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ANALYZING THE VALUE CHAIN OF HARICOT BEANS AND FACTORS AFFECTING THEIR PERFORMANCES IN RIFT VALLEY AREAS OF SOUTHERN ETHIOPIA: THE CASE OF GEDEO ZONE AND BURJI DISTRICT

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ABSTRACT

The main heading of this study was analyzing the value chain of Haricot Beans and the Factors affecting their Performances in the Gedeo zone and Burji district in Southern Ethiopia. Meanwhile, it was designed to assess the value chain activities, market channels, value chain actors, and the factors that affect their performances. In the ways of collecting data both descriptive and explanatory research designs as well as qualitative and quantitative research approaches were used in this study. Totally 252 sampled respondents participated in this study and the data of the study were obtained from both primary and secondary sources. Questionnaires and interviews were used to collect primary data and the secondary data were obtained from reports, books, and published and unpublished documents. Regarding the analysis of data, the qualitative data were analyzed through narrative analysis, and the quantitative data were analyzed by using simple descriptive statistics. Further, a linear regression model was used to estimate the relationships between the dependent and independent variables of the study. The study found that many value chain actors including supporting actors, input suppliers, producers, traders, local processors, brokers, transporters, and consumers participate in the value chain of Haricot beans. As they differ by their nature these value chain actors perform input supplying, land preparation, sowing, growing, weed controlling, harvesting, post-harvest storage, marketing, training, and extension and credit services value chain activities specifically.

KEYWORDS
Gedeo, Burji, value chain, haricot bean, value chain actors, market channels.

JEL CODE
M11

1. BACKGROUND OF THE STUDY

In Ethiopia numerous variety of crops are planted by large number of farmers. Due to this the country is known as the homeland of several produces. Among the crops grown in the country pulse is one and it ranked the country 13th among the pulse supplying countries in the world (FAO, 2015). In Ethiopia a different variety of haricot bean types are grown in different regions of the country. The well-known varieties of beans grown in Ethiopia include the mottled, red, white and black varieties. From these varieties the pure red and pure white colored beans are the most common commercial varieties (Ferris and Kaganzi, 2008). In Ethiopia many smallholder farmers grow Haricot beans for monetary and dietary purposes. Its relevance for smallholder farmers to produce it abundantly is justified by the quick maturity time, high nutritional content, cheap input demand, and improvement of soil fertility as well as its ability to boost export revenues, employment generation, and food security for the country's economy (Selam, 2020). For the production of Haricot beans Ethiopian small-scale farmers have excessive chances to produce and export large amounts of Haricot Beans all over the world. These opportunities include a high request for quality Haricot Bean on the world export market, the appropriate climate of the country, little production costs of Haricot Beans, availability of farming land, and the right to use the port of Djibouti (Bisschop and Dijk, 2007). According to research, Ethiopia produces 100–200 thousand tons of beans annually where approximately 35–40 thousand tons of beans are exported through Djibouti to foreign markets. At the same time, an estimated 10,000 tones are dispatched to Kenya through the Moyale border (Ferris and Kaganzi, 2008). The exports of Haricot beans boost the national economy by roughly USD 134 million per year (ERCA, 2015). In Ethiopia, the movements of the Haricot Beans from farmers to consumers are viewed as the river where a little amount of them are produced by a large number of smallholder farmers over a wide area. Before they are delivered to the central market of Nazret they are collected by registered or unregistered village or urban center small traders from isolated local markets. Then, they are delivered to district-level suppliers and transported to central wholesale markets (FAO, 2015). In these processes, input suppliers, producers, assemblers, cooperative unions, retailers, whole-sellers, and exporters have participated in its operations as specific actors (Broek et.al, 2014).

2. STATEMENT OF THE PROBLEM

Among the important pulse crops found in Ethiopia and the world, one is Haricot Bean. It takes the first position in a global context and ranks second next to Faba Bean at the national level (Gebriel, 2018). However, its value chain faces multidimensional problems due to various hindering factors. Among the affecting factors one is financial restriction. Financial restrictions push producers to sell off their products immediately after harvest when selling prices are small (Tewodros, 2013). Also, shortage of market information, low quality of the product, disjointed suppliers, stretched value chain networks, extreme transaction costs, and absence of quality controlling and grading systems are other factors that affect the value chain performances of Haricot beans (Ephrem, 2016). Likewise, the nonexistence of extension services, low farming experiences, absence of access to credit, distance from access roads, and lack of support activities are major constraints of Haricot Bean value chain activities (Gebriel, 2018). Above all, even though there is a huge demand for Haricot beans in the local and global market by different consumers,

still its production, marketing, storage, and distribution face a number of problems. Thus, this shows a need for a more comprehensive and holistic study that would examine and suggest necessary remedial measures that will resolve the existing constraints of the Haricot beans value chain in the study area. But, we got limited studies like Agete (2014), Ephrem (2016), Shewaye et.al. (2016), Hunegnaw (2017), Gabriel (2018), Selam (2020) and Adino et.al, (2021) in Ethiopia that have been done before this study on Haricot bean crops. Unfortunately, the aforementioned studies deal with Haricot bean market issues than the Haricot bean value chain and factors affecting its performance. From these, researchers recognized that the previous studies do not consider the problems of Haricot beans before the marketing stages like constraints of input supply, farm preparation, sowing, weeding, disease controlling, pest controlling, harvesting, and storage. Moreover, in the current study's districts even though there is an abundant production of Haricot beans we haven't seen any previous studies conducted on the current study's problem. So, these are gaps we identified from the former works of literature. Therefore, the main motive of this research was to fill these gaps based on the specific questions of this research and by searching answers for to the research questions given hereunder.

3. OBJECTIVES

This research was designed based on the following specific research objectives:

1. To overview value chain activities of Haricot Bean in study Districts
2. To observe the market channel of Haricot Bean in its value chain
3. To outline actors within the value chain of Haricot Bean in the study districts
4. To identify major factors that affects the Value chain performances of Haricot bean in the study area

4. RESEARCH QUESTIONS

This study was done by answering the following research questions

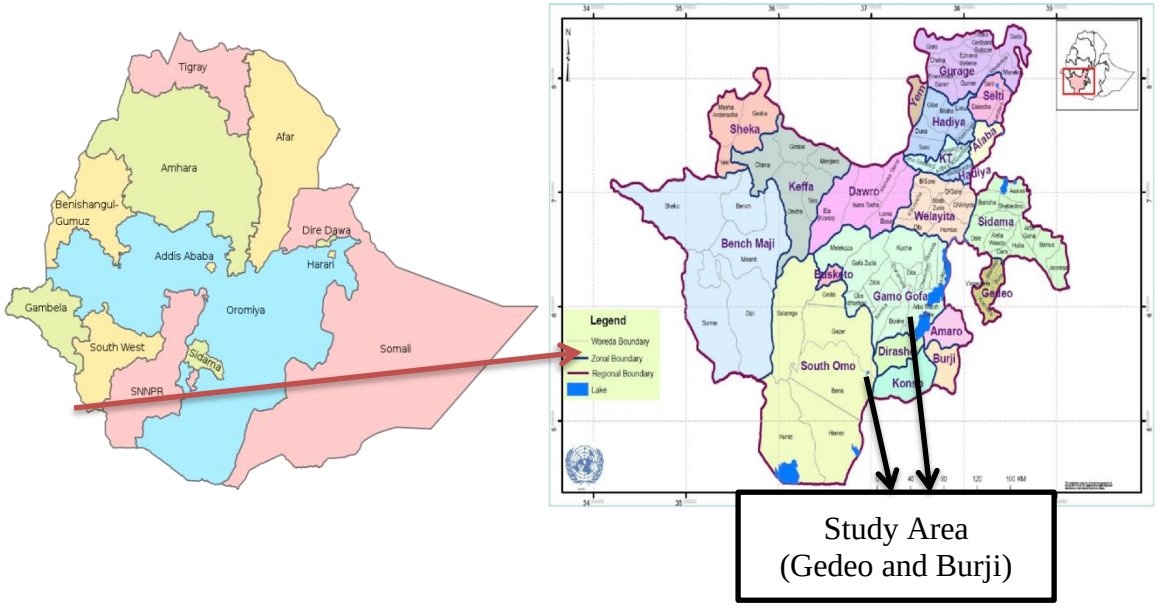
1. What are the value chain activities of Haricot Bean in the study Districts?
2. How the market channel of Haricot Bean is mapped from farmer to consumer?
3. Who are actors within the value chain of Haricot Bean in the study districts?
4. What are factors affecting the Value Chain performances of Haricot bean in the study districts?

5. RESEARCH METHODS

STUDY AREA

This study was done in the Gedeo zone and Burji districts in the rift valley areas of Southern Ethiopia. The Gedeo zone is one of the provinces in the rift valley area of Southern Ethiopia. Gedeo shares its northern border with the Sidama Region and Dilla serves as the zone's administrative center. The Oromia Region also borders the zone on the east, south, and west. The altitude of the Zone ranges from 1268 meters above sea level in the vicinity of Lake Abaya to an elevation of 2993 meters at Haro Wolabu Pond. The Gedeo economy is mainly based on their historical heritage of Enset-based agro-forestry and it is the origin of Yirgacheffee coffee which is preferable by a large number of consumers globally. Besides, another district of this study was the Burji district. Burji nationality lives near to Southwest of Lake Abaya and Lake Chamo which is 280km far from the Northern Kenyan border. They mainly depend on agriculture and the woreda is bordered by the Western Guji Zone to the East and Borana Zone to the South, Amaro special Woreda to the North, and Konso Zone to the West. The population of the woreda resides in different agroecological zones living on mixed agriculture by growing different varieties of crops where 'Teff' and Haricot Bean/Bura Burje/ take the prominent share.

FIGURE 1: MAP OF STUDY AREAS



Source: Google Image

RESEARCH DESIGN

In this study, both descriptive and explanatory research designs were implemented to describe the study problem and explain the problem of this study which has not been well studied and explained previously. Further, mixed (qualitative and quantitative) research approaches are used to collect and analyze the subjective and objective responses of respondents. Also, the data of this study were collected from both primary and secondary sources of data. Hence, the primary data were obtained from Haricot bean producers, traders, extension service experts, and Trade and Industry development office workers through questionnaires and interviews where secondary data were obtained from reports, books, and published and unpublished documents to make the study comprehensive. The Haricot bean producers, traders, kebele development agents, and Trade and Industry office workers were the population of the study who had participated in interview and questionnaire. To select respondents three stages of sampling techniques were employed where woreda, kebele, and households were selected at the first, second, and third stages respectively. In the Gedeo zone from eight woredas Gedeb, Kochore, and Wenago were selected randomly in the first stage. Then in the second stage, Harimufo kebele from Gedeb woreda, Buno Kebele from Kochore woreda, and Deko Kebele from Wenago woreda were also selected randomly. In the third stage, 57 respondents among which 30 producers 10 of each from three kebeles, 15 traders, and 6 extension workers from similar aforementioned kebeles were selected for interview. Additionally, 6 trade and industry office workers 2 of them from three woreda of Gedeo zone namely Gdeb, Kochore, and Wonagao were selected purposively for interview. Similarly, three-stage sampling techniques were employed in the Burji district where Burje and Galana clusters were selected randomly in the first stage. In the second stage from selected two clusters six kebeles namely Kilicho and Mure from the Burje cluster and Wordeya

Gude, Raleya Bila, Gera, and Walaya Kebeles from the Galana cluster were selected. In the third stage, from selected six kebeles sampled Haricot Bean producers were selected randomly for the questionnaire by using a simple random sampling technique. The sample size of Burji district were determined by Khotari (2004) sample size determination formula which is based on, Z= 1.96 to 95%, p = 0.5, q= 1-p, e^2 = 0.07 and N=2602

$n= \frac{z^2 N.p.q}{e^2(N-1)+z^2 p.q}$

Where: N= total households; n = size of the sample; Z= standard variation at a given confidence level; P= proportion of successes; q = proportion of failures; e^2 = acceptable error

$n= \frac{z^2 N.p.q}{e^2(N-1)+z^2 p.q}$ we found that $n=\frac{2602}{14.2}$= 183

TABLE 1: SAMPLE SIZE OF BURJI DISTRICT

No	Selected Kebele	Number of Household	Percentage share	Sample Size
1	Kilocho	427	16.3%	30
2	Mure	421	16.1%	30
3	Gude	431	16.5%	30
4	Bila	459	17.5%	32
5	Gera	399	15.6%	29
6	Walaya	465	17.7%	32
	Total	2709	100%	183

Source: Own Design, 2023

As shown in Table 1 above 183 Haricot beans procedures/farmers participated in a questionnaire in the Burji district. Additionally, 6 extension service workers, 4 licensed local traders, and 2 Trade and Industry development office workers total of 12 respondents were interviewed from the Burji district. In general, the total sample size of the study was 252 respondents where 57 of them were from the Gedeo zone and 195 of them were from the Burji district. Further, the data were analyzed in mixed data analysis methods. Here, qualitative data of research were analyzed narratively, and quantitative data were analyzed in simple descriptive statistics. For collecting data first of all we get a go-ahead permission from Dilla University. During the distribution of the questionnaire, respondents were informed about the purpose of the study along with their full right to refuse or completely reject participation. Also, we told the respondents about their responses would be kept confidential and their identity would not be exposed. To estimate the relationship between the dependent and independent variables of the study we used the linear regression model as presented here under

Yi = β0+ β1VA+ β2IVCAC+ β3 MC + β4AF + €

Where: Y = the outcome/Value chain Performances of Haricot beans/

VCA= Value chain activities, VCAC= Value chain actors, MC= Marketing Channel, AF= Affecting factors of value chain performances, €= standard error, β0= is the intercept term- constant which would be equal to the mean if all slope coefficients are 0. β1, β2, β3, β4 are the coefficients associated with each independent variable which measures the change in the mean value of Y, per unit change in their respective independent variables. In this study we used Cronbach's Alpha as a standard test for questionnaires' consistency. Regarding to this, Tavakol and Dennick (2011) reported as Cronbach's alpha of less than 0.5 is unacceptable, Alpha less than or equal to 0.6 is poor, Alpha less than 0.7 is questionable and Alpha equal to or greater than 0.7 is acceptable. Besides, the validity of content was assured by using various previous sources of literatures and the construct validity was assured by structuring the questionnaire according to the specific objectives of the study.

6. RESULT AND DISCUSSIONS

TABLE 2: DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Gender	Male	Female				Total
	113(61.7%)	70(38.3%)				183(100%)
Marital Statues	Single	Married		Divorced		
	30(16.4%)	148.8(80.9%)		5(2.7%)		183(100%)
Ages	< 20	20-29	30-39	40-49	>50	
	14(7.7%)	37(20.2%)	66(36.1%)	38(20.8%)	28(15.3%)	183(100%)
Education Levels	Illiterate	Grade 1-8		Grade 9-12	>12	
	35(19.1%)	96(52.5%)		31(19.1%)	21(9.3%)	183(100%)
Farming experiences	<5 years	5-15 years		>15 years		
	12(6.5%)	101(55%)		70(38.5%)		183(100%)

Source: Survey Result, 2023

The result of study respondents' male respondents was highly participated than females and the majority of respondents were married. Also, a high number of respondents were at a productive age level and most of them have education level from grade 1 to 8 and majority of them had long time experiences which were more than 15 years.

PRODUCTION TRENDS OF HARICOT BEAN IN STUDY AREA

The finding of this research shows in the Burji district Haricot bean is the leading crop in production and marketing. In this area the 1st adapted variety of Haricot bean was called 'Kenya' because it was imported from Kenya. But currently it is known as 'Bura Burje'. In Burji almost all farmers practice sole cropping, rain fed and traditional farming which uses human labor and ox powers. On other side, in the Gedeo Zone Haricot bean is optional crop where most of farmers produce it for home consumption rather than selling. As well, small-scale farmers practices intercropping systems i.e., growing Haricot beans with other crops like maize, Enset, banana and coffee. This was due to shortage of farming land which is covered by large number of populations resides in the zone.

TABLE 3: BURA BURJE HARICOT PRODUCTION FROM 2020-2022 IN BURJI DISTRICT

Year	Allocated land for Production	Product Gained
2020	11160 Hector	222,300 quintals
2021	5580 Hector	89,280 quintals
2022	4487 Hector	17,948 quintals

Source: Burji Special woreda Office of Agricultural and Rural Development Office report, 2022

Table 3 above shows the size of land and the Haricot beans gained in Meher season in three successive years in the Burji district. The result shows both the allocated land size and production level of Haricot beans had decreased extremely. For this it has reported as shortage of rainfall and social instability at the border areas with Western Guji Suro-Barguda area communities of Oromo ethnic groups were the main reason that limits its production in this district.

FIGURE 2*:* IMAGE OF BURA BURJE HARICOT BEAN AT GROWING STAGE

Source: photo captured by researchers, 2023

VALUE CHAIN ACTIVITIES

In both the Gedeo zone and Burji district interlinked value chain activities were carried out by different value chain actors. These were supplying farming inputs to farmers, receiving and using inputs, land preparation (clearing and plow), sowing, growing, weed controlling, harvesting, post-harvest storage, marketing (selling and buying), training, extension, and credit services. As the data revealed farming inputs like seeds, fertilizer, herbicides, pesticides were supplied by traders and Agricultural and rural development offices of Woreda. Besides, land preparation, sowing, growing, weed controlling, harvesting, post-harvest storage, and handling activities were done by the family members' of producers.

MARKET CHANNELS

As cited by Kotler and Armstrong (2003) marketing channel is a business structure of interdependent groups that reach a product from the point of production to the destination of final consumption. The market channel of Haricot beans in the current study area starts with small farmers and passes different stages to reach the final consumer. In the Gedeo zone, four market channels of Haricot beans are identified among which the first channel was the shortest that connects farmers and consumers directly without the involvement of market intermediaries. But, in the second, third, and fourth channels of Haricot bean markets local collectors, wholesalers, and retailers were involved between producers and consumers. Above all, the first market channel was the shortest one and the fourth market channel was a little bit longer than others where local collectors, wholesalers, and retailers were involved between farmers and consumers.

FIGURE 3*:* MARKET CHANNEL OF HARICOT BEANS IN GEDEO ZONE

Channel I: Farmers →Consumers

Channel II: Farmers→Local Collectors →Consumers

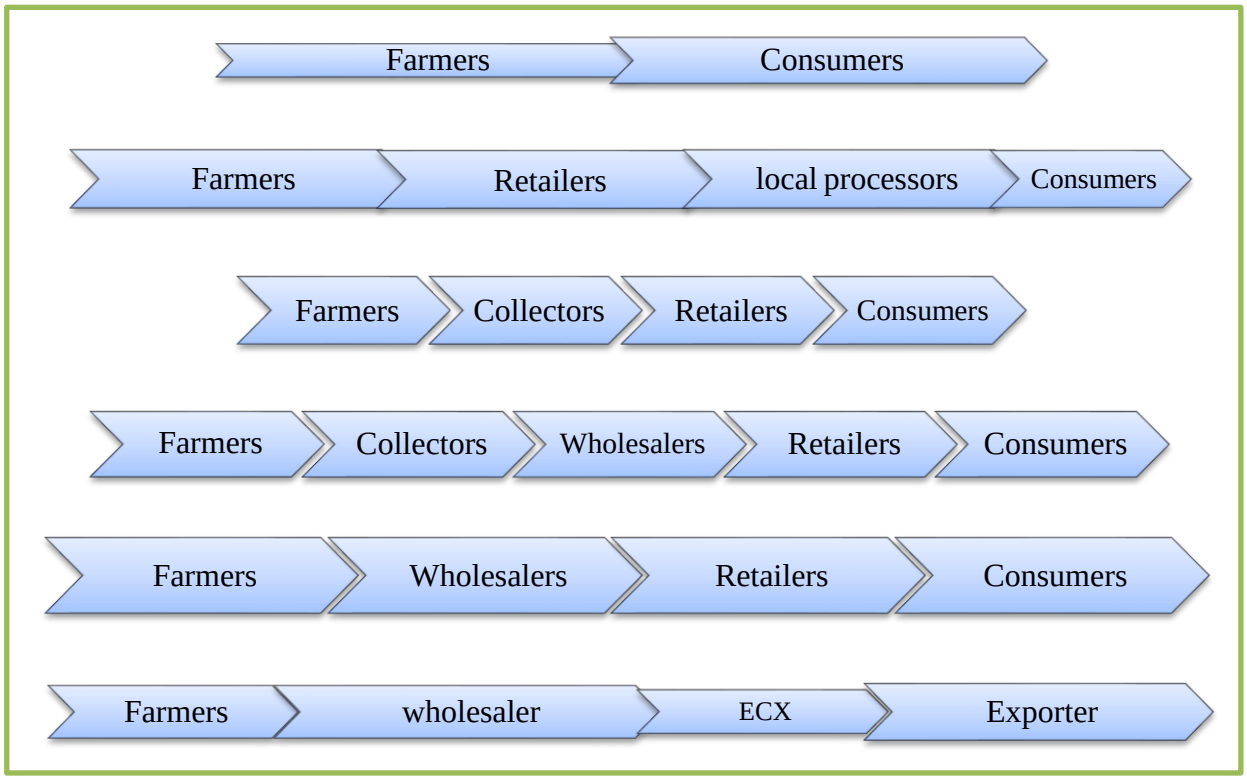
Channel III: Farmers → Retailers → Consumers

Channel IV: Farmers →Local Collectors → Wholesalers → Retailers → Consumers

Source: Interview result, 2023

Similar to the Gedeo zone, the market channel of Haricot bean between producers and consumers were long in the Burji district. Also, the produce of Haricot beans moves from farmers to consumers either legally or illegally. In legal flow, Haricot beans were traveled by traders who have legal trading licenses. On another side, a large amount of dry Haricot beans was dispatched from Burji to Northern Kenya as illegal cross-border trade, especially to Marsabit County. For this illegal cross-border flow of beans, the blood relationship of the Marsabit county people of Kenya with the Ethiopian Burji people was one enabling factor. Also, the blocking of the Burji to Bule Hora, and Burji-Amaro-Dilla route because of unsolved security problems occurred at the administrative border of Guji and Burji ethnic groups were another critical factor that gives a wide opportunity for illegal traders to move this product beyond the border of the country illegally. Above all, our research identified six market outlets of dry Haricot beans from farmers to final beneficiaries in the Burji district as presented here under.

FIGURE 4: MARKET CHANNEL OF BURA BURJE HARICOT BEAN



Source: Researchers, 2023

In study area**,** input suppliers, farmers, traders, transporters, local collectors, and consumers were the main value chain actors of Haricot beans that overtakes various activities.

Supporting actors: They are the value chain actors who provide supportive services of training, extension, and credit for other value chain actors. In the study area, agricultural and rural development office workers, cooperative work office workers, and Kebele agricultural extension workers/development agents were the main supporting service-providing actors who play a central role in the awareness creation of production, storing, and marketing of beans. Also, the micro-finance institution was a value chain supporting actor that was responsible for providing credit services for various value chain actors.

Input suppliers - they are the value chain actors responsible for supplying farming inputs like fertilizer, herbicide, pesticides, and other farming implements. In this study area, the Office of Agriculture and cooperative work were the main fertilizer suppliers for local farmers, and traders were also involved in supplying herbi-cides; pesticides, and farm implements in their shops.

Farmers - they are small-scale farmers who prepare land, Sow and grow beans, control weed, pest, and diseases as well carry harvesting, post-harvest handling, and marketing activities specifically.

Local collectors - they are part-time collectors or represented actors assigned for collecting produce at primary markets from farmers. Specifically, they were responsible for negotiating market prices, buying a few bags of beans from many farmers, storing them for some duration of time, and finally dispatching it to the body who assigned them by pack animals and small trucks.

Brokers - They are the value chain actors who connect buyers and sellers together. But, in our study area producers complained that due to cheating marketing information of brokers, they have no trust in brokers.

Retailers - Retailers are the value chain actors that buys Haricot bean from farmers or wholesalers and sell them to end users or customers.

Wholesalers - These are the value chain actors who purchase large volumes of Haricot beans from different sources and resell them to exporters than selling them directly to the ultimate consumers. In the study area, they are small in number and have strong financial resources as well as management-know when compared with other value chain actors. Besides, they have good storage, transportation, and communication access than other actors.

Transporters: they are value chain actors who move Haricot beans from farm to home, from home to marketplace, and from marketplace to other destinations of consumption.

Local processers -They obtain beans directly from farmers or from retailers and take the milling process to make food like 'Shiro'.

Consumers- they are the final value chain actors who buy the beans for consumption purposes.

FACTORS AFFECTING THE VALUE CHAIN OF HARICOT BEANS IN STUDY AREA

Socio-economic and input factors are affecting the value chain of Haricot beans in the study area - These are farmers-related factors such as illiteracy, lack of training, not using improved bean varieties, obeying to use fertilizer/using the unbalanced ratio of fertilizer with beans, low farming income, traditional farming practices of farmers as well as input related factors such as high cost of farming inputs (fertilizer, herbicide, and pesticide), shortage of farming lands, delay in supplying fertilizer, lack of irrigation with a combination of weed, disease, and insects. In the study area, the illiterate and low educational background farmers are not active to accept new agricultural extension directions provided by the government to upgrade the production levels of beans and have no ability to record and use market information. Similarly, inexperienced and untrained farmers have low skills how to use fertilizers and pest control chemicals. Also, farmers with low farming incomes cannot buy farming inputs and other necessities on time which contributes to extra production.

The lack of proper storage facility is affecting the value chain performances of Haricot beans in the study area - availability of proper storage facilities help farmers and traders to ensure the quality of beans and get a price advantage after harvesting season. Because during harvesting time large amount of beans are supplied to the market which reduces purchasing demand of consumers which will in turn reduces the selling price of beans. But, the finding of this study shows the lack of proper storage facilities for farmers and traders in the current study area. During our research, we observed that farmers stored their beans under the roof of their homes with simple packing materials. Due to this, the harvested beans are exposed to sun, rain, moisture, and theft. These also resulted in a decrease in product quality and supply to the market. Because of these farmers do not store their beans with them for more than two months. Similarly, traders who purchase Haricot beans in large quantities store them in the market areas by covering them with unsecured covering materials until they dispatch them to export-ers. Consequently, we observed the loss of products with thefts and other factors particularly in the Burji area.

Marketing factors are affecting the value chain performances of Haricot beans in the study area - these are factors that are related to marketing information, market accessibility, selling price, and involvement of brokers in the marketing process of beans. So, it has been reported as small-scale Haricot bean producers have no on-time marketing information because of their inability to use modern information-seeking devices. They get marketing information through telephone

calls from different value chain actors and brokers are the main sources of marketing information. Further, traders and brokers have high power to decide the price of beans in the market. Also, there is a long marketing channel of haricot bean between producers and consumers which creates a delay in supply and increase the cost of transactions. Furthermore, remoteness of farmers from central markets, cheating in weighting machines, and fluctuating marketing prices of beans were some of the market-related factors that have been affecting the value chain performances of beans as reported by sampled respondents in the study area.

Environmental factors are affecting the value chain performances of Haricot beans in the study area - these are ecological factors including shortage/surplus of rains, deterioration of soil, disease, and pests that are limiting the production and supply of beans in the study area.

Transportation factors are affecting the value chain performances of Haricot beans in the study area - here the collected data revealed as due to the poor conditions of roads and the lack of access to means of transportation, the movements of beans from producers to consumers are costly and time-consuming. These challenges enforce producers to use human power (on the head, shoulder, and back), packing animals and motorbikes to transport their produce. This was also time-consuming and unsafe for users which related to accidents and damage to their products.

Extension, Credit, and Training Service factors are affecting the value chain performances of Haricot beans in the study area - the respondents of the study have complained that the existing extension services were poor and unsatisfactory due to the limited number of development agent workers services for all crops in a given Kebele. Besides, it has been reported as the Omo-micro finance institution is the only institution that gives credit to most value chain actors. Besides, there is limited access to credit and the service given by this institution is bureaucratic and time-consuming. Similarly, even if it has initiated to promote knowledge of farmers how to use modern agricultural technologies, and accept and adopt new varieties through training the existing evidence shows that there is a shortage of farmers training in the study area. Also, there is a lack of and poor existence of Farmer's Training Centers (FTCs) in the study area.

TABLE 4: RELIABILITY OF QUESTIONER DIMENSION

Category	Cronbach's Alpha (α)	No. of Items	Comments
Value chain activities	0.828	7	Accepted
Market Channel	0.836	5	Accepted
Value chain actors	0.726	6	Accepted
Value chain performances	0.992	6	Accepted
Affecting factors of Value chain	0.861	7	Accepted
Overall reliability	0.905	31	

Source: Survey SPSS result, 2023

Table-4 above shows that all the variables had Cronbach's Alpha greater than the acceptable value of 0.7. Also, it has been shown that the value chain actors have the least internal consistency of 72.6% while the value chain performances have the highest internal consistency of 99.2%. Above all, all variables in the model have Cronbach's Alpha (α) value greater than 0.7 which is an acceptable value.

Correlation Analysis

According to Dancy and Reidy (2004), the coefficient of correlation could take values ranging from -1 to +1, where the signs signify the direction of the relationship. A correlation value of 0 implies the absence of relationships among variables, a result between 0.1 and 0.3 indicates weak relationships, a result between 0.4 and 0.6 shows moderate relationships, a result of 0.7 and 0.9 specifies strong relationships and a result of 0.9 to 1 shows very strong relationships and a correlation coefficient of 1 suggests a perfect relationships between variables. Thus, in this study, Bivariate Pearson Coefficient (r) was used to examine the relationship between the four value chain dimensions using a two-tailed test at a 95% significance level, P <0.05. To that end, a correlation analysis was conducted to determine whether a statistically significant relationship existed between the dimensions of independent variables (value chain activities, marketing channel, value chain actors, affecting factors of the value chain) and the dependent variable, namely Haricot beans value chain performance. Hence, the correlation analysis of this study is presented in the subsequent table:

TABLE 5: CORRELATION ANALYSIS

		VCA	MC	VCAC	AF	VCP
VCA	Pearson Correlation	1	-.184*	.035	.441**	.774**
	Sig. (2-tailed)		.013	.641	.000	.000
	N		183	183	183	183
MC	Pearson Correlation		1	.414**	-.001	-.083
	Sig. (2-tailed)			.000	.989	.264
	N			183	183	183
VCAC	Pearson Correlation			1	.419**	.110
	Sig. (2-tailed)				.000	.138
	N				183	183
AF	Pearson Correlation				1	.635**
	Sig. (2-tailed)					.000
	N					183
VCP	Pearson Correlation					1
	Sig. (2-tailed)					
	N					183

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table-5 above presents the correlation coefficients and the respective significance of the correlation. Accordingly, value chain activities and value chain performances have strong positive and significant relationships (r=0.774, p=0.000) at a 0.01 significant level. Also, the marketing channels and value chain actors have weak negative and insignificant positive relationships (r) =-0.083 and p=0.264 and weak positive and insignificant positive relationships (r) = 0.110 and p= 0.138 with value chain performances of Haricot beans respectively. Again, the Pearson moment correlation coefficient of affecting factors of the value chain with value chain performances shows that there is a moderate positive relationship with a Pearson coefficient of (r= 0.635, p=0.000) with a significance value at 0.01 level. To sum up the correlations of dimensions results the analysis implies that at a 0.01 level of significance, it was discovered that value chain activities and affecting factors of the value chain of beans play a significant role in determining the value chain performance of Haricot beans in the study area. The highest correlation is signified by value chain activities (r= 0.774), followed by affecting factors of the value chain (r=0.635), value chain actors (r=0.110), and marketing channels (r=-0.083) respectively. From this, we can understand that as their value falls between -0.083 and 0.774, low to high positive correlations are found between the three independent variables namely value chain activities, value chain actors, and affecting factors of the value chain and the value chain performances of Haricot beans (dependent variable). But a negative correlation is found in one independent variable (marketing channels) with the dependent variable of value chain performances of Haricot beans.

Regression Analysis

Linear regression analysis is a method of estimating the value of the dependent variables on independent variables (.Marczyk et.al, 2005). So, in this study, the predicting power of independent variables on the dependent variable through linear regression is reported hereunder

TABLE 6: MODEL SUMMARY

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.846[a]	.715	.709	.74968

a. Predictors: (Constant), AF, MC, VC, VCA

Source: Survey result, 2023

In Table 6, the coefficient of correlation R is 0.846 which indicates the strong positive correlation between the dependent and independent variables of the study. The coefficient of determination R square is 0.715, which means that our independent variables of the study cause 71.5% variations in the dependent variable. This further implies that there are other factors (not covered in this study that explains the remaining 28.5% in the value chain performances of Haricot beans in the study district.

TABLE 7: ANOVA

Model		Sum of Squares	DF	Mean Square	F	Sig.
1	Regression	251.210	4	62.803	111.743	.000[b]
	Residual	100.041	178	.562		
	Total	351.251	182			

a. Dependent Variable: Value chain performances of Haricot beans

b. Predictors: (Constant), AF, MC, VC, VCA

The ANOVA table 7 above indicates that the overall model was in a good fit with statistical (F-value=111.7 and P-value =.000 < 0.01. In a linear regression analysis of such sort, the ANOVA test shows the acceptability of the model from a statistical perspective. Accordingly, the regression row indicates the extent of variation explained by the model, whereas the residual row indicates information about the variation that is not accounted for in the model, i.e., variation on the dependent variable explained by factors not included in the model.

TABLE 8: COEFFICIENTS OF THE VARIABLE

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.924	.302		-6.377	.000
	VCA	.143	.011	.609	13.296	.000
	MC	.021	.012	.078	1.712	.089
	VCAC	-.032	.013	-.117	-2.353	.020
	AF	.088	.011	.415	8.259	.000

a. Dependent Variable: Value chain performances of Haricot beans

Table 8 shows the coefficient result of the study. The un-normalized coefficients β1 to β4 are the coefficients of the anticipated regression version. Thus, the value chain performance of Haricot beans therefore is written as:

$Y = \alpha + \beta1*X1 + \beta2*X2 + \beta3*X3 + \beta4*X4 + £i$

Where, α= is the intercept term- constant

Y= Value chain performance of Haricot beans, X1 = value chain activities, x2= Marketing channel, X3= Value chain actors, X4= Affecting factors of Haricot value chain

$Y=1.924 + 0.143X1 + 0.021X2 + .032X3 + 0.088X4$

The findings indicate that in the absence of the predictor variables, the value chain performance of Haricot beans in the Burji district equals 1.924. Similarly, a unit increase in value chain activities increases the value chain performances of Haricot beans by 0.143. The implication of this outcome is that effective value chain activities can enhance the value chain performances of haricot beans in the study district. At the same zero value, one unit increase in marketing channel and value chain actors increases performance by 0.021 and 0.032 respectively. Also, one unit increase in affecting factors of the value chain resulted in 0.088 increases in value chain performances of Haricot beans in the study district.

7. CONCLUSIONS

In the Gedeo zone and Burji district, the Haricot beans are produced for home consumption and generating cash purposes. In the value chain of Haricot bean input suppliers, farmers, collectors, traders, local processors, transporters and consumers are the major value chain actors who perform various value chain activities including inbound logistics activities (supplying, receiving, warehousing, and distributing of farming inputs like fertilizer, herbicide, pesticide), production activities (land preparation, input supply, sowing, weed controlling, disease controlling, pest controlling, harvesting, post-harvest storage, and handling), marketing activities such as transporting, selling and buying of beans and services(providing extension, credit and training services) to the value chain actors. Further, delays or short-ages of supplying and distributing fertilizers, herbicides, and pesticides to farmers, weak integration of value chain actors, traditional farming practices, and poor storage and handling practices which is exposed to loss and damage of beans with moisture, sunlight, and pests, lack of timely market information, low bargaining powers of farmers in marketing, unnecessary interventions of Brokers, poor transportation access, conflicts, deterioration of soil, shortage/excess of rainfall, disease, and pests as well as weak agricultural extension, training and credit services were factors which are influencing the value chain performances of Haricot beans in the study area.

8. RECOMMENDATIONS

Based on the findings of the study, the following recommendations are made in order to ensure effective value chain performances of Haricot beans in the study area

- Farming inputs especially fertilizer, herbicide, and pesticide should be supplied and distributed to farmers timely with affordable cost.
- To increase the competitiveness of the Haricot bean in the global market the existing Haricot beans variety should be replaced by an improved variety that resists disease and has competent quality.
- Training should be given continuously for value chain actors concerning production, marketing, transportation, and storage.
- The value chain activities of beans should add value at each stage rather than stretching the chain between producer and consumer.
- There should be strong bondage between the value chain actors of Haricot beans.
- Government should protect against the unnecessary intervention of brokers and the illegal cross-border flow of beans attentively.
- To encourage farmers to supply Haricot beans to the market transportation services should be improved and accessible to rural kebele farmers.
- The agricultural extension and credit service-providing institutions should be accessible to farmers' area.
- The farmers' training centers (FTC) should be accessible in farmers' areas to encourage farmers' training on how to promote the production level of beans.
- Social instability (resource-based conflicts) occurring in the Burji area should be managed and resolved by federal or state government bodies.

9. FUTURE RESEARCH

We suggest that the researchers should additionally explore on harvesting and post-harvest storage time loss of beans, haricot bean value chain governance, linkages of value chain actors, and production and marketing opportunities of Haricot beans in the current study area.

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NUTRITIONAL DEFICIENCY AND WELFARE COMPARISONS ACROSS AGRICULTURAL AND NON-AGRICULTURAL HOUSEHOLDS IN RURAL INDIA

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ABSTRACT

This paper aims to look into the nutritional deprivation of rural households in accordance with demand and supply aspects and to assess the impact of food price changes on household welfare in rural India. The findings showed that agricultural households were better off from the nutritional perspective. The results from multiple regression model confirmed that education, land ownership and consumption diversity has positively contributed to the welfare of agricultural households.

KEYWORDS

IHDS, welfare, nutrition, poverty.

JEL CODES

Q18, E31, I32.

INTRODUCTION

It is widely acknowledged that agriculture not only ensures food security of the nation, but it also provides income and adequate nutrition to the masses. Since the period of Green Revolution, the agriculture sector in India has been catered to the demands of hiking population by increasing the availability of food grains. Apart from ensuring food security, agriculture sector can contribute to income and profits for net producers (Mukhopadhyay, 2012). However, a recent study based on IHDS data articulated the fact that both stunting and wasting were seemingly higher in agricultural households relative to nonagricultural households (Bhagowalia et al, 2012). In rural India, more than 20 per cent of farm households were living below the poverty line (Chand, 2017). Given the agrarian distress and the resultant farmers' suicides in many parts of the country, policy-makers have now turned attention to doubling the income of farmers by 2022. Against this backdrop, it would be interesting to look at the nutritional deprivation of agricultural households and to compare with that of non-agricultural households and to draw policy interventions suitable to them.

This paper aims to look into the nutritional deprivation of rural households in accordance with demand and supply aspects and to assess the impact of food price changes on household welfare in rural India. To satisfy the objectives, FGT Indices, Net Benefit Ratio and Multiple Regression method will be used here.

The introductory section deals with food price situation in India. The conceptualization of household welfare has been presented in the next section. The third section compares net benefit ratios across the agricultural and non-agricultural households. The fourth section looks at the factors that contributed to the welfare gains of agricultural households. The concluding remarks are made in the last section.

OBJECTIVES OF THE STUDY

1. To look into the nutritional deprivation ofl agricultural and non-agricultural households in rural India.
2. To assess the impact of food price changes on household welfare in rural India.

DATA SOURCES AND METHODOLOGY

The present study makes use of the NSS Unit Record data on Household consumption expenditure limited to the 61st (2004-05) and 68th rounds (2011-12). The two NSS rounds accomodate a sample of 79,298 households and 59,695 households in rural areas. Besides the tables relating to the Summary of RDA for Indians provided by Indian Council of Medical Research (2010) have been used which stands as a reference point for recommended dietary allowance for Indians. This enables us to elicit any shortfall in macro-nutrients. Lastly the IHDS datasets I and II have been used. The IHDS data takes a sample of 27,010 rural households in 2004-05 and 27,579 rural households in 2011-12. Around 84% of households in IHDS-I were re-contacted in IHDS-II.

The main tools analyzed in the work are FGT Index, Net Benefit Ratios and Ordinary Least Square Method. The FGT Index for the ith sub-group (agricultural versus non-agricultural households) is specified as follows:

$P^{\propto}_i = (1/n_i)[RDA - CALIN_i / RDA]^{\propto}$

When $\propto$ is larger, the index puts more weight on the position of the undernourished. When $\propto = 0$, the formula shows the Head count index, which represents the proportion of households not consuming the required nutrients. For measuring the depth of undernutrition, the Proportionate Gap Index will be calculated. When $\propto = 1$, the average distance from the minimum requirement can be measured. When $\propto = 2$, the severity of undernutrition can be measured by assigning greater weights to those households who are far from the minimum required calories. The Ordinary Least Square Method and Net Benefit Ratios will be explained in the subsequent sections.

FOOD INFLATION - INDIAN EVIDENCE

Food inflation has been surged in 2008 all over the world. Since then, a number of studies have come out for providing an insight to the global food inflation and how global food prices have been transmitted to their domestic economies. Many Sub-Saharan African countries have insulated their economies from global inflation as these economies have not integrated with the global economy. The open economies like India also resisted to food inflation due to the timely policy response of the government. These policy responses include export ban on cereals and suppression of fertilizer prices (Pons, 2011; Ganguly and Gulati, 2013).

In the wake of drought that the country faced in 2009 and global economic recession, food inflation in India has been escalated at the rate of 10.20% from January 2008 to July 2010. Other reasons behind food inflation are growth in per capita income, increase in the overall demand for food, bottlenecks in agricultural production, increase in world crude oil and food prices and so on (Nair and Eapen, 2012; Sasmal, 2015). When a commodity-analysis of food inflation is carried out, inflation rate of fruits (11%) is on par with cereals, but the inflation rate of pulses (15%) has surpassed the prices of cereals (11%), vegetables (8%) and fruits during 2008 to 2010. The anatomy of food inflation suggests that protein-based inflation is strengthening in the country.

HOUSEHOLD WELFARE: CONCEPT AND MEASUREMENT

In development discourse, the monthly per capita consumption expenditure was considered a rough proxy of household welfare. According to Kodithuwakku and Weerahewa (2011), household welfare mainly looks at "maximizing satisfaction of all household members by way of consumption of food and non-food items and by way of their engagement in leisure activities, subject to resource constraints". Household welfare is affected by a multiplicity of factors such as the extent of price transmission, credit constraints, the number of net buyers or net sellers of the commodities in question, the share of consumer's budget devoted to the

items, the extent of own-consumption relative to market purchases and the effect of price increases on real wages (Benjamin and Deaton, 1993; Simler, 2010; Rui and Xi, 2010). An understanding of household welfare in rural households is called for when own production forms a substantial portion of total consumption of food grains. Own production is critical for those households which do not make use of PDS and market for rice or wheat consumption or both (Ahluwalia 1993; Dev and Suryanarayana, 1991; Dutta and Ramaswami, 2001).

As a measure of household welfare, net benefit ratios have been worked out. Net benefit ratios are used for estimating the short-run impact of an increase in food prices on household welfare. The ratio is the difference between the production ratio and consumption ratio. The basic model equation is as follows:

$$\Delta W^h = \sum_{i=1}^{n} \Delta Pi\ (PRi^h - CRi^h)$$

Where ΔW^h is the compensating variation expressed as a percentage of total expenditures of a household. By definition, compensating variation shows how much money is needed for a household to maintain its standard of living. PRi^h is the production ratio, which is the value of food commodity produced as a fraction of total household expenditures. CRi^h is the consumption ratio, which is the value of food commodity consumed as a fraction of total household expenditures.

The basic model is built on some important simplifying assumptions (Simler, 2010; Benfica, 2014). First, consumers may abstain from shifting their consumption patterns in response to higher prices. Therefore, the model ignores medium and long-run impacts. Second, it is assumed that the increase in producer price is not at odds with the increase in consumer price, ignoring changes in production and transportation. Third, the model does not take into consideration of the second-order effects that arise from the adjustments in production in response to changes in relative prices. Finally, there is no scope for introducing subsidies or other transfers aimed at diluting the effects of food price shocks (Benfica, 2014).

These assumptions have undergone modifications over time. For example, some recent studies (Minot and Dewina, 2013; Dawe and Maltsoglou, 2014) have relaxed the second assumption that both the producer prices and consumer prices go up in the same proportion. Instead of assuming proportional marketing margin, studies proposed fixed marketing margin, whereby the increase in producer prices will be twice the per cent increase in the consumer price.

The Net Benefit Ratios can be computed for individual commodities or for aggregates of commodities. Households with a positive NBR (net sellers) would gain from a price increase, and households with a negative NBR (net buyers) would lose. By using net benefit ratios, one can identify and separate out the most affected household as a result of food price increase. The net benefit ratio as a policy tool throws light on what should be done to minimize the impact of food price shocks on the severely affected group.

Here net benefit ratios were calculated for four different food groups, namely cereals, pulses, vegetables, and fruits. The computation of net benefit ratios is having the problem of matching production values with the consumption values by the respondents. To circumvent this problem, some adjustments need to be made so that the negative values of NBR at household level will turn into positive values, thereby facilitating the comparison of agricultural and non-agricultural households. This adjustment lies in multiplying the values of NBR with minus one and it is restricted to those households with large size of landholdings (More than 10 hectares).

AGRICULTURAL HOUSEHOLDS AS GAINERS AND LOSERS

This section seeks to explain whether agricultural households have gained from the food price increase or not. To address this research question, both NSS and IHDS datasets will be used.

In case of agricultural households, whose production diversity score is greater than zero, a high positive net benefit ratio can be observed in cereals, followed by vegetables, pulses and fruits. The production of cereals and vegetables is advantageous for the agricultural households. Specifically, the agricultural households in backward states could seize the opportunity of food price increase. In 2004-05, Punjab, Haryana and Tamil Nadu had incurred losses from the production of cereals (Table 1). When we look at 2011-12, Andhra Pradesh and Tamil Nadu were the losers in the production of pulses and vegetables (Table 2). It implies that the losers have changed their production behaviour over time.

In case of non-agricultural households, whose production diversity is equal to zero, a high negative net benefit ratio can be observed in cereals and vegetables. When cereal prices have grown, the non-agricultural households in Assam, Bihar and West Bengal had suffered the most. Thus, a 10% increase in cereal price would hit real income by 5-6% in these states.

A low net benefit ratio in case of pulses shows that pulse cultivation seems to be less lucrative for rural India. This may be due to the fact that farmers are not aware of minimum support prices particularly in case of pulses which pave the way for exploitation by the middlemen and other traders (Aditya et al, 2017). As a result, farmers get lowest price for their produce, which will erode their real income.

The non-agricultural households had suffered due to the increase in fruit price in 2004-05, while non-agricultural households might have reduced fruits consumption in 2011-12. When net benefit ratios of fruits are considered, a break-even situation can be observed. In the remaining food groups, it was found that the estimated welfare losses seem to be higher than welfare gains.

TABLE 1: STATE-WISE MEAN NET BENEFIT RATIOS ACROSS AGRICULTURAL AND NON-AGRICULTURAL HOUSEHOLDS IN 2004-05

State	Agricultural Households				Non-Agricultural Households			
	Cereals	Pulses	Vegetables	Fruits	Cereals	Pulses	Vegetables	Fruits
Andhra Pradesh	0.03	0.01	0.02	0.00	-0.69	-0.11	-0.21	-0.05
Gujarat	0.33	0.13	0.31	0.06	-0.67	-0.17	-0.39	-0.05
Haryana	-0.05	0.06	0.14	0.05	-0.57	-0.11	-0.27	-0.06
Karnataka	0.12	0.03	0.06	0.02	-0.58	-0.14	-0.18	-0.08
Kerala	0.30	0.05	0.09	0.06	-0.44	-0.07	-0.15	-0.15
Maharashtra	0.21	0.08	0.14	0.04	-0.65	-0.17	-0.25	-0.05
Punjab	-0.12	0.05	0.07	0.03	-0.56	-0.16	-0.26	-0.04
Tamil Nadu	-0.01	0.00	0.01	0.00	-0.50	-0.12	-0.21	-0.06
Assam	0.45	0.16	0.33	0.03	-1.33	-0.18	-0.48	-0.03
Bihar	0.30	0.14	0.32	0.04	-1.55	-0.19	-0.43	-0.03
Madhya Pradesh	0.32	0.10	0.25	0.05	-1.03	-0.20	-0.33	-0.04
Orissa	0.51	0.10	0.34	0.04	-1.49	-0.13	-0.43	-0.04
Rajasthan	0.40	0.08	0.24	0.04	-0.80	-0.11	-0.28	-0.05
Uttar Pradesh	0.25	0.18	0.34	0.05	-1.21	-0.23	-0.41	-0.04
West Bengal	0.28	0.08	0.26	0.03	-1.21	-0.10	-0.42	-0.03
Total	0.28	0.10	0.24	0.04	-0.93	-0.15	-0.32	-0.05

Source: Calculated from unit record data of the 61st NSSO round

TABLE 2: STATE-WISE MEAN NET BENEFIT RATIOS ACROSS AGRICULTURAL AND NON-AGRICULTURAL HOUSEHOLDS IN 2011-12

State	Agricultural Households				Non-Agricultural Households			
	Cereals	Pulses	Vegetables	Fruits	Cereals	Pulses	Vegetables	Fruits
Andhra Pradesh	0.29	-0.03	-0.02	-0.01	-0.40	-0.12	-0.15	0.00
Gujarat	0.25	0.01	0.01	0.00	-0.37	-0.14	-0.22	0.00
Haryana	0.07	0.07	0.12	0.00	-0.24	-0.13	-0.23	0.00
Karnataka	0.44	0.02	0.02	0.00	-0.44	-0.15	-0.15	0.00
Kerala	0.19	0.05	0.07	0.04	-0.23	-0.06	-0.09	0.00
Maharashtra	0.34	0.01	0.01	-0.01	-0.40	-0.15	-0.15	0.00
Punjab	0.03	0.06	0.07	0.00	-0.27	-0.13	-0.22	0.00
Tamil Nadu	0.28	-0.03	-0.04	-0.01	-0.38	-0.12	-0.15	0.00
Assam	0.45	0.14	0.17	0.01	-0.55	-0.14	-0.25	0.00
Bihar	0.32	0.11	0.19	0.01	-0.69	-0.19	-0.35	0.00
Madhya Pradesh	0.24	0.02	0.03	0.00	-0.40	-0.17	-0.18	0.00
Orissa	0.44	0.06	0.14	0.01	-0.54	-0.12	-0.27	0.00
Rajasthan	0.17	0.07	0.14	0.00	-0.30	-0.11	-0.18	0.00
Uttar Pradesh	0.24	0.19	0.26	0.00	-0.46	-0.22	-0.33	0.00
West Bengal	0.31	0.02	0.03	0.00	-0.66	-0.08	-0.26	0.00
Total	0.28	0.08	0.12	0.00	-0.46	-0.14	-0.22	0.00

Source: Calculated from unit record data of the 68th NSSO rounds

The IHDS data helps to delineate and arrive at the proportion of agricultural households without the break-up of food groups. The agricultural households can be bifurcated into the gainers and losers on the basis of income and expenses they incur. Agricultural production is subject to farm expenses which comprises of expenditure on seeds, fertilizer, pesticides, water, hired equipment, etc. Hence, if a household is getting positive farm income, it is able to cover all expenditure on seeds, fertilizer, pesticides, water, and hired equipment.

Out of 15 states, 7 states have registered an increase in positive farm income in 2011-12. These states are Andhra Pradesh, Gujarat, Haryana, Punjab, Tamil Nadu, Madhya Pradesh and Rajasthan. More than one-third of households that belong to backward states are found to be the gainers in agricultural production with highest positive farm income (Table 3).

Table 4 shows that the proportion of rural households earning negative farm income due to the mounting expenses was the highest in case of Andhra Pradesh, Karnataka and Bihar. The opposite results hold for Orissa, Punjab, Haryana and Assam.

TABLE 3: STATE-WISE PROPORTION OF RURAL HOUSEHOLDS EARNING POSITIVE FARM INCOME

State	2004-05	2011-12
Andhra Pradesh	20.33	29.00
Gujarat	39.56	45.27
Haryana	33.33	37.01
Karnataka	47.32	43.02
Kerala	30.89	24.72
Maharashtra	59.38	56.59
Punjab	28.87	34.15
Tamil Nadu	13.64	21.89
Assam	38.18	34.57
Bihar	49.33	40.65
Madhya Pradesh	53.28	59.07
Orissa	62.77	59.76
Rajasthan	59.51	63.47
Uttar Pradesh	59.69	58.62
West Bengal	44.67	36.67
Total	47.94	49.33

Source: Computed from IHDS Data

TABLE 4: STATE-WISE PROPORTION OF RURAL HOUSEHOLDS EARNING NEGATIVE FARM INCOME

State	2004-05	2011-12
Andhra Pradesh	5.73	17.42
Gujarat	9.17	8.82
Haryana	3.04	2.94
Karnataka	6.84	14.55
Kerala	5.34	9.39
Maharashtra	5.77	4.53
Punjab	2.37	2.38
Tamil Nadu	11.52	5.06
Assam	2.28	3.57
Bihar	5.39	11.52
Madhya Pradesh	6.52	5.85
Orissa	1.57	1.46
Rajasthan	9.42	7.15
Uttar Pradesh	5.94	6.73
West Bengal	0.80	5.74
Total	5.34	6.99

Source: Computed from IHDS Data

ROLE OF AGRICULTURE IN ALLEVIATING UNDERNUTRITION

The FGT indices of agricultural and non-agricultural households have been compared here. Agricultural households have been designated as those households whose production diversity score is greater than zero. The production diversity score has been worked out for 10 groups, excluding sugar and salt and beverages. In contrast, non-agricultural households have zero production diversity, which implies that these households are not producing at all.

By 2011-12, around 61 per cent of rural households had engaged in agricultural activities. More importantly, in 7 states the proportion of households engaged in agricultural activity declined, while in 2 states, it remained the same. As opposed to this, the proportion of non-agricultural households was 39% in 2011-12. It can also be matched with the proportion of net buyers of cereals and vegetables that stands at 33 per cent and 32 per cent, respectively.

In all states, monthly per capita consumption expenditure has been doubled or more than doubled between 2004-05 and 2011-12. This increasing trend can also be seen in both agricultural and non-agricultural households. The MPCE figures reminds of a period in which majority agricultural households had domination over non-agricultural households. However, in 2011-12, non-agricultural households have overturned agricultural households in terms of income (Table 5).

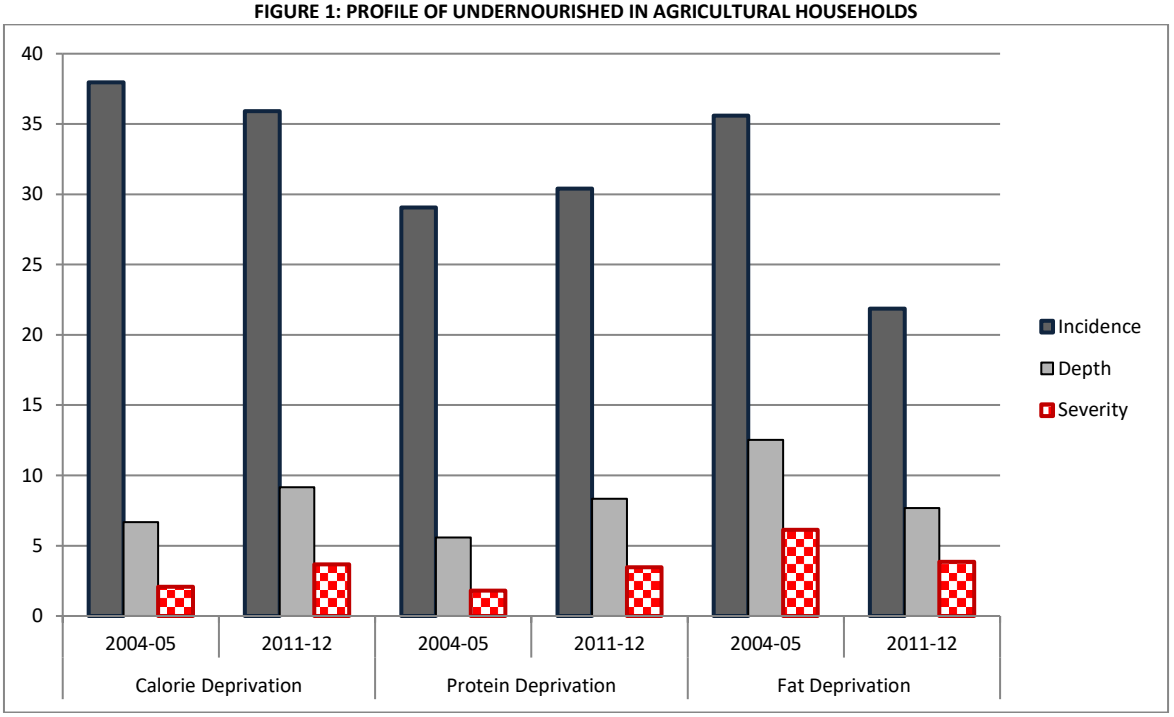
As depicted in Figure 1, around 36% of agricultural households were calorie deficient in terms of head-count ratio during 2011-12. The corresponding head-count ratio for non-agricultural households was 50% (Figure 2). Similar percentage difference could be observed in case of protein deprivation. In terms of fat deprivation, the difference between agricultural and non-agricultural households was negligible.

Across the states, Gujarat seemed to be the highest calorie deprived in both agricultural and non-agricultural households with 61% of agricultural households were calorie deprived in 2004-05. The calorie deprivation for non-agricultural households stood at 69%. This has been followed by Maharashtra and Karnataka, with the reversal of ranks in agricultural and non-agricultural households. The picture in 2011-12 was somewhat different. Kerala and Assam shared the first rank with 47 per cent were calorie deprived in agricultural households. In both 2004-05 and 2011-12, the ranks of the highest calorie deprived states were more or less the same in non-agricultural households. It underscores the shifting of rural households from agriculture to other occupations which they choose to remain in hungry and to compound the issues related to the nutritional deficiencies.

In all the states, the plight of non-agricultural households was worrisome in comparison to the agricultural households. This pattern was similar in all the study periods and undernutrition indices.

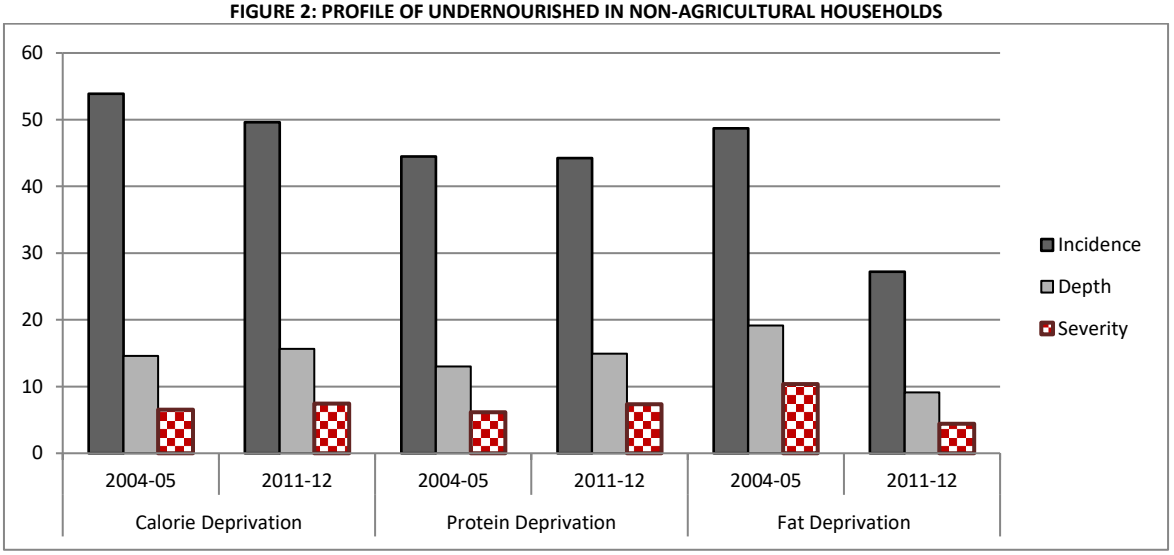
The non-income aspects may be important for the non-agricultural households which need to be probed further beyond the income changes.

FIGURE 1: PROFILE OF UNDERNOURISHED IN AGRICULTURAL HOUSEHOLDS



Source: Estimated from NSS unit record data 68th round

FIGURE 2: PROFILE OF UNDERNOURISHED IN NON-AGRICULTURAL HOUSEHOLDS



Source: Estimated from NSS unit record data 68th round

TABLE 5: MEAN MPCE OF AGRICULTURAL HOUSEHOLDS AND NON-AGRICULTURAL HOUSEHOLDS

State	2004-05		2011-12	
	Agricultural Households	Non-Agricultural Households	Agricultural Households	Non-Agricultural Households
Andhra Pradesh	1013	869	1828	1940
Gujarat	709	723	1674	2097
Haryana	961	797	2643	1712
Karnataka	902	712	1847	1850
Kerala	1558	1391	3996	3729
Maharashtra	793	732	1742	1833
Punjab	1053	865	2813	2023
Tamil Nadu	1105	877	1980	1971
Assam	622	546	1346	1468
Bihar	535	414	1306	1085
Madhya Pradesh	552	477	1317	1390
Orissa	488	429	1125	1187
Rajasthan	655	691	1694	1623
Uttar Pradesh	656	540	1297	1103
West Bengal	672	609	1574	1537
Total	765	724	1729	1749

Source: Calculated from unit record data of the 61st and 68th NSSO rounds

WELFARE OF AGRICULTURAL HOUSEHOLDS

In the last section, nutritional advantage of agricultural households has been portrayed. This section explains the factors accountable for improving the welfare of rural agricultural households.

The MPCE of agricultural households has been adopted as the dependent variable. To normalize the dependent variable, the logarithmic transformation is applied. The independent variables selected for the model are household size, number of children and elderly, consumption diversity score, unit value of rice, wheat, milk and chicken and a host of dummy variables such as the presence of a regular salary earning member, land ownership and education of the household head. Descriptive statistics are presented in Table 6. The average household size was 6 persons in rural areas. The mean dietary diversity score was 12. Also, the average price of pulses and pulse products was higher than cereals and cereal substitutes. Wide variations in average price of milk and milk products and egg, fish and meat products could be observed in rural areas.

Table 7 presents the results using ordinary least square method. The square of household size has been figured in the model to capture the non-linearity. The model has ratified the non-linear relationship between household size and welfare of agricultural households. An increase in family size improves the welfare of the farmers. The result is consistent with the studies by Audu and Aye (2004), who argued that improvement in household welfare can be expected when availability of labour goes up.

The presence of a regular wage earner reduces the welfare of agricultural households. This implies that regular salary earners may not undertake agricultural activities due to paucity of time. Likewise, the younger children within the family contribute less to agricultural income.

The elderly members within the family positively contribute to the welfare of agricultural households. This can be ascribed to their farming experience.

More educated members look for appropriate technologies to relieve their production constraints. The coefficient on education was positive and significant, suggesting that welfare increases with the level of education of the household head. A similar finding has also been generated in related studies that looks at the effects of agricultural technology on household welfare (Audu and Aye, 2014; Ghimire and Huang, 2016).

With an improvement in consumption dietary diversity score, MPCE of agricultural households also increases. So, an important route to augmenting the welfare of agricultural households is through an improvement in dietary diversity. Dietary diversity is likely to improve with improvement in health and it will lead to reduction in medical expenditures.

One may argue that positively significant coefficient of dietary diversity could be because of the high correlation between consumption diversity scores and production diversity scores. However, the results vindicate that the correlation between the variables is 0.086, which was significant at 1% level.

Land ownership exerts a positive impact on the welfare of agricultural households. The model doesn't talk about the quality of lands and for what purpose land is used. When food prices are factored in, the coefficient on land ownership turns negative and it becomes insignificant.

Controlling for food prices, the first model gives an R^2 value of 0.19, which means that 19% of variation in the dependent variable has been captured by the inclusion of independent variables. When food prices are factored in, the explanatory power of the model increases. At this moment, 27 per cent of variation in the welfare indicator is accounted for by the independent variables.

TABLE 6: DESCRIPTIVE STATISTICS

Household characteristics	2004-05		2011-12	
	Mean	SD	Mean	SD
Household Size	5.62	2.76	5.84	2.52
Is any member of the household a regular salary earner?	1.76	0.43	1.78	0.42
Education of household head (1= Literate, 0=Otherwise)	4.25	2.59	0.72	0.45
Land Ownership (1=Yes, 0=Otherwise)	1.03	0.18	1.03	0.16
Number of Persons Below 15	1.88	1.68	1.72	1.57
Number of Persons Above 60	0.37	0.62	0.35	0.62
Consumption Diversity Score	11.36	0.65	11.68	0.59
Price of Cereals and Cereal substitutes	9.76	3.49	15.70	5.33
Price of Pulses and Pulse products	27.95	5.40	56.88	11.57
Price of Vegetables	7.94	3.30	16.06	5.68
Price of Milk and Milk products	28.74	45.87	56.21	84.19
Price of Edible oil	58.07	13.12	82.78	14.83
Price of Egg, Fish and Meat	59.69	28.26	121.82	46.63

Source: Calculated from unit record data of the NSSO for the respective rounds

TABLE 7: RESULTS OF THE OLS REGRESSION ON MPCE OF AGRICULTURAL HOUSEHOLDS IN 2011-12 AND 2004-05

Explanatory variables	Coefficient	Standard Error	Coefficient	Standard Error
Constant	6.651* (5.556*)	0.033 (0.077)	5.825* (4.594*)	0.069 (0.060)
Household Size	-0.092* (-0.047*)	0.003 (0.005)	-0.108* (-0.149*)	0.004 (0.003)
Household Size^2	0.005* (0.002*)	0.000 (0.000)	0.006* (0.007*)	0.000 (0.003)
Is any member of the household a regular salary earner?	-0.185* (-0.155*)	0.006 (0.013)	-0.140* (-0.110*)	0.008 (0.007)
Education of household head (1= Literate, 0=Otherwise)	0.175* (0.129*)	0.006 (0.010)	0.146* (0.040*)	0.007 (0.001)
Land Ownership (1=Yes, 0=Otherwise)	0.098* (-0.103)	0.014 (0.041)	0.064* (0.030*)	0.016 (0.016)
Number of Persons Below 15	-0.082* (-0.060*)	0.002 (0.005)	-0.067* (-0.050*)	0.002 (0.003)
Number of Persons Above 60	0.035* (0.054*)	0.004 (0.011)	0.017* (0.056*)	0.005 (0.005)
Consumption Diversity Score	0.102* (0.102*)	0.002 (0.005)	0.110* (0.175)	0.005 (0.004)
Price of cereals and cereal substitutes	-----	-----	0.018* (0.022*)	0.001 (0.001)
Price of pulses and pulse products	-----	-----	0.002* (0.004*)	0.000 (0.001)
Price of vegetables	-----	-----	0.019* (0.022*)	0.001 (0.001)
Price of milk and milk products	-----	-----	0.006* (-0.001)	0.002 (0.000)
Price of edible oils	-----	-----	0.004* (0.002*)	0.000 (0.000)
Price of egg, fish and meat	-----	-----	0.003* (0.001*)	0.001 (0.000)
R Square 0.191 (0.180)			**R Square 0.270 (0.380)**	

Source: Calculated from unit record data of the 61st and 68th NSSO rounds. Figures in parenthesis show the OLS regression values for the period 2004-05.

Table 7 shows that agricultural households have a higher advantage in terms of vegetable prices, followed by prices of cereals and cereal substitutes, as shown by the higher value of regression coefficient. However, price of high value commodities exerted a minor positive impact on the welfare of agricultural households. A negative impact can also be observed when one takes the prices of milk and milk products into account.

It may be difficult to make out the difference in OLS models in two NSS Surveys. One difference which is perceptible to anyone is that the dummy variable which signifies the status of land ownership was negative but insignificant in 2004-05. But it became positive when the price variables were taken into account. In contrast, landownership created a positive impact in 2011-12, irrespective of the changes in econometric models.

CONCLUSION

The aim of the paper was to reinforce the agriculture-nutrition linkage and to investigate how household welfare has been changed in response to food price shocks. The net benefit ratios as a measure of household welfare has been worked out for major food groups, including cereals, pulses, vegetables and fruits. The results emanating from the net benefit ratio shows that food prices are not helping to improve the welfare of producing states. Instead, the consumers in producing states get some benefits on account of higher production and lower transportation costs which may translate into lower prices. On the basis of net benefit ratios, it can be argued the consumption of fruits can be eschewed at the expense of vegetables, which was more so in case of poor expenditure groups and backward states. The deployment of FGT indices also shows that non-agricultural households struggle with nutritional shortage in all the periods under consideration. At the same time, it was also found that agricultural households were better off from the nutritional perspective. The results from multiple regression model confirmed that education, land ownership and consumption diversity has positively contributed to the welfare of agricultural households. The selected food items also demonstrated that cereals and vegetable cultivation have an edge over pulse cultivation when gains from price increase are taken into consideration. The results also establish the fact rooted in literature that pulse cultivation was not lucrative for the agricultural households as these households were ignorant of minimum support prices.

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