and pesticides greatly enhances crop yields such that yields often doubles.

Table 3: Per hectare cost-returns analysis for different cereals – legumes enterprises

Enterprise	Benefit / Revenue	EOP/Expenses	Profit / Returns	Rank	Average yield Ha (tons)
Sole Crops	**TR (₦)**	**TC (₦)**	**π (₦)**		
Rice	225,000	155,000	70,000	5	1.5
Maize	195,000	135,000	60,000	6	1.3
Sorghum	195,000	110,000	95,000	3	1.2
Millet	130,000	70,000	90,000	2	1.3
Sesame	210,000	110,000	100,000	1	1.0
Soya	150,000	70,000	80,000	4	1.1
Mixed Crops					
Maize /Cowpea	300,000	160,000	140,000	3	
Maize/ G/nut	270,000	130,000	150,000	2	
Sorghum / Cowpea	310,000	130,000	180,000	1	
Sorghum / G/nut	260,000	150,000	110,000	5	
Millet/ Cowpea	270,000	150,000	120,000	4	
Millet/ G/nut	230,000	130,000	100,000	6	
G/ nut/ Cowpea	180,000	100,000	80,000	7	

Source: Survey data, 2019

Table 3 present results on costs and returns associated with different cereals –legumes enterprises. It shows that sole sesame, sorghum and millet ranked first, second and third among the sole crops with a returns of N100, 000, N95, 000 and N90, 000 per hectare respectively. The implication of this result is that, these crops were not commonly cultivated relative to rice, maize and soya. There is therefore need for sensitization of farmers on this aspect. Among the intercropped crops, sorghum intercropped with cowpea ranked first in terms of returns per hectare (N180, 000), followed by maize intercropped with groundnut N150,000 per hectare while maize intercropped with cowpea ranked third N140,000 per hectare. This result also implied that maize intercropped with cowpea which is the most practiced in the area was not the most profitable. There is need for sensitization of farmers too.

Table 4: Factors influencing decision of poor resource cereals – legumes farmers in the study area

Factors	Level of influence			
	Very significant Freq. per.	Significant Freq. per.	Not significant Freq. per.	Total per.
Availability of land	120 (60)	60(30)	20(10)	200(100)
Availability of labour	90 (45)	100(50)	10(05)	200(100)
Availability of capital	140 (70)	40(20)	20(10)	200(100)
Management skills	20(10)	150(75)	30(15)	200(100)
Food security (motives)	160(80)	25(12.5)	15(7.5)	200(100)
Income generation (motives)	70(35)	120(60)	10(05)	200(100)
Advisory services	80(40)	100(50)	20(10)	200(100)
Price of commodities	150(75)	30(15)	30(15)	200(100)
Price of inputs	80(40)	20(10)	100(50)	200(100)
Government policies	60(30)	130(65)	10(05)	200(100)

Source: Survey data, 2019

Table 4 present results on factors influencing decision of poor resource cereals – legumes farmers in their chosen enterprises. It shows that majority (80%) reported that household food security motives, price of commodity (75%) and availability of capital (70%) significantly affected production decision of poor resource farmers.

Table 5: Problems Facing Poor Resource Cereals-Legumes Farmers in the Study Area.

Problem	Level of influence			
	Very severe Freq. Per	Severe Freq. Per	Not Severe Freq. Per	Total per.
Conflict	120(60)	70(35)	10(05)	200(100)
Low price of commodities	100(50)	80(40)	20(10)	200(100)
High price of inputs	65(32.5)	130(65)	5(2.5)	200(100)
Poor road net work	50(25)	120(60)	30(15)	200(100)
Inadequate capital	110(55)	60(30)	40(20	200(100)
Inadequate labour	60(30)	135(67.5)	5(2.5)	200(100)
High cost of labour	70(35)	100(50)	30(15)	200(100)
Saving devices	60(30)	110(55)	30(15)	200(100)
Inadequate credit facilities	75(37.5)	90(45)	35(17.5)	200(100)
Inadequate extension / advisory services	80(40)	85(42.5)	25(12.5)	200(100)
Low profit	140(70)	55(27.5)	5(2.5)	200(100)
Inadequate storage facilities	70(35)	115(57.5)	15(7.5)	200(100)

Source: Survey data, 2019

Table 5 presents result on problems facing poor resource cereals - legumes farmers in the study area. It shows that majority (70%) complaint that low profit is affecting the enterprise very severely followed by conflict (60%) inadequate capital (55%) and the low price of commodities (50%). Similarly, majority complained that labour (68%) high price of inputs (65%) and poor road network (60%) affects their enterprise.

Table 6: Opportunities available to poor – resource cereals legumes farmers in the study area

Opportunities	Rating		
	Strongly agree Freq. Per.	Agree Freq. Per.	Not agree Freq. Per.
Household food security is guaranteed	180 (90)	10 (5)	10 (5)
Income is enough to provide basic needs	15 (7.5)	25 (12.5)	160 (80)
Serve as sustainable livelihood / employment	50 (25)	110(55)	40 (20)
Mitigate crime/ missives in the communities	20 (10)	170(85)	10 (5)
Serve as source of feed to animals	40 (20)	140 (70)	20 (10)
Serve as source of materials for shelter	30 (15)	160 (80)	90 (45)

Source: Survey data, 2019

Table 6 present results on opportunities of cereals – legumes enterprise in the study area. It shows majority (90%) of the respondents strongly agreed that their households' food security is guaranteed. Similarly, 85% of the respondents agreed that, it helps in mitigating crime in the area. While, (80%) and (70%) agreed that it serve as source of feed to their animals and provide materials for shelter respectively.

Table 7: Chi- square analysis of factors influencing decisions of poor – resource cereals- legumes farmers in the study area

Chi- square	DF= (c-1)(r-1)	Probabilitylevel(Alpha)	Decision
Hypothesis 1 x^2cal = 322.00 x^2tab = 9.49	4	0.05	The calculated chi-square is greater than the tabulated chi – square. The null hypothesis was rejected.
Hypothesis 2 x^2cal = 298. 25 x^2tab = 9.49	4	0.05	The calculated chi-square is greater than the tabulated chi – square. The null hypothesis was rejected.

Source: Survey data, 2019

Table 7 present results on chi – square analysis of factors influencing decisions of poor – resource cereals – legumes farmers in the study area. It shows that both the first and second hypotheses were rejected. Therefore,the study concluded that factorsearlier specified were responsible for influencing the decisions of poor- resource cereals – legumes farmers in the study area.

Conclusion

Male, middle aged, married, educated and well experienced operators dominate small scale cereals – legumes enterprise in the study area. More than 60% and 90% had income and farm asset of more than ₦150, 000 respectively. This result therefore shows that poor resource cereals- legumes farmers are fairly doing well, even though majority cultivate less than 2 hectares of farmland. Household food security motives ranked first as the reason for decision to cultivate chosen crops and this has been achieved since, majority has reported that, they were food secured in terms of household food requirement. Similarly, majority cultivated more than one crop and were generating surplus income to buy other food supplements and other households needs,constraints such as low returns from business, conflict between herders and farmers, inadequate capital and low access to credit facilities to facilitate procurements of basic inputs such as fertilizers, seeds and herbicides farmers.

Despite the above-mentioned challenges, the activities of poor resource cereals – legumes farmers in the area had offered the following opportunities in addition to food security and income motives is providing employment to majority of people in the communities and serve as sustainable livelihood in the area,mitigating criminal tendencies and youths in restiveness, while the bye-products from cereals – legumes enterprises serve as source of feeds to livestock's and also providing materials for making shelter.

Recommendations

Based on the findings of this study, the following were recommended towards improving the productivity and wellbeing of poor – resource cereals – legumes farmers in the study area and probably beyond;

1. Low returns on investment and low capital should be addressed through provision of timely and cheaper credit facilities to support purchase of productive resources (inputs) such as improved seeds, fertilizers, labour saving advices etcetera. Similarly, formation of farmer groups / association such as cooperatives will go a long way towards achieving this goal. Farmers can advocate for good price for communities and low price for inputs. Also deployment of extension personal to provide advisory services and build the capacities of the cereals – legumes farmers will boost their productivity.
2. Low price of commodities can be minimized through government intervention by buying at reasonable price at harvest time and selling to the end uses at fair price during slag period so that both farmers and consumers can benefit from price incentive. High price of inputs too could be minimized through government price incentive to farmers.
3. Government, Non – Governmental Organizations (NGOs) and communities should also intervene by providing support for storage facilities, improving marketing structures and road network for easy transportation of inputs and outputs.

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APPENDIX

Factors	**o – e**	**$(o - e)^2$**	**$\frac{(o - e)^2}{E}$**
Availability of land	180 – 100 = 80	6,400	64
Availability of labor	190 – 100 = 90	8,100	81
Availability of capital	180 – 100 = 80	6,400	64
Managerial skills	170 – 100 = 70	4,900	49
Capacity building	180 – 100 = 80	6,400	64
$\sum \frac{(o-e)^2}{e}$			322
Food security motives	185 – 100 = 85	7,225	72.25
Income generation motives	190 – 100 = 90	8,100	81
Price of inputs	180 – 100 = 80	6,400	64
Price of outputs	100 – 100 = 0	0	0
Government policies	190 – 100 = 90	8,100	81
$\sum \frac{(o-e)^2}{e}$			298.25
degree of freedom (r-1) (c-1)			4
Alpha significant level			0.05