**Livelihood Status of Shea Nuts Processors of German International Corporation (GIZ) Technology Intervention in Niger State, Nigeria**

**Abstract**

Shea tree is a resourceful plant for income-generating activities with significant cultural ties and features to human existence and environmental benefits for the protection of land management activities. Also, medicinal values, food, non-timber resources and income are derived from the shea tree and its products. The study investigated the influence of the adoption of German International Corporation Technologies (GIZ) on the livelihood of the shea nuts processors (beneficiaries only) and identified constraints to the adoption of GIZ’s processing technologies in Niger State. A two-stage sampling technique was adopted for the study. The first stage involved a purposive selection of 15 Local Government Areas (LGAs) of GIZ’s intervention. The second stage involved a proportionate random selection of 297 beneficiaries, constituting 10% processors in the GIZ profile list. Also, in the same LGAs, the snow-balling technique was used to randomly select 297 Shea nut processors that were GIZ non-beneficiaries, thereby making a total sample size of 594. Data were collected through an interview schedule and analysed using percentages, mean, Cumulative Livelihood Status Score (CLSS) and F-test. It revealed that the productivity of GIZ’s beneficiaries before and after the adoption was found to be significant at 5%, i.e. shea nut processed (t=26.237), output (t=16.418), and income t=22.634). Also, revealed that the adoption of GIZ’s technologies had improved the livelihood of the beneficiaries (CLSS = 64.9%). They indicated that the most severe constraints were inadequate funds (=1.875), poor market channels (=1.737) and inadequate extension contact (=1.542). The study established a benchmark that the majority of the respondents faced some basic constraints stemming from inadequate finance, poor marketing linkages and an average illiteracy level in assimilating the basic principles of adoption of the technologies. The study recommended frequent technology interventions to improve the shea nuts processors' capacity and experience from the government organisations or non-governmental organisations (NGOs) across the value chains of the shea industry to enhance stakeholders’ productivity and livelihood activities, as indicated in the positive outcome of the adoption of GIZ technology intervention in Niger State.

**Keywords:** *Livelihood, Shea Nuts, Processing, German International Corporation, Intervention.*

**INTRODUCTION**

Shea tree (*Vitellaria paradoxa*) is an important and versatile tree crop that grows wild across sub-Saharan Africa. It is also called a wonderful tree because of its versatility. The tree crop is highly demanded from several World markets for fruits and other products. According to Maranz; Wiesman, *(*2003a) and Masters; Yidana; Lovett (2004), “it extended up to about 5000 km wide belt of savanna including West African countries of Senegal, Mali, Côte d‟Ivoire, Burkina Faso, Togo, Ghana, Benin, Nigeria, Niger, Cameroon, and further east in Uganda, Sudan and Ethiopia” (Chalfin, 2004 and Goreja, 2004). The shea belt is referred to shea tree population coverage among merchants **(**Ferris, Collinsom, Wanda, Jagwe, and Wright, 2001)**.**

Shea tree is a resourceful plant for income-generating activities with significant cultural ties and features to human existence and environmental benefits for the protection of land management activities. The shea tree provides jobs for Shea pickers, traders who buy directly from the pickers, Shea kernel and Shea butter processors and exporters. Like most agroprocessing industries in Ghana, the Shea industry in the Northern region is characterised by activities of rural women and it is the major income-generating activity for women (Amoako et al., 2024). Also, medicinal values, food, non-timber resources and income are derived from the shea tree and its products. According to Lovett (2004), the world production of shea nut is between 1.5 and 2.5 million metric tons (MT); of this, roughly 80% is harvested for utilisation. Shea butter plays s significant role in the nutritional supplement to African diets. For example, “in Nigeria and Ghana, it is widely consumed by the farmers as a desert crop during farming activities when the staple and cash crops are under cultivation” (Teklehaimoanot, 2004; Suleiman, 2008; and Pouliot, 2012). Shea tree produces quality, strong and resilient timber for making farming tools, and is also used as fuel for cooking. Shea butter is either manually or mechanically extracted from the shea nut, which is produced by the shea tree, and it contains about 80-90% acid and oleic acid. Shea butter also has a lot of end-use benefits, which include oil for cooking, cosmetics and skincare, pharmaceutical and medicinal uses. The shea nut/seeds may contain up to 50% oil from the extraction process, and when refined, it is also used as a substitute for margarine and cocoa butter in the food industry. In view of the considerable financial and health benefits of the Shea butter domestically and internationally, the interest in the product is on a consistent rise annually. Disregarding this appeal, the Shea butter delivered by the processors remains deficient in quality, suggesting that assets are not efficiently used to generate perfect butter to satisfy both local and worldwide standards (Akaribo, F. N., & Sarpong, 2021; Goumbri et al., 2022). According to Alander (2004), Moore (2008), and Suleiman (2008) that shea butter is next to oil palm in terms of valuable oil crops in Africa for its oil content in table oil, and it is also able to thrive in semi-arid environments that are unsuitable for improved and hybrid oil palm growth. In the 1970s, shea butter was identified as the only available vegetable oil that could be used as a supplement as a cocoa butter equivalent, mainly for its uses in cosmetics and chocolate (Pouliot, 2012). Shea tree fruits produce a major by-product called shea butter, which has high economic and nutritional potential both at the local and international domestic and industrial purposes, and the demand for the commodity is experiencing a constant annual increase in price (Njoku, Eneh, Ononogbu and Adikwu, 2000; Chalfin, 2004; Olaniyan, 2007 and Suleiman, 2008).

Currently, “Shea nut and butter are exported from African countries, including Nigeria, to France, Great Britain, the Netherlands, Denmark, North America, and Japan (Elias and Carney, 2007). In these countries, it is processed into an extensive range of food products, including chocolate, and it is becoming more acceptable in the cosmetic industry” (Schreckerberg, 2004).

“In Nigeria, Niger state leads among the shea nut producing states, followed by Kwara, Nasarrawa, Zamfara, Kaduna, Sokoto, Jigawa, Kano, Plateau, Taraba, Benue, Adamawa, Bauchi, Kebbi, Edo, Yobe and Federal Capital Territory (FCT), Abuja. With recent investment exhibitions and potentials of agricultural products, the need for shea nut oil (shea butter) for industrial applications in food, cosmetics, pharmaceutical and traditional demand at national and international levels has tremendously improved and this calls for the attention of farmers and government at all levels to utilize available opportunities of the industry” (Suleiman, 2008).

However, processing technologies of shea nut include, among others, parboiling, drying, kneading, packaging and storage stages, which are critical and require improved technologies for the production of high-quality or premium shea butter oil to meet the market demand. The prices of shea nuts are also being determined by the middleman, depending on the season of the availability of either the wet or dry season. Awkwardly, Shea nut production and export are not sufficient for the demand both locally and internationally.

The low productivity of the processors affects the outcome of shea nut processing due to the lack of adoption of available improved technology, thereby affecting their livelihood assets and capabilities in human, physical, social, economic and political participation in the society. Also, a lack of improved technologies decreased the outcome of rural processors, which limits the production capacity of shea butter. Traditional extraction of shea butter improved artisanal processing technologies, but the adoption of improved technologies may have a substantial economic effect, including: enhancement of the most wearisome aspects of extraction, reduction of the time and labour input required at the production and an increase in total productivity.

To address this effect of low productivity in the shea butter production, the Federal Government, in collaboration with the German International Corporation (GIZ), other NGOs and government organisations, have developed and disseminated improved shea nut processing technologies to the traditional shea nut processors in Niger state. Moreover, there has been a dearth of empirical studies on the effect of the adoption of GIZ processing technologies on the livelihood of processors in Niger State, Nigeria. This study therefore sought to analyse the effects of German International Corporation Technologies on the livelihood of Shea nut processors in Niger State, Nigeria.

The study is to analyse the effects of German International Corporation technologies on the livelihood of the shea nut processors in Niger state, Nigeria. This is to examine the level of adoption of GIZ shea nut processing technologies and evaluate the effects of adoption of GIZ processing technologies on the livelihood of the processors (beneficiaries only)

**MATERIALS AND METHODS**

**The Study Area**

The study was carried out in Niger State, which is located in the North Central Geopolitical zone of Nigeria, with its capital in Minna. It lies between latitude 3°–10°N and longitude 3°–8°E. It is bordered by Kebbi and Zamfara States to the North-West and to the South by Kwara and Kogi Stateswhile Kaduna State and the Federal Capital Territory (FCT) border the State to the East and South-East respectively. The State also shares a common international boundary with the Republic of Benin at Babanna in Borgu Local Government Area of Niger State. This gives way to common inter-border trade with the State. The State has a land mass of 76,363 Km2making it the largest State in Nigeria in terms of total land area, and has twenty-five (25) local government areas. The State has the highest wild shea tree plantations in Nigeria, with a substantial number of traditional rural processors of shea nut which cut across the agricultural zones of the State (Suleiman, 2008). It is divided by the Niger State Agricultural Development Programme into three agricultural zones for better agricultural administrative activities, namely: zone I, II, and III, with headquarters at Minna, and the zones have their headquarters at Bida, Kuta, and Kontogora, respectively.

**Sampling Procedure and Sample Size**

In order to have a wide coverage and full representation, all three Agricultural Development Programmes (ADP) zones were used for the study. A 3-stage sampling technique was adopted for the study. In the first stage, a purposive selection of 15 Local Government Areas (LGAs) of the German International Corporation (GIZ) intervention site was made (GIZ, 2011; 2014) across the three zones. The purposive selection was carried out due to the fact that there was a high population density of shea trees and high participation of the shea value chain, particularly shea processing activities. At the second stage, from the profile list of GIZ Shea groups comprising 2,970 processors of GIZ, 2011;2014 profile lists, a proportionate random selection, based on 10%, of Shea nut processors was made across the selected LGAs, giving a total sample of 297. The third stage involved the use of snow-balling technique to randomly select an equal number (297) of Shea nut processors who were non-beneficiaries (non-registered Shea nut processors) in the same 15 selected LGAs to have a genuine comparison effect, thereby making a total sample size of 594 that was used for the study (Table 1).

**Data Collection and Instrument for Data Collection**

The data for the study were obtained from both primary and secondary sources. The primary data was collected through an interview schedule. The secondary data was sourced from published and unpublished documents of agricultural journals, the internet and past studies. Trained enumerators of the State Agricultural Development Programme office and extension agents were engaged in the study area to collect information from the respondents.

**Analytical Techniques**

Descriptive such as frequency counts and percentages, were used in the study**.**

**Model Specifications**

Consequences of Adoption of GIZ Processing Technologies on the Processors’ Livelihood: The following discussion illustrates the operational definitions and techniques that were used to measure the seven livelihood indicators of processors as developed by Sheheli (2014) in Bangladesh and modified by Omotesho, Akinrinade, and Ogunlade (2017) to determine the livelihood of processors through income-generating activities. The livelihood indicator adopted for this study was to determine the influence of processors’ productivity on the livelihood of processors in the study area. The seven indicators included:

**i) Food Availability:** Food availability was measured on the basis of accessibility to basic food throughout the whole year for the family. Scoring for availability of food was ‘3’ for adequate, ‘2’ for inadequate and ‘1’ for shortage of food. The cumulative scores of twelve months indicate the food availability of a processor’s family. Therefore, the possible food availability score varied from 12 to 36, where 12 indicated the ‘lowest’ and 36 indicated the ‘highest’ level of food availability.

**ii) Housing Condition:** This indicator referred to the present situation of the house inhabited by processors. To determine the housing conditions, six characteristics of houses were considered, namely: 1) Roof, 2) Walls, 3) Floor, 4) Kitchen position, 5) Furniture and 6) General impression. The overall housing condition of each respondent was determined by summing the scores obtained from these six characteristics of the house. The possible score varied from 6 to 21, where 6 indicated a ‘very poor’ and 21 indicated a ‘very good’ housing condition. The total score of the six variables was 21, as allocated to each variable, while the roof was 1 and the general impression was 6. The summation numerals were equal to 21scores.

**iii). Water Facilities:** The water facilities indicator was measured by three sub-dimensions, including 1). Water sources 2). Drinking water availability and 3). Quality of drinking water. The score of water facilities of each respondent was calculated by summing the scores of the above three sub-dimensions.

**a. Source of Water:** The sources of water included 1). Stream 2). River 3). Rain 4). Table water and 5). Pipe borne. The total number of water sources was 5, whereby the most available source scored 5 and the least available source scored 1. Therefore, the possible score for water sources varied from 1 to 5.

**b. Quality of Drinking Water:** The quality of drinking water included 1). Stream 2).River 3). Tube well 4). Rain and 5). Pipe borne. This was measured based on 5 items, and the possible score varied from 1 to 5. Therefore, the possible score for water sources varied from 1 to 5.

**c. Different Purposes of Water;** The different purposes of water were measured based on 5 items: drinking for (5), cooking for (4), utensils for (3), bathing for (2) and washing clothes/clearing for (1). The possible score varied from 1 to 5. Therefore, the possible score for water sources varied from 1 to 5.

**d. Adequacy of Drinking Water:** The scoring of drinking water availability for each month of the year would be ‘3’ for adequate, ‘2’ for inadequate and ‘1’ for scarcity of drinking water multiplied by each month of the year, which was twelve months. The scores of twelve months from each respondent were added to yield a drinking water availability score, which varied from 12 to 36. Finally, the scores of four sub-dimensions of water facilities were summed, which range from 12 to 36, whereby 12 indicated a poor and 36 indicated a very good water facility.

**iv. Health Condition:**

**a. Health Status:** This indicator was measured on the basis of 5 items. The possible score of health status ranged from 1 to 5. Good (5), disabled or incapacitated (4), short-term illness (3), long-term illness (2) and weak (1).

**b. Ability to get Health Treatment:** The Total number of health treatment providers was five. Scoring for availability of health treatment providers was ‘3’ for visiting regularly, ‘2’ for occasionally and ‘1’ for never visited. Health treatment ability was measured by summing scores of five items, and the possible score varied from 5 to 15. Considering the health status and ability to get health treatment, the score of health situation varied from 5 to 15, whereby 5 indicated a ‘very bad’ and 15 indicated a ‘very good’ health situation.

**v. Sanitation:**

**a. Possession of a Toilet:** This indicator referred to the possession of a toilet in the household. Data was collected on three items with scores of 3, 2, and 1 for having own toilet, using other people’s toilet, and having no access to a toilet, respectively. The possible score for toilet possession ranged from 1 to 3.

**Type of Toilet:** This indicator refers to the type of toilet in the household. Data was collected on three items with a score of 3 for a sanitary or hygienic toilet, 2 for a pit toilet and 1 for an open space toilet, respectively. The possible score for the type of toilet ranged from 1 to 3.

***b.* Toilet Condition:** This indicator referred to the physical condition of the toilet possessed by processors. Roof for 3(iron sheet, straw, open), Walls for 2(bricks and tiled, iron sheet and jute stick), Floor for 1(tiled, ordinary and cemented), while the position of the toilet was considered to measure toilet condition indicated inside, outside and open. The scores thus obtained were added to yield the toilet condition score. The range of a possible toilet condition score varied from 4 to 12, whereby 4 indicated a ‘very bad’ and 12 indicated a ‘very good’ toilet condition. After summing the score of three sub-dimensions, the sanitation score was then ranged from 4 to 20, whereby a score of 4 indicated processors had poor sanitation facilities and a score of 20 indicated they had very good sanitation facilities.

**vi. Participation in Social Activities:** Participation in social activities is defined as the degree to which processors attend different social events. It was measured by computing a ‘social participation score’ based on the participation in five selected social events. Scoring of participation was ‘3’ for always, ‘2’ for occasionally, and ‘1’for no participation. The scores of five social events were added to calculate the total score of participation in social activities. Therefore, the participation in social activities score varied from 5 to 15, whereby a score of 5 indicated ‘no participation’ and a score of 15 indicated ‘regular participation’.

**vii. Freedom in Cash Expenditure:** This indicator referred to the freedom of processors to spend money on various aspects of their family affairs. Eight aspects of expenditure was considered to measure the freedom in cash expenditure and 4 point Likert-type scale was used to define the freedom of cash expenditure where 4, 3, 2 and 1 indicated expenditure decision dependent on ‘processors’, (4) for ‘spouse (herself), (3) for ‘husband’ (2) for ‘together’’ and (1) for ‘other family members’, respectively. Finally, the total score was obtained by summation of scores of all eight items of cash expenditure, which included daily expenses, investment on land, household repair, child education, health, household assets, taking loans and use, and loan servicing. Possible score varied from 8 to 32, where 8 indicated ‘low freedom in cash expenditure’, i.e., the respondent depends highly on other family members to take decisions, and a score of 32 indicated ‘high freedom in cash expenditure’, i.e. the respondent took all decisions by him/herself.

**Development of a Cumulative Livelihood Status Score (CLSS)**

To obtain valid and reliable data for the livelihood status of processors, the CLSS was determined in two steps. First, a cumulative percentage score for each of the seven livelihood indicators was determined. After that, the cumulative livelihood status was computed based on the scores of these seven indicators. The procedure for measuring the cumulative percentage score and the cumulative livelihood status score of processors was summarised as follows:

**Computation of Cumulative Percentage Score**

The computation of the ‘cumulative percentage score’ for each indicator was measured in two  
stages: (i) determination of an individual processor's percentage score and (ii) determination of a cumulative percentage score.

(i) The individual processors’ field score was divided by the corresponding possible maximum score and expressed as a percentage.

The following formula was used to determine the individual processor's percentage score:

Where, IWFPS = Individual processors percentage score

IWFFS= Individual processors field score

IWFPMS = Individual processors' possible maximum score

(ii) The cumulative percentage score was obtained by dividing the sum of individual processors' percentage scores by the sample size. The following formula was used to determine  
the cumulative percentage score:

Where, CPS = Cumulative percentage score

ΣIWFPS = Sum of individual processors percentage score

N = Sample size

**Computation of Cumulative Livelihood Status Score**

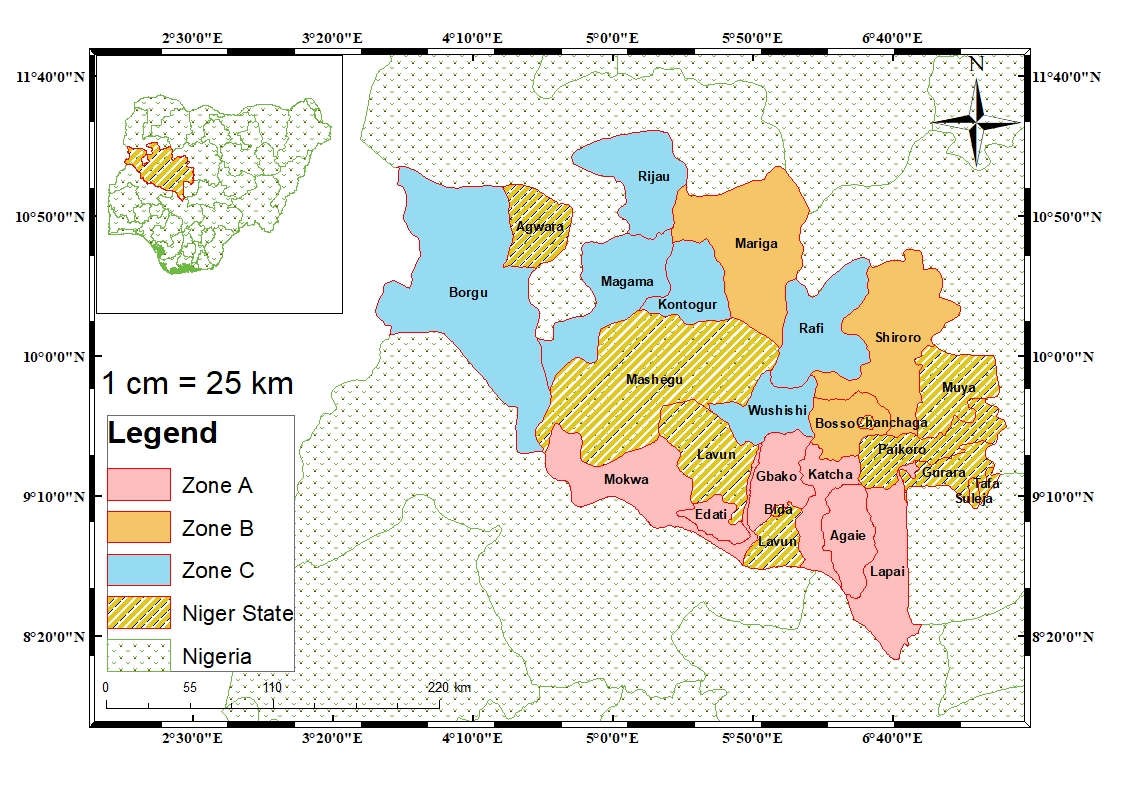
The cumulative livelihood status score of processors was measured by dividing the sum of the cumulative percentage scores of livelihood indicators by seven. The following formula was used to attain the cumulative livelihood status score:

Where, CLSS = Cumulative livelihood status score

ΣCPS = Sum of cumulative percentage score of seven livelihood indicators

LI = Livelihood indicators (7)

**6. Constraints to Processors' Adoption of GIZ Shea Nut Processing Technologies**: This was measured using a 3-point Likert-type scale against a list of factors/constraints as follows: Very Severe (VS) = 3, Severe (S) = 2, Not severe (NS)= 1



**Figure 1: Map of Niger State showing Local Governments of GIZ Intervention**

*Source: GIZ Shea processors profile list, 2011; 2014*

**Table 1: The Distribution of the Sample Shea Nut Processors (Beneficiaries and Non- Non-Beneficiaries)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Local govern-ent areas** | **Sample frame(No of GIZ processors as contained in the profile list of GIZ Shea groups in Niger State)** | | **No of selected GIZ beneficiaries through proportionate sampling based on 10%** | **No of selected GIZ non-beneficiaries** | **Total sample of GIZ beneficiaries and non-beneficiaries** |
| **Zone A**  Lapai  Gbako  Katcha  Mokwa  Agaie  Edati  **Zone B**  Shiroro  Bosso  Mariga  **Zone C**  Kontagora  Borgu  Wushishi  Magama  Rijau  Rafi  **TOTAL** | | 297  240  313  243  89  123  81  289  63  159  445  146  379  72  31  2,970 | 30  24  31  24  9  12  8  29  6  16  45  15  38  7  3  **297** | 30  24  31  24  9  12  8  29  6  16  45  15  38  7  3  **297** | 60  48  62  48  18  24  16  58  12  32  90  30  76  14  6  **594** |

*Source: Field Survey, 2018’*

**RESULTS AND DISCUSSIONS**

**Effect/ Consequences of Adoption of GIZ Processing Technologies on the Livelihood of the Processors**

**Table 2: Distribution of Respondents by Food Availability (Beneficiaries N=297)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Months |  | | | | | |  | | | | | |  | | | | | |
|  | | **Adequate** | |  | | **Inadequate** | |  | |  | | **Shortage** | |  | |  | |
|  | **Frq** |  | **%** |  |  | **Frq** |  |  | **%** |  |  | **Frq** |  | **%** |  |  |  |
| January |  | 247 |  | 83.2 |  |  | 48 |  |  | 16.2 |  |  | 2 |  | .7 |  |  |  |
| February |  | 238 |  | 80.1 |  |  | 57 |  |  | 19.2 |  |  | 2 |  | .7 |  |  |  |
| March |  | 219 |  | 73.7 |  |  | 30 |  |  | 10.1 |  |  | 48 |  | 16.2 |  |  |  |
| April |  | 167 |  | 56.2 |  |  | 78 |  |  | 26.3 |  |  | 52 |  | 17.5 |  |  |  |
| May |  | 118 |  | 39.7 |  |  | 117 |  |  | 39.4 |  |  | 62 |  | 20.9 |  |  |  |
| June |  | 105 |  | 35.4 |  |  | 173 |  |  | 58.2 |  |  | 19 |  | 6.4 |  |  |  |
| July |  | 153 |  | 51.5 |  |  | 124 |  |  | 41.8 |  |  | 20 |  | 6.7 |  |  |  |
| August |  | 173 |  | 58.2 |  |  | 101 |  |  | 34.0 |  |  | 23 |  | 7.7 |  |  |  |
| September |  | 221 |  | 74.4 |  |  | 65 |  |  | 21.9 |  |  | 11 |  | 3.7 |  |  |  |
| October |  | 249 |  | 83.8 |  |  | 38 |  |  | 12.8 |  |  | 10 |  | 3.4 |  |  |  |
| November |  | 280 |  | 94.3 |  |  | 17 |  |  | 5.7 |  |  | - |  | - |  |  |  |
| December |  | 237 |  | 79.8 |  |  | 60 |  |  | 20.2 |  |  | - |  | - |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

***S****ource: Field survey, 2018*

**2: Food Availability**

Table 2 reveals that there was adequate food availability right from January to April, indicated by the majority of the respondents with proportions of 83.2%, 81.1%, 73.7% and 56.2% respectively. Also, there was food availability from July to December as shown by the respondents in the proportion of 51.5%, 58.2%, 74.4%, 83.8%, 94.3% and 79.8% respectively. However, there was a shortage of food only for two months of May and June, as accounted by the majority (75.1%) of the respondents. This, therefore, implies that in a whole year, for ten months, there was availability of food for the respondents, indicating that the benefits of adopting the GIZ technologies were derived. The only two months of food shortage might be lean periods for the respondents in the study area when farming activities are at their peak, expecting the year bumper harvest. The finding further implies that the manifestation of GIZ benefits has enhanced their livelihood capabilities in the study area. The finding is in line with the report of Sultana (2011) that smallholder farmers who adopted technology had sustainable access to different types of food in their houses for consumption.

**Table 3: Distribution of Respondents by Housing Condition (Beneficiaries N=297)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Housing Condition Indicator |  | |  | |  | |
|  | **Frequency** |  |  | **Percentage** |  |
| Roofing  Brick |  | 1 |  |  | .3 |  |
| Iron Sheet |  | 290 |  |  | 97.7 |  |
| Straw |  | 6 |  |  | 2.0 |  |
| Wall  Brick & Painted |  | 19 |  |  | 6.4 |  |
| Ordinary Brick |  | 144 |  |  | 48.5 |  |
| Mould |  | 134 |  |  | 45.1 |  |
| Floor  Tiled |  | 1 |  |  | .3 |  |
| Cemented |  | 280 |  |  | 94.3 |  |
| Ordinary |  | 16 |  |  | 5.4 |  |
| Kitchen  Inside |  | 78 |  |  | 26.3 |  |
| Outside |  | 219 |  |  | 73.7 |  |
| Furniture  Very good |  | 1 |  |  | .3 |  |
| Good |  | 65 |  |  | 21.9 |  |
| Simple |  | 212 |  |  | 71.4 |  |
| Very Old |  | 19 |  |  | 6.4 |  |
| Housing Outlook  Very good |  | 14 |  |  | 4.7 |  |
| Good |  | 156 |  |  | 52.5 |  |
| Simple |  | 114 |  |  | 38.4 |  |
| Very Old |  | 13 |  |  | 4.4 |  |

*Source: Field Survey, 2018*

**3: Housing Condition**

Data in Table 3 reveals that the majority of the respondents (97.7 %) kitchen outside their houses, 94.3% used cemented floor, 73.7% used an outside kitchen, 71.4% used simple furniture and above half (51.5 %) used housing outlook. The implication of this is that the majority of the respondents used available human, natural, physical and financial capital assets for their housing conditions. This, therefore, indicates that the majority of the respondents were able to afford good housing conditions due to the positive outcome from the adoption of intervention technologies. The finding is in line with the report of Muzari et al. (2012) that adoption of technology intervention enhanced the financial capabilities, ownership of equipment of rural households and increased the risk-taking ability of the rural farmers.

**Table 4: Distribution of Respondents by Water Facilities (Beneficiaries N=297)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Water Facilities (Indicators)** | **Very Clean**  **Frq.** | **%** | **Fair**  **Frq.** | **%** | **Bad Smell**  **Frq.** | **%** |
| Stream | 204 | 68.7 | 77 | 25.9 | 16 | 5.4 |
| River | 230 | 77.4 | 57 | 19.2 | 10 | 3.4 |
| Tube Well | 244 | 82.2 | 46 | 16.5 | 7 | 2.4 |
| Rain | 238 | 80.2 | 53 | 17.8 | 6 | 2.0 |
| Pipe Borne | 296 | 99.7 | 1 | .3 | - | - |

*Source: Field Survey, 2018*

**4: Water Facilities**

From Table 4, it is shown that majority of the respondents; 99.7%, 82.2%, 80.2%, 77.4% and 68.7% had very clean pipe borne water, tube well, rain, rivers and stream respectively. With the GIZ intervention, the respondents’ water facilities were seen to have improved and this may encourage the beneficiaries and even non-beneficiaries to account and continue with the adoption of GIZ technologies. It, therefore, follows that few had bad water facilities. They might not effectively adopt the technologies due to some challenges that may be limiting them. The finding is in support of FAO (2009) that the most important physical assets of the adopters of the technology intervention include roads, electricity and water supply for their livelihood sustenance.

**Table 5: Distribution of Respondents by Different Water Purposes (Beneficiaries N=297)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Water Sources |  | | | | | | | | | | | |
| **Drinking** | | **Cooking** | | **Utensils** | | **Bathing** | | **Washing Cloth** | | **Suitable for all Purposes** | |
| **Frq.** | **%** | **Frq.** | **%** | **Frq.** | **%** | **Frq.** | **%** | **Frq.** | **%** | **Frq.** | **%** |
| Stream | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | 297 | 100.0 |
| River | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | 297 | 100.0 |
| Rain | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | 297 | 100.0 |
| Table Water | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | 297 | 100.0 |
| Pipe Borne | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | 297 | 100.0 |

*Source: Field Survey, 2018*

**5: Different Water Purposes**

The result in Table 5 reveals that all the respondents (100.0%) used different water sources for all purposes. This implies that the respondents were not selective of different water sources and usage, but depended on the available water supply in their communities within a given period of the season. This coincides with the report of Tango (2006) that 94% of the rural population in similar studies in Bangladesh used different sources of drinking water in the

**Table 6: Distribution of Respondents by Monthly Distribution of Drinking Water Availability**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Months** |  | | | | | |  | | | | | |
| **Adequate** | |  | | **Inadequate** | |  | | **Scarcity** | |  | |
| **Frq.** |  | **%** |  | **Frq.** |  | **%** |  | **Frq.** |  | **%** |  |
| January | 155 |  | 52.2 |  | 110 |  | 37.0 |  | 32 |  | 10.8 |  |
| February | 127 |  | 42.8 |  | 131 |  | 44.1 |  | 39 |  | 13.1 |  |
| March | 112 |  | 37.7 |  | 97 |  | 32.7 |  | 88 |  | 13.1 |  |
| April | 105 |  | 35.4 |  | 102 |  | 34.3 |  | 90 |  | 30.3 |  |
| May | 133 |  | 44.8 |  | 133 |  | 44.8 |  | 31 |  | 10.4 |  |
| June | 188 |  | 66.7 |  | 93 |  | 31.3 |  | 6 |  | 2.0 |  |
| July | 277 |  | 93.3 |  | 12 |  | 4.0 |  | 8 |  | 2.7 |  |
| August | 286 |  | 96.3 |  | 4 |  | 1.3 |  | 7 |  | 2.4 |  |
| September | 286 |  | 96.3 |  | 4 |  | 1.3 |  | 7 |  | 2.4 |  |
| October | 269 |  | 90.6 |  | 16 |  | 5.4 |  | 12 |  | 4.0 |  |
| November | 244 |  | 82.2 |  | 38 |  | 12.8 |  | 15 |  | 5.1 |  |
| December | 189 |  | 63.6 |  | 97 |  | 32.7 |  | 11 |  | 3.7 |  |

*Sources: Field Survey, 2018*

**6: Monthly Distribution of Drinking Water Availability**

The results in Table 6 show that the majority of the respondents, 66.7 %, 96.3%,96.3%, 90.6%, 82.2%, 63.6% and 52.2% had adequate drinking water availability from June to January, respectively. From the month of February to May, there was inadequate drinking water availability to 42.8%, 37.7%, 35.4% and 44.8% respectively. A few respondents had drinking water scarcity throughout the year, as indicated by lower proportions, all of which were lower than 30.3%. This implies that the majority of the respondents had adequate drinking water availability for eight months of the year and inadequate drinking water availability for four months of the year. It could therefore be seen that water availability was evenly distributed throughout the year for the respondents in the study area, except for the month of April**.** In supporting this finding, Ellis (2000) reported that water is one of the crucial and indispensable assets to poor household whose survival depends on them for their livelihood activities.

**Table 7: Distribution of Respondents by Health Status**

|  |  |  |
| --- | --- | --- |
| Category | Freq | % |
| Good | 258 | 86.9 |
| Disabled | 1 | 0.3 |
| Short time illness | 21 | 7.1 |
| Long time illness | 10 | 3.4 |
| Weak | 7 | 2.4 |
| Total | 297 | 100.0 |

*Source: Field Survey, 2018*

**7: Health Status**

Data in Table 7 shows that the majority of the respondents (83.8%) claimed good health status, while very few (0.67%) were disabled, 7.7% had short-term illness, 3.4%had long-term illness and 2.4% were weak. This implies that with the adoption of GIZ technology, the majority had good health status, which could be attributed to the increase they have had both in terms of processing output and income. With an increase in income after adopting GIZ technologies, the processors were able to afford the health care facilities, thereby improving their welfare condition. In line with this result, World Bank (2014) justified the importance of good health status of farmers/processors as a bedrock to the rapid responses to the adoption of technology intervention, which is associated with the income generation activities of the adopters

**Table 8: Distribution of Respondents by Ability to Afford Health Treatment (Beneficiaries)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Health Treatment  Providers | Visit Regularly Occasionally Never Visited | | | | | | | | | | | | ted | | | | | |
|  | |  | |  | |  | |  | |  | |  | |  | |  | |
|  | **Frq.** |  | **%** |  | **Frq.** |  | **%** |  | **Frq.** |  | **%** |  |  |  |  |  |  |
| Self- Treatment |  | 71 |  | 23.9 |  | 193 |  | 65.0 |  | 33 |  | 11.1 |  |  |  |  |  |  |
| Village Pharmacy |  | 53 |  | 17.8 |  | 141 |  | 47.5 |  | 103 |  | 34.7 |  |  |  |  |  |  |
| Village Doctor |  | 40 |  | 13.5 |  | 158 |  | 53.2 |  | 99 |  | 33.3 |  |  |  |  |  |  |
| General Hospital |  | 86 |  | 29.0 |  | 184 |  | 62.0 |  | 86 |  | 29.0 |  |  |  |  |  |  |
| Private Hospital  Total |  | 49  297 |  | 16.3  100.0 |  | 166  297 |  | 56.9  100.0 |  | 82  297 |  | 27.5  100.0 |  |  |  |  |  |  |

*Source: Field Survey, 2018*

**8: Ability to afford Health Treatment**

Table 8 shows that the majority of the respondents (65.0 %) occasionally carried out self-treatment, while a few (23.9 %) regularly carried out self-treatment, and a few (11.1 %)never participated in self-treatment for health treatment. Also, about 47.5 % of the respondents occasionally visited village pharmacy while 34.7 % never visited village pharmacy and only few (17.8 %) visited regularly the village pharmacy for health treatment. However, more than half, the majority (53.2 %) of the respondents occasionally visited the village doctor, while a few (33.3 %) and (13.5 %) never visited the village doctor and regularly visited the village doctor for health treatment, respectively. Table 9 shows further that the majority of the respondents (62.0 %) occasionally visited a general hospital, while 29.0 % visited regularly, and 29% never visited a general hospital for health treatment. Also, more than half of the respondents (56.9 %) occasionally visited a private hospital, while a few of the respondents (27.5 %) never visited a private hospital, and only 16.3 % visited regularly for health treatment. The implication of these findings is that the majority of the respondents occasionally visited all the available health providers for treatments. This could be attributed to the low educational level or illiteracy level of the respondents and or inadequate health care advocacy on the challenges of delay and incomplete disease treatments, as well as drug abuse.

**Table 9: Distribution of Respondents by Type of Toilet Possession (Beneficiaries=297)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Toilet Possession  Indicators |  | |  | |
|  | **Frq.** |  | **%** |
| Own Latrine |  | 216 |  | 72.7 |
| Use Other`s Latrine |  | 24 |  | 8.1 |
|  |  |  |  |  |
| No Latrine & Use Other`s Toilet  No Latrine at all but using available bush  Total |  | 16  41  297 |  | 5.4  13.8  100.0 |

*Source: Field Survey, 2018*

**4.6.8: Type of Toilet Possession**

Table 10 reveals that the majority of the respondents (72.7 %) had their own latrines, a few (8.1%) used others’ latrines, whereas a few of them had no latrine but used other toilets and the rest 13.8% of the respondents had no latrine at all but confessed using available places in the bush. It is worth noting that the majority owned their latrine, and this indicates that the living conditions of the respondents had improved after the adoption of the GIZ intervention technologies. This could be attributed to the increment in the level of production and income that may give opportunity to get their own latrine. The findings are consistent with the report of Sheheli (2014) in his study area, that 73% of women owned their own toilets.

**Table 10: Distribution of Respondents by Toilet Positions (Beneficiaries=297)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Toilet Position  Indicators |  | |  | |
|  | **Frq.** |  | **%** |
| Outside |  | 183 |  | 61.6 |
| Inside |  | 114 |  | 38.4 |
| Total |  | 297 |  | 100.0 |

*Source: Field Survey, 2018*

**29: Toilet Positions**

From Table 10, it is shown that the majority of the respondents (61.6%) had their toilet positions outside their houses, while the rest (38.4%) had their toilet positions inside their houses**.** This shows that the respondents did not spend their income from shea nut processing activities on having toilets inside their houses, but having up to about 39% with toilet position inside the house considering the rural set-up and other decision-making factors in such rural areas. This is similar to the findings of Sheheli (2014), who found in Bangladesh that the majority of the respondents’ toilets (62%) were situated outside of the houses, while 38% of the toilets were attached.

**Table 11: Distribution of Respondents by Type of Toilet Used (Beneficiaries)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Used Toilet  Indicators |  | |  | |
|  | **Frq.** |  | **%** |
| Pit Toilet |  | 178 |  | 59.9 |
| Open Space Toilet |  | 90 |  | 30.3 |
| Sanitary Toilet & Pit Toilet |  | 10 |  | 3.4 |
| Sanitary Toilet &Open Toilet |  | 4 |  | 1.3 |
| Pit Toilet & Open Space Toilet |  | 15 |  | 5.1 |
| Total |  | 297 |  | 100.0 |

*Source: Field survey 2018*

**30: Type of Toilet Used**

Table 11 reveals that more than half of the respondents (59.9%) used a pit toilet, while a few (0.7%) used an open toilet, and 30.3% used an open space toilet. Others (9.0%) used sanitary toilet and pit toilet, sanitary toilet and open space toilet, pit toilet and open space toilet. The finding implies that the beneficiaries have earned more income from the adoption of the GIZ technologies to cope with different types of toilets. This is related to the position of the World Bank (2010a) that among the rural households, few used sanitary latrines, while 30% used home-made pit latrines.

**Table 12: Distribution of Respondents by Toilet Construction/Condition (Beneficiaries)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Toilet Construction  Indicators |  | |  | |  | |
|  | **Frq.** |  | **%** |  |  |
| Roof  Iron Sheet |  | 187 |  | 63.0 |  |  |
| Straw |  | 23 |  | 7.7 |  |  |
| Open  Total |  | 87  297 |  | 29.3  100.0 |  |  |
| Wall  Brick& Painted |  | 57 |  | 19.2 |  |  |
| Ordinary |  | 145 |  | 48.8 |  |  |
| Mould  Total |  | 95  297 |  | 32.0  100.0 |  |  |
| Floor  Tiled |  | 15 |  | 5.1 |  |  |
| Rugged/Tiles |  | - |  | - |  |  |
| Cemented  Total |  | 282  297 |  | 94.9  100.0 |  |  |

*Source: Field survey 2018*

**31: Toilet Construction/Condition**

Table 12 shows that the majority of the respondents (63.0 %) used iron sheet construction, while a few (29.3%) used an open roof, and just 7.1%used roof straw for toilet construction. Also, a little below the average of the respondents (48.8%) used ordinary wall, while 32.0% used mould wall and a few (19.2%) used construction. The Table also shows that the majority of the respondents, majority (94.9%) used cemented floor, a few (5.1%) used tiled floor, and none of the respondents used rug/carpet floor for toilet construction. The findings imply that the respondents used simple and available materials for their toilet construction.

**Table 13: Distribution of Respondents by Participation in Social Activities (Beneficiaries)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Indicators |  | | Always | |  | | Occasionally | | Never | | Participated | |
|  | **Frq.** |  | **%** |  |  | **Frq.** | **%** |  | **Frq.** |  | **%** |
| Family Event |  | 240 |  | 80.8 |  |  | 57 | 19.2 |  | - |  | - |
| Cultural Program |  | 46 |  | 15.5 |  |  | 234 | 88.8 |  | 17 |  | 5.7 |
| Village Meeting |  | 109 |  | 36.7 |  |  | 164 | 55.2 |  | 24 |  | 8.1 |
| Voluntary Help |  | 94 |  | 31.6 |  |  | 201 | 67.7 |  | 2 |  | .7 |
| Mediation |  | 89 |  | 30.0 |  |  | 170 | 57.2 |  | 38 |  | 12.8 |

Source: Field Survey, 2018

**32: Participation in Social Activities**

Table 13 shows that the majority of the respondents (80.8%) always participate in family events, while a few (19.2%) occasionally participate in family events, and none for never participated in family events. In cultural programmes, the majority of the respondents (88.8%) occasionally participated, while 15.5% always participate, whereas a few (5.7%) never participated. Further result shows that above average of the respondents (55.2%) occasionally participate in village meetings, while 36.7% always participate in village meetings, whereas a few (8.1%) never participate in village meetings. In voluntary help, the majority (67.7%) claimed occasional participation, while 31.6% always participated in voluntary self-help, and a few (0.7%) never participated in voluntary self-help. Also revealed on Table 13 is occasional participation in mediation, while 30.0% always participated in mediation, and a few (12.8%) never participated in mediation. The implication is that respondents were full participants of social activities, and it could be observed from Table 13 that the proportions of occasional participants in the selected social activities were higher, but the percentage of the beneficiaries who participated in the family events was higher than in other events**.** The rural women's participation in social activities was predominantly associated with family programmes such as marriage ceremonies, invitations and other related ceremonies offered by other families. The findings supported the report of Shaermin (2005) and Aktaruzzamman (2006) found that 71% of rural women in Bangladesh have low participation in social activities, while Nazeneen (2004), Naved (2000)and Rahaman (2006) reported that the majority of rural women have medium participation.

**Table 14: Distribution of Respondents by Freedom in Cash Expenditure (Beneficiaries)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Freedom in Cash Expenditure  Indicators |  | | | | | | | |  | | | | | | | |
| **Other Members** | |  | |  | | **Together** | |  | | **Husband** | |  | | **Herself** | |
|  | **Frq.** |  | **%** |  | **Frq.** |  | **%** |  | **Frq** |  | **%** |  | **Frq.** |  | **%** |
| Daily |  | 3 |  | 1.0 |  | 179 |  | 60.3 |  | 115 |  | 38.7 |  | - |  | - |
| On Land |  | 3 |  | 10.8 |  | 264 |  | 88.9 |  | 1 |  | .3 |  | - |  | - |
| On Household Repairs |  | 1 |  | .3 |  | 97 |  | 31.6 |  | 202 |  | 68.0 |  | - |  | - |
| On Child Education |  | 1 |  | .3 |  | 187 |  | 63.0 |  | 1 |  | .3 |  | - |  | - |
| On Health Care |  | 1 |  | .3 |  | 208 |  | 70.0 |  | 88 |  | 29.6 |  | - |  | - |
| On Household Assets |  | 2 |  | .7 |  | 197 |  | 66.3 |  | 98 |  | 33.0 |  | - |  | - |
| On Take Loan and Use |  | 3 |  | 1.0 |  | 125 |  | 42.1 |  | 120 |  | 40.4 |  | 49 |  | 16.5 |
| On Loan Servicing |  | 3 |  | 1.0 |  | 120 |  | 40.4 |  | 127 |  | 42.8 |  | 47 |  | 15.8 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

*Source: Field Survey, 2018*

**33: Freedom in Cash Expenditure**

From Table 14, it is shown that the majority of the respondents (63.3%) together make their cash expenditure on a daily basis, while the rest (38.7%) had husbands make cash expenditure, and very few (1.1%) of the respondents had other members, and none by herself made expenditure. The Table shows further that the majority of the respondents (88.9%) together make cash expenditure, and a few (11.1%) others make cash expenditure. On land, majority of the respondents (68.0%) together make their cash expenditure on house repair and few (31.9%) had others make cash expenditure. Also, the majority of the respondents (63.0%) together make their cash expenditure on child education, while a few (37%) had others make expenditure on child education. On health care, the majority of the respondents (70.0%) together make cash expenditure, and the remaining 30.0% make expenditure. On households’ assets, the majority of the respondents (66.3%) had together cash expenditure, and the remaining 36.7% had other expenditure. Also, on taking a loan and using it, about 42.1% made cash expenditures together, and the remaining (57.9%) had others make expenditures. However, on loan servicing, 42.8% had husbands make expenditures, while the remaining proportion (57.2%) had others make cash expenditures. From the analysis, it could be deduced that the cash expenditure is evenly distributed, and the processors, who were mainly women, had some freedom for cash expenditure. It follows, therefore, that with the benefits derived from GIZ technologies, processors having had their generated income increased, were able to actively be involved in cash expenditure, thereby contributing to the family and children's education expenses. The finding disagrees with that of Hogue and Itohara (2008) that decisions are made by male members of the family, and in most cases, the man makes decisions alone rather than consulting with his wife.

**Table 15: Distribution of Respondents by the Seven Livelihood Indicators (Beneficiaries)**

|  |  |  |
| --- | --- | --- |
| Seven Livelihood Indicators | Cumulative percentage Score | Rank |
| Water Facilities  Health Condition  Housing Condition  Freedom in Cash Expenditure  Sanitation  Participation in Social Activities  Food Availability  Cumulative Livelihood Status percentage score | 84.1  70.5  70.3  65.6  59.9  57.3  46.5  64.9 | 1  2  3  4  5  6  7  - |

*Source: Field Survey, 2018 CPS=64.9%*

**34: Seven Livelihood Indicators**

As revealed in Table 15, adoption of GIZ technologies has enhanced the livelihood conditions of the respondents, and the water facilities had the highest cumulative percentage score (84.1%) and the highest cumulative percentage score ranking, indicating that the water condition of the respondents is better than all indicators for the beneficiaries of GIZ technologies. Next, in decending order of livelihood cumulative ranking, as shown in the Table, were health condition (70.5%), housing condition (70.3%), freedom in cash expenditures (65.6%), sanitation (59.9%), participation in social activities (57.3%) and food availability (46.5%) being the least. However, on the general note, the cumulative livelihood status score of 64.9% ascertained good performance of livelihood indicators, thereby implying that the adoption of GIZ technologies is highly reflected in the welfare of beneficiaries in the study area**.** The findings are in agreement with the report of Sheheli (2014) that the majority of the rural women (60%) indicated that their livelihood improved through participation in income-generating activities of technology intervention.

**Effect of the adoption of GIZ Technologies on the Livelihood of Shea nut processors**

**Table 16: Regression Analysis of Adoption of GIZ Technologies on the Livelihood of Shea Nut Processors**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Livelihood indicators | R2 | Adjusted  R2 | F- ratio | t- cal | Significant(2-tailed) |
| 1.Food Availability | 0.100 | .098 | 65.770 | 8.110 | .000\*\* |
| 2. Housing condition | 0.028 | .027 | 7.207 | 4.148 | .000\*\* |
| 3.Water Facility | 0.075 | .073 | 47.942 | 6.924 | .000\*\* |
| 4. Health condition | 0.031 | .029 | 18.909 | 4.348 | .000\*\* |
| 5. Sanitation | 0.018 | .016 | 10.739 | 3.277 | .000\*\* |
| 6. Participation in social activities | 0.017 | .016 | 10.475 | 3.246 | .000\*\* |
| 7. Freedom in cash expenditures | 0.021 | .020 | 13.007 | 3.606 | .000\*\* |

*Source: Field Survey, 2018*; Dependent Variable-adoption of GIZ technologies

NB = \*\* at 1% Significant Level,

**41; Effects of the adoption of GIZ Technologies on the Livelihood of Shea Nut Processors.**

The effects on each of the livelihood indicators were marginal with the exception of water

Table 16 shows that adoption of GIZ technologies had significant effects on the livelihood assets and capabilities of the respondents and were significant at 1% level of probability. Water facilities were significant (t=6.924, p< .000) and had the highest R square of 0.075, that is explains 75%. Others were housing condition (t=4.148, p<.000), health condition (t=4.348, p< .000), sanitation (t=3.277, p<.000), participation in social activities (t=3.246, p<.000) and food availability (t=8.110, p<.000). The effects on each of the livelihood indicators were generally on marginal basis except the case of water facilities with R-square value explained at high value of 75%. The finding implies that there were other factors that affected the respondents’ adoption/implementation decisions of technologies, and their contributions to the enhancement of the respondents’ livelihood activities show an increase. The results are in agreement with the report of Jain *et al.* (2009) that non-adopters of improved technologies can hardly maintain their marginal livelihood activities due to low income generation of traditional technologies, which is associated with socio-economic stagnation leading to inadequate livelihood assets.

**42: Constraints to the Adoption of GIZ processing technologies**

**Table 17: Distribution of Respondents by the Factors Constraining Adoption of Shea Nut Processing**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Constraints to GIZ adoption** | **%** | **Mean** | **Std. Deviation** | **Rank** |
| 1.Inadequate finance | 100.00 | 1.875 | 0.727 | 1 |
| 2. Poor market linkages/channels | 92.30 | 1.737 | 0.711 | 2 |
| 3.Inability to understand due to illiteracy | 84.60 | 1.630 | 0.705 | 3 |
| 4.Lack of credit facilities | 76.90 | 1.576 | 0.689 | 4 |
| 5.Inadequate extension agents | 69.20 | 1.542 | 0.512 | 5 |
| 6.Poor processors groups for annexin opportunities | 61.50 | 1.451 | 0.687 | 6 |
| 7.Inadequate capacity building and follow-up | 63.08 | 1.389 | 0.632 | 7 |
| 8.Less cooperation from the husband /families | 46.10 | 1.387 | 0.626 | 8 |
| 9.Natural calamities (heavy rain storms | 38.40 | 1.380 | 0.534 | 9 |
| 10.Religious values | 15.30 | 1.22 | 0.424 | 10 |
| 11.Social insecurity | 15.30 | 1.22 | 0.424 | 10 |

*Source: Field Survey, 2018*

**42: Factors Constraining Adoption of Shea Nut Processing**

Table 17 shows the array of constraints to the adoption of GIZ technologies by the respondents. The most severe of these constraints were inadequate finance (x̄=1.875), poor market linkage/channel (x̄=1.737) and inability to understand due to illiteracy (x̄=1.630) as conceived by the majority of the respondents in proportions of 100.0%, 92.3% and 84.6% respectively. Others found to be severe were credit facilities (x̄=1.576), inadequate extension agents to go round the populace of respondents regularly (x̄=1.542), poor processors’ groups for annexing opportunities (x̄=1.451) and inadequate capacity building (x̄=1.576) and follow-up (x̄=1.387). However, the less severe constraints conceived by few of the respondents were (46.1%) for less cooperation from husband/families (x̄= 1.387), 38.4% for natural calamities such as heavy rain storms (x̄=1.380), 15.3% for religious values (1.22) and 15.3% social insecurity (x̄=1.22).

**43; Conclusion and Recommendation**

Findings from the study revealed that the majority of the respondents who adopted GIZ Shea nut processing technologies have their livelihood conditions enhanced in all the livelihood indicators, namely, water facilities, health condition, housing condition, freedom in cash expenditures, sanitation, participation in social activities and food availability. However, on the general note, the cumulative livelihood status score was above average, which ascertained good performance of livelihood indicators, indicating that GIZ technology is highly reflected in the welfare of beneficiaries in the study area.

The findings also indicated that the majority of the respondents faced some constraints ranging from inadequate finance, poor marketing channels and an illiteracy level of understanding of the basic principles of adoption of the technologies. The study recommended frequent technology interventions to improve the shea nuts processors' capacity and experience from the government organisations or non-governmental organisations (NGOs) across the value chains of the shea industry to enhance stakeholders’ productivity and livelihood activities, as has been indicated in the positive adoption of GIZ technology intervention in Niger State.

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