

Effects of Irrigation on Socio-Cultural Characteristics of Farmers in Hadejia Valley Project (HVIP) of Jigawa State, Nigeria

Mohammed Bashir Umar

Department of Agricultural Economics and Extension,
Faculty of Agriculture, Federal University, Gashua, Yobe State, Nigeria

Abstract: The effects of irrigation on beneficiaries in the Hadejia Valley Irrigation Project (HVIP) among the primarily Hausa community in Hadejia Emirate, Jigawa State, are highlighted in this study. The project area was divided into eight (8) "sectors" for the study. The particular goals were to define the socio-economic and institutional features of respondents in the project region, determine the effects of irrigation on respondents' socio-cultural characteristics and identify the project's limits. As part of the study's sample size, a simple random sampling of 120 respondents (120) was conducted and questioned. A systematic questionnaire was used to collect data, which was then analyzed using descriptive statistics. The respondents had an average age of 41 years and a three-year difference in educational levels, according to the report. The average household size was 11 individuals. Respondents had an average farm size of 3 hectares, got a wide range of off-farm income of N 210, 583.3, a mean of N 254, 666.70 as labor cost and had an average of 30 years of irrigation farming experience, according to the findings of this study. In addition, the respondents' fields were 3 kilometers from a water source (Dam). According to the findings, respondents received an average of 5 extension visits per season. They also received a credit of N 52, 771.00 and farm input subsidies of N 50, 205.68, in that order. A mean of 0.9 membership of social organizations registered under the plan (Water Users' Association) was discovered in the membership of cooperative societies. Men, on the other hand, are more inclined to demonstrate enthusiasm for any crop if its status is or changes to "cash crop." And food cropping/ technological innovation is an issue that deserves deliberate attention lest advances in food cropping lag behind. Farmers should form strong cooperatives, it was suggested. Farmers' income would be increased if better pricing policies were implemented; for example, relevant government bodies should attempt to secure markets for farmers and make appropriate cold storage facilities available so that marketing delays do not negatively impact farmers; government should implement crop zoning to avoid flooding the market for various crops. Farmers might fight for loans from their food customers if they had strong and reliable marketing groups; agronomists should conduct study into the possibilities of planting crops that require less fertilizer and pesticides; Furthermore, a study on the effect of irrigation on food and diet focusing specifically on the nutritional standards of the people in the irrigation (especially children) using a more technical methodology (e.g. anthropometry) would complement the findings of this study; it would provide a more quantifiable nutritional standards assessment; irrigation has increased employment opportunities in the area; labor demands could be reduced by greater utilization of appropriate resources.

Key words: Effects • Social • Cultural • Irrigation • Constraints

INTRODUCTION

Traditional technology known as "cutlass-hoe culture," which has been utilized for farm operations such as clearing, ridging, weeding and harvesting, is often evidence of the type of technology employed in

agricultural output in Nigeria. The tools were designed to meet the geography of the country's various ecological zones, resulting in the various types of hoe and cutlass that are still available today. In this situation, the Nigerian peasant is only concerned with employing his and his family's labor in conjunction with the traditional cutlass-

Corresponding Author: Mohammed Bashir Umar, Department of Agricultural Economics and Extension,
Faculty of Agriculture, Federal University, Gashua, Yobe State. E-mail: mbumar1966@gmail.com.

hoe culture. The farmer is not accustomed to improving his land (soil) by subsoil manuring, drainage, or irrigation [1].

The major goal of peasant farmers is to produce enough food and shelter to meet their subsistence needs, which necessitates arduous labor. This is due to the small tools used on farms and the amount of time spent on them. This problem is exacerbated by socio-cultural variables such as land fragmentation and the long distance between home and farm, all of which diminish the number of man-hours used in any given man-day of farm operations. Traditional technology has an impact on human labor vigor and stability, agricultural output and crop culture practices.

However, in traditional Nigerian society, the social and agricultural systems are inextricably linked (farming is seen as away of life). As a result, modifying one will affect the other, i.e., changing conventional agricultural techniques will create changes in the socio-cultural system, such as land tenure, religion, household or family decision-making and other parts of the peasant value system. Furthermore, rainfall in semi-arid areas of the world is frequently insufficient in quantity and variable in timing, necessitating irrigation to meet the moisture requirements of the crops needed to meet the demand for food and fiber [2]. In Nigeria, irrigation development has primarily taken the shape of large-scale irrigation schemes overseen by the River Basin Development Authorities (RBDAs).

The Federal Government established eleven (11) RBDAs in 1976, each responsible with developing irrigation infrastructure, increasing agricultural productivity and carrying out rural development initiatives in their respective jurisdictions [3]. One of the first and greatest of these initiatives was the Hadejia Jama'are River Basin Development Authority (HJRBDA). HJRBDA's Hadejia Valley Irrigation Project (HVIP) was built in 1993 and is located in Hadejia Emirate. As a result of the intervention program, this study attempted to highlight the effects of irrigation on the socio-cultural aspects of farmers in Hadejia emirate. The following are the precise objectives that the study aims to achieve:

- Characterize the socio-economic and institutional characteristics of respondents in the project area,
- Determine the effects of irrigation on respondents' socio-cultural characteristics in the study area and
- Evaluate the constraints faced by respondents in the project area.

Theoretical Framework: Cultural ecology: To understand the cultural changes that have occurred as a result of the Hadejia Valley Irrigation Project (HVIP), one must first understand the ecological and social changes that have occurred. Farmers must adapt to the new environment as a result of the changing environment. Some of the changes that have occurred can be explained via the lens of cultural ecology. [4] claims that the phrase "cultural ecology" is "sometimes used more broadly to refer to assessments of the link between culture, social organization and the environment." Ellen, on the other hand, thinks the phrase should be limited to Steward. Cultural ecology, according to Hatch, is the study of how culture interacts with the natural environment [5].

Farmers in the Hadejia Valley Irrigation Project (HVIP) canal operate in a unique setting with unique problems and limited resources. They re-define some cultural standards to adapt with their new surroundings. This is particularly visible in cropping patterns and labor utilization. One of the most prominent and early proponents of a cultural ecological approach to understanding human behavior claims that cultures in various environments have changed dramatically over millennia and that these changes can be traced back to new adaptations necessitated by changing technology and productive arrangements [6] Hatch adds that Steward's conception of culture might be described as pragmatic rather than irrational, because human institutions, in his opinion, should be understood in terms of how they adapt to life's demands [5] and culture does not exist in a vacuum from the harsh facts of life; rather, it responds to them in a unique way.

The Adaptation Model of Leach: Cultural ecologists frequently emphasize the relationship of the physical environment and culture [7]. It is also vital to examine the social environment and demonstrate how people adjust to changes in this area in this study. As a result, the adaptation model must be used to enhance cultural ecology. People, according to Leach, use or manipulate conditions to deal with sociopolitical and socioeconomic demands. He believed that kinship rules had been twisted or reinterpreted to allow the peasants to make more flexible economic decisions [8]. Individualism in labor utilization is evident in the Hadejia Valley Irrigation Project (HVIP).

It is difficult to form strong labor links with neighbors who are similarly constrained since people have been disconnected from their old production methods (though the irrigators explain that they are too

busy to have time for friends and relatives due to the labour-intensive cropping). Individualism looks to be an insurance policy against individuals who might seek to reap where they have not sown—the free-rider problem. Furthermore, by dispersing risks among the irrigators, a lot of them have two farms, one in a dry-land farming zone and the other irrigated. Cropping diversification is also possible, even if only one holding is accessible. In a study conducted by [9], the Giriama emerging wealthy demonstrated a similar mentality of securing social bonds in times of change. Thus, cultural ecology and Leach's concept of adaptation are important in understanding the choices made in the Hadejia Valley Irrigation Project's resource utilization (HVIP).

The Multi-Dimensional Approach to Development: The multi-dimensional development approach is considered to be effective in measuring the scheme's effects because the study deals with a number of distinct topics that are crucial in development. The research comes at a time when a new definition of "development" is needed [10]. Similarly, [11] indicates that in irrigation projects, a holistic evaluation is required. [12] considers multi-dimensional features of development to include not just growth and/or change, but also the relief of poverty through increasing the availability and spread of food, housing and health. Furthermore, development should improve living conditions by giving more jobs, better education and greater wages in order to boost individual self-esteem.

Similarly, it should reduce reliance and, as a result, boost individual choice [12]. These aspects of development have been viewed as pointing towards the direction of rural development. [13] identifies some of the primary issues of rural development programs as ensuring a subsistence food supply for all rural communities, increasing earnings and distributing them equitably and increasing work possibilities, health and family stability. People should be involved in the planning, implementation and evaluation of their programs in the same way. They should also strengthen development administration machinery and foster national cohesion through cross-ethnic rural interaction patterns. Some of these are key to the study, which is why the focus on the impact of irrigation within a rural development framework is so important.

MATERIALS AND METHODS

The research was developed in 3 steps: 1) study area and village selection; 2) sampling procedure and sample size; and 3) results and discussion.

Study Area: The investigation was carried out in the Auyo Local Government Area (LGA), which included eight (8) communities (the sector). The villages were between 11° and 13° degrees north latitude and 8° degrees east latitude and the climate in the study area is marked by extensive and rapid temperature and humidity variations. Humidity levels might approach 100 percent in a region that is recognized for being dry. The daily low and high temperatures were 15.1° and 33.1° degrees Celsius, respectively.

Sampling Procedure and Sample Size: The Hadejia Valley Irrigation Project (HVIP) is managed by the Hadejia-Jama'are River Basin Development Authority (HJRBD), which is under the administration of Nigeria's federal government and delivers irrigation water to the sector areas through a barrage at Gamsarka. The Hadejia emirate in Jigawa State is divided into eight Local Government Regions (LGAs): Auyo, Birniwa, Hadejia, Kafin-Hausa Mallam-Madori, Kirikasamma and Guri. Auyo LGA was chosen for the field study because it includes HVIP developed irrigable areas (known as "sectors"). In order to acquire a general feel of the current state of irrigation technology use in the Auyo LGA, a quick tour of all of the communities was done. The eight villages studied were Adaha, Auyo, Ayama, Gamsarka, Ganuwar Kuka, Gatafa, Marina and Yamidi. Likewise, the eight towns were all in the same general area. In 2021, the field work component included the primary survey, which featured in-depth data collection. As part of the study's sample size, a simple random selection of one hundred and twenty respondents (120) was conducted and questioned.

RESULTS AND DISCUSSION

Socio-Economic and Institutional Characteristics of Respondents: The study's first purpose was to describe the socioeconomic and institutional characteristics of the respondents. A variety of characteristics were assessed, including age, level of formal education, household size, farm size, non-farm income, cost of hired labor, irrigated farming experience, reaches, extension visits, credit, input subsidy and membership in a water users' group. The findings are summarized in Table 1. The table shows that the respondents were on average 41 years old, with a three-year difference in educational levels. The average household size was 11 individuals. Respondents had an average farm size of 3 hectares, got a wide range of off-farm income of N 210, 583.3, a mean of N 254, 666.70 as labor cost and had an average of 30 years of irrigation

Table 1: Distribution of respondents in the project sectors according to socio-economic and institutional characteristics (n= 120)

Variables	N	Mean	SD	Min.	Max
Age	120	41	7.59	30	60
Level of education		3	4.2	0	16
Household size		11	5.2	2	20
Farm size		3	2.2	0.5	10
Non-farm income		210583.3	203061.8	50000	600000
Cost of hired labour		254666.7	224454.5	15000	600000
Irrigation farming		30	13	2	60
Experience					
Reaches		3	2	0	3.4
Extension visit		5	3	1	20
Credit		52, 771	81, 646	0	500000
Subsidy on inputs		32, 422.33	35138.2	0	500000
Water Users' Ass.		0.9	0.363	0	1

Source: Field Survey, 2021

farming experience, according to the findings of this study. In addition, the respondents' fields were 3 kilometers from a water source (Dam). According to the findings, they received an average of 5 extension visits per season. They also received a credit of N 52, 771.00 and farm input subsidies of N 50, 205.68, in that order. A mean of 0.9 membership of social groups registered under the initiative was discovered in the membership of cooperative societies.

Effects of Irrigation on Respondents' Socio-Cultural Aspects

Water-Use Organization: Farmers in the Hadejia Valley Irrigation Project (HVIP) are self-sufficient in terms of water utilization. The Hadejia Valley Irrigation Scheme (HVIP) lies around 150 kilometers east of Kano City in Jigawa State's Auyo LGA. The Hadejia Barrage, the Feeder Canal (FC), the North Main Canal (NMC), the headworks and the origin of the South Main Canal are all part of the HVIP (SMC). The first two sectors, which take water from the FC and one sector near the end of the NMC are also included.

Access to Irrigation Water: The study's second goal is to determine the effects of irrigation on respondents' socio-cultural traits. The term "access to irrigation water" referred to the farmers' ability to get water from the dam when they needed it to irrigate their crops. It was assessed by polling and evaluating beneficiaries on the following irrigation service parameters: water availability, distribution equity, satisfaction and water charge payment.

- Head reach- Farms located from the barrage to the first sluice gate, which was 9 kilometers wide (from the barrage to Auyo village),

- Middle reach- farms located from the first sluice gate to the second gate, which was 6 kilometers wide (from Auyo to Gatafa village) and
- Tail-end- farms located from the second sluice gate to the last reservoir, which was 3 kilometers wide (from Gatafa to Auyo village).

Table 2 shows that 58 percent, 28 percent and 14 percent of respondents were located at the head, middle and tail ends of the project region, respectively. This could be linked to the project's poor building progress, as the project was supposed to cover 25, 000 hectares but only 6100 hectares have been constructed so far [14]. Natural resource access is the foundation for many people's long-term livelihoods. Rural households, in particular, rely on the availability of fertile land, grazing areas, water, woodlands and fisheries. Farmers utilize water to irrigate their fields, cultivate their crops and harvest them for domestic or commercial purposes. As a result, access to water contributes to the farmer's benefits. Despite the fact that water rights are protected, [15] found that a farmer's placement on the irrigation network has a considerable impact on their revenue.

As a result, this study measured the beneficiaries' perceptions of irrigation service components and then condensed this information into a format that could be utilized to easily map irrigation water access in the Hadejia Valley Irrigation Project's canal system (Table 3). Water availability was a hot topic among respondents, with 81 percent, 98 percent and 100 percent at the top, middle and bottom indicating that water was available. On water distribution equality, 85 percent at the head and 91 percent at the middle reach stated that water was distributed equally, while 15 percent, 9 percent and 10% at the head, middle and tail-end stated that it was somewhat equal, with just 7% at the tail-end stating that

Table 2: Distribution of beneficiaries according to farm location in the project (n = 120)

Location	Beneficiaries	
	Freq	Percent (%)
Head reach	69	58
Middle reach	34	28
Tail-end	17	14
Total	120	100

Source: Field Survey, 2021.

Table 3: Distribution of beneficiaries according to access to irrigation water (n=207)

Parameter	Head-reach	Middle-reach	Tail-end
Water availability			
Available	56 (81)	33(98)	17(100)
Not available	13 (19)	1(2)	0(0)
Equality			
Equal	59(85)	31(91)	0(0)
Fairly equal	10(15)	3(9)	10(59)
Not equal	0(0)	0(0)	7(41)
Satisfaction			
Yes	39(57)	28(82)	0(0)
No	30(43)	6 (18)	17(100)
Water charges			
Beginning	25(36)	20(59)	11(65)
Middle	7(10)	11(32)	0(0)
End	37(53)	3(9)	6 (35)

Source: Field Survey, 2021

Figures in parentases are percentages

Table 5: Membership of Water Users' Association

Year	Registered Members	Percent	Registered members
1996	505		15.6
1997	656		19.09
1998	868		25.26
1999	1019		29.65
2000	1169		56.89
2001	1955		56.89
2002	2690		78.28
2003	3436		100

Source: Hadejia Valley Project, 2021

it was not equal. The water distribution in the project was rated as satisfactory by 57 percent of respondents at the top and 28 percent of respondents at the center. However, in the head, middle and tail-end, 43 percent, 18 percent and 17 percent, respectively, were dissatisfied.

Formation of Water Users’ Associations (WUAs):

Eight (8) WUAs) were founded in the following sectors as a result of the development of the agency–farmer joint management method in the HVIP: Adaha, Auyo, Ayama, Gamsarka, Ganuwar Kuka, Marina, Yamidi and Zumoni [16]. These farmer's organizations arose fast to tackle the issues that farmers faced, particularly in the operation and

maintenance of irrigation facilities in their respective districts. The intervention gave the WUAs more power and expanded the scope of their work to include:

- Desilting of channels and repairing damaged irrigation infrastructure,
- Water sharing among members' plots, especially during droughts,
- Collection of water fees from farmers on behalf of the HVIP,
- Sourcing of credit facilities on behalf of members and
- Sourcing of physical farm inputs for members' crop production, season.

The Apex organizations have just updated their registrations to national NGOs and registered with the Corporate Affairs Commission, the national NGO governing agency [17].

System of Land Tenure: Although the exact origins of land tenure in this community are unknown, research has revealed that the prevalent system in this portion of the country was based on communal relationships. The Fulani (Dan fodio) seized Hausa country in general in 1804 and the communal land tenure arrangement was altered [18]. The Fulani constructed a modified feudal system based on Islamic law, in which the Sultan claimed ownership of the land. The leaders were given land, but the locals were degraded to the status of feudal serfs. With colonialism came the Native Rights Proclamation No.9 of 1910, which changed the feudalistic land tenure structure by declaring that without the agreement of the government, the right to occupy and utilize land was null and void. This proclamation was passed three times: in 1916, 1962 and 1978. All of these decrees changed the way things were done.

Since declaring all land to be state property, the government's policy was to expropriate land from indigenous holdings at a compensation that may be at the government's convenience:

- The government's acquisition of 2150 hectares for irrigation may have resulted in the change of ownership of many rural farmers in the area, as indicated by 51.3 percent of respondents who cited land inaccessibility as a major problem,
- This may have resulted in the marketing of land, which was previously discouraged by the existing communal tenure system,
- This government action may have resulted in the fragmentation of landholdings, as indicated by 30 percent of respondents and
- It is also possible that the quality of agricultural production will suffer as a result of this.

Table 6: Distribution of respondents according to farm size

Farm size (Has)	Number of respondents	Percent %
None	18	15
0.5-2.0	58	48
2.5-4.0	24	20
4.5-6.0	10	8
6.5-8.0	8	7
8.5-10.0	2	2
Total	120	100

Source: Field Survey, 2021

Table 7: Distribution of respondents in the project sectors according to land tenure characteristics (n= 120)

Tenancy	Number	Percent (%)
Landless	18	15
Inheritance	50	42
Pledge	10	8
Borrow	8	7
Purchase	10	8
Sharecropping	6	5
Renting	8	7
Shadow farmer	3	3
Government allocation	7	6
Total	120	100

Source: Field Survey, 2021

Division of Labor in Agriculture: For diverse crop production and irrigation, the distribution of labor in current Hadejia Valley Irrigation Project (HVIP) villages is investigated. Individual cropping patterns could not be examined due to the enormous diversity in both food and cash cropping. However, a duality for crop categories emerges, which is explored in terms of food and cash crops. The entire treatment sample's (N=120) households cultivate both food and cash crops. Irrigation aids farmers in diversifying their farming, which can be seen in both the food and cash crop categories. Crops planted as cash crops by one farmer are planted as food crops by another, hence the term "cash crop" is used loosely in this study. They (cash crops) are crops that are planted with the intention of generating income from their sale in this study. Farmers who plant "food crops" with the explicit goal of producing a relatively big surplus for sale are considered to be growing them as both food and cash crops. In a similar line, farmers who only sell their output because they need the money to buy other food (for example, selling rice to buy millet) are considered to be simply farming food crops. The reasoning behind this is that the proceeds from the sale are re-invested in food. Indeed, these farmers do not consider themselves to be cash-croppers.

Gender Labor Division Marginalization: An adaptive method: Rice, for example, is one of the most labor-intensive cash crops growing in the study area. Without hired labor, the majority of households are unable to meet their labor demands. In the irrigation zone, hired labor is plentiful. Farmers, on the other hand, are busy planting and weeding their own crops during the wet season. Farmers believe that labor payments lower their profits, particularly because other inputs (most notably fertilizers and pesticides, which are required in cash crops) force

them to dig deeper into their wallets. Among both farmers and laborers, daily labor terms are more popular than monthly ones.

Casual labor, according to the farmer, is more efficient, albeit more expensive, while the worker claims it is more lucrative. Planting, weeding and harvesting are all times when labor demand peaks. Farmers establish arrangements such that while harvesting some crops, they can also plant or weed others, ensuring that mature harvests are available for sale throughout the year. Farmers, on the other hand, avoid letting crops flower between late June and early August, claiming that the wet season is harmful to practically all of the crops they raise for sale. Although contracted labor is primarily performed by men, a look at the gender labor divide in households reveals a clear division in harvesting, such as rice winnowing.

[19] examines the Kofyar of Northern Nigeria, noting the move from intense household agriculture to shifting cultivation and the emphasis on nuclear family labor. More labor can be obtained by marrying more wives, expanding homes by keeping married sons, employing labor and organizing beer-drinking volunteer work parties. He also mentions that extended families predominated in a community on the Fijian island of Moala, where various widely scattered food sources had to be utilized [19]. However, it is impossible to relate the intensity of irrigated farming as one of the causes of the Hadejia Valley Irrigation Project's absence of cooperative labor (HVIP).

With such few labor resources, farmers may easily change their labor management practices to meet their needs. This has forced farmers in the Hadejia Valley Irrigation Project (HVIP) to reconsider the gender division of labor in agricultural production. How do we explain, however, that some agricultural operations (land preparation, pesticide spraying and, to a lesser extent, crop-selling) are still largely male tasks? Land preparation is predominantly a man's job in food growing. How can we explain the apparent importance of female labor in food production in comparison to male labor? The fact that the technology that is mostly used is still traditionally conserved for men may be part of the rationale for the gender disparity in labor allocation in land preparation. In the other, the technology was used.

Spraying cash crops (and some food crops) is done with a container filled with harmful liquid insecticides that the farmers are aware of. The harmful levels are unknown, but the majority of farmers are concerned about the toxicity. Pesticides are not a woman's affair, according to the guys, because they are too powerful for them.

The farmers gauge the chemical's impact on a person by the amount of tiredness they experience after spraying. Farmers take milk before and after spraying their crops to counteract the effect. They then take a bath after spraying to remove any chemicals that may have gotten on their skin. Though the difference in female/male labor contribution in the two activities (land preparation and pesticide toxicity) is explained in part by the technology used in field preparation and the toxicity of pesticides, in terms of land preparation and crop spraying, a farmer may cover a wider area in less time than he can when planting, weeding, or harvesting. Furthermore, while all crops must be planted, weeded and harvested, farmers do not spray all of their crops (partly owing to a lack of pesticides) and ground preparation is always done prior to planting.

Agricultural Decision-Making: Typically, respondents report that partners make decisions on labor arrangements (when and who should undertake specific jobs) together, but that if they have differing views, the man's preferences take precedence. This is true for both cash and food crops. Many respondents admit to having crop preferences in terms of labor input. However, the majority of responders favor the crops they grow because they pay well. When asked if other household members had a preference for crops, respondents said yes and the grounds for choice were, once again, higher and more reliable income, followed by their importance as food crops.

Irrigation's Effect on Living Standards: A major goal of rural development programs is to improve the living standards of rural people. In fact, it was one of the stated aims of the Hadejia Valley Irrigation Project from the beginning (HVIP). It is impossible to measure all aspects of progress or living standards accurately since they are numerous and even if we had the time, some of them would be impossible to quantify. The income, assets and employment criteria of living standards are explored in this study. One of the more obvious but equally important ways that water availability has improved rural life in the Hadejia Valley Irrigation Project (HVIP) is that it has relieved the drudgery that comes with domestic water scarcity. The Hadejia River was the only year-round source of water in the region before irrigation was introduced.

Income: All of the respondents are pleased with the fact that their farms can produce higher yields not only in income crops but also in food crops. Despite the fact that

Table 8: Net-farm income of beneficiaries of Hadejia Valley Irrigation

Project (n = 120).	
Input ₦/ha	Costs (₦)
A. Variables	
Seeds	71525
Fertilizer	202300
Chemical	30536
Labour	322212
Fuel	60406
B. Fixed cost	127320
C. Total cost (A + B)	814304
D. Revenue:	
Rice	1048437
Maize	463719
Wheat	66140
Tomato	456620
Onion	87640
Others	79120
Total revenue	2201676
Net farm income	1387372

Source: Field Survey, 2021

some of them claim that after deducting the income spent on inputs, they concede that they are still in a better financial position than they were before they began irrigating. The respondents' income distribution is seen in Table 8.

Factors Affecting Farmers' Benefit Realization

Inventory of Wealth: Different scholars have utilized different characteristics as indicators of living standards and wealth [20]. Some local definitions, such as preferences for certain home types and household consumer products, have been captured in this study's assessment of wealth and living standards. Some of the study area's young people do not consider cattle to be a source of income, but the elder generation does. All agree, however, that livestock is useful in times of scarcity. They are a kind of insurance in case of illness, as well as an investment to alleviate a lack of finances for paying school fees, especially at the beginning of the year when fees are high. This study looked at transportation, shelter, sanitation, energy, technology, communications and other household assets.

Shelter: In the Hadejia Valley Irrigation Project, shelter is an essential indicator of affluence and living standards (HVIP). Young and old alike believe that if a person is wealthy, he will reside in a home with tiles or corrugated iron roofs. The walls would be made of bricks or blocks and the floor would be concrete. The house would be large as well.

Consumer Durables for the Home: Another factor used in the study to measure living standards and wealth is household consumer durables. Consumer durables-rich households typically have greater purchasing power than their rivals. It is assumed that these durables reduce drudgery, hence raising farmers' living conditions. Before inventory was begun, the people's preferences in consumer durables were investigated. Table 9 shows the results of the consumer durables survey. According to the population's estimate, the consumer durables inventory represents a typically not too low level of living by rural standards. There were numerous types of homes that were typical of households in the study area. Among them are mud huts, brick and block houses with various roofing materials, *polem* and *dagga* houses with grass thatched roofs and *polem* and *dagga* houses with grass thatched roofs. The most common types of housing in the project region were mud (64%) and concrete (4%) houses, although mud houses were more popular in the non-project area, adopting a highly traditional housing approach and were widely employed by households in both places. Despite being less expensive to construct, they were easily destroyed during the rainy season, as indicated by the large number of house repairs (72% and 28%) (Table 9).

Families who could afford either type of residence were deemed wealthy in any case. 19%, 45 percent, 29 percent and 7% of respondents, respectively, owned a tractor, pumping machine, sprayers and threshers, which are used in farm activities and for raising water for irrigation. Cars were purchased by 8% of respondents, lorry/pickups by 13%, motorcycles by 58 percent, tricycles by 5% and bicycles by 17 percent. 16 percent of respondents possessed a refrigerator, while 24% owned a generator. Radio and video were owned by 77 percent of respondents, while television was owned by 7%, VCD by 8% and satellite by 4%. Handsets androids and PCs were all held by 65 percent, 33 percent and 3% of the population, respectively. Gas cookers, kerosene stoves and charcoal stoves were obtained by 4%, 23% and 73% of the respondents, respectively.

Livestock: Though the younger generation does not generally believe livestock is a reliable indicator of a person's wealth, the elder age is unwavering in their belief. Because the age range is so vast, it was decided that livestock should be included to account for individual preferences in wealth acquisition. Furthermore, the area's tiny stock contributes to the food and diet of young children. They have a good impact on people's nutrition

Table 9: Proportional distribution of assets of respondents in Hadejia Valley Irrigation Project (n= 120)

Assets	Respondents	
	Freq	Percent (%)
A. Buildings:		
a. Mud house	86	72
b. Concrete house	34	28
B. Farm equipment:		
a. Tractor	23	19
b. Pumping machine	54	45
c. Sprayers	35	29
d. Threshers	8	7
C. Automobiles:		
a. Car	9	8
b. Lorry/Pick-up	16	13
c. Motorcycle	69	58
d. Tricycle	6	5
e. Bicycle	20	17
D. Electrical appliances:		
a. Refrigerator	19	16
b. Generator	29	24
c. Solar panels	47	39
d. Rechargeable lamp	25	21
E. Electronics:		
a. Radio	92	77
b. Video	6	5
c. Television	8	7
d. VCD	9	8
e. Satellite	5	4
F. Communication Gadgets:		
a. Handsets	78	65
b. Androids	39	33
c. Computers	3	3
G. Kitchen Appliances:		
a. Gas cooker	5	4
b. Kerosene stove	28	23
c. Charcoal stove	87	73
H. Farm animals:		
a. Cattle	30	25
b. Sheep	24	20
c. Goats	37	31
d. Poultry	29	24

Source: Field Survey, 2021

in this way. Additionally, whereas cows are crucial for breeding (growing numbers and thus raising the probability of a bigger income after sales) and milk, oxen are important for plowing. Furthermore, the majority of respondents believe that animals are useful in times of financial hardship, such as when paying school tuition. 25% of the population possessed cattle, sheep, goats and poultry.

Table 10: Percentage distribution of employment opportunities created by the Hadejia Valley Irrigation Project in the study area (n = 120)

Wage earning Opportunities	Respondents	
	Freq	Percent (%)
Trading	76	63
Bricklaying	53	44
Fishing	30	25
Hunting	26	22
Water vending	13	11
Hired labour	23	19
Commercial transportation	33	28
Animal traction	13	11
Craftwork	23	19
Repairs of pump machines	13	11
Sales of spare parts	5	4
Sales of farm inputs	3	3
Land market	16	13
Commission agent	14	12

Source: Field Survey, 2021

Table 11: Distribution of respondents in the project sectors according to the major problems faced in their farming operations

Problems mentioned	Number of respondents	Percent %
Inaccessibility to land	20	17
Annual Flooding	40	33
Pests and Diseases	16	13
Birds' infestation	16	13
Poor marketing outlets	6	5
Lack of irrigation water	14	12
No problem at all	8	7
Total	120	100

Source: Field Survey, 2021

Opportunities for Employment: The findings of this study demonstrated that the Hadejia Valley Irrigation Project generated a wide range of employment opportunities in the areas investigated. This could be attributed to increased economic activity and an influx of people from other areas looking to take advantage of the project's potential economic opportunities. Additional occupational activities arose as a result of these socioeconomic activities. Table 10 shows that 63 percent of respondents engaged in commerce, 44 percent in bricklaying, 25 percent in fishing, 20 percent in hunting and 11 percent in water vending as additional income-generating activities brought to the area as a result of the project. While 19 percent said they worked as hired laborers, 28 percent said they did commercial transportation, 11 percent said they did animal traction, 19 percent said they did craftwork and 11 percent said they did pump repairs as supplementary sources of income.

Constraints Faced by Beneficiaries of the Project:

Irrigation, like most projects, has both positive and negative environmental consequences. The positive consequences are frequently reflected in farmer welfare gains as a result of higher agricultural output, as well as the multiplier effect on national income and food security. Its multiple negative impacts, on the other hand, have been reported as either 'on-site' or 'off-site' effects. The entire beneficial consequences of irrigation development, according to [21], can be both direct and indirect. The following are the limits that respondents in the project reported:

- Land inaccessibility was indicated by 17% of respondents; ii. Annual flooding, the occurrence of floods in the HVIP on an annual basis is of significant concern to all stakeholders in the area. Floodwaters wreak devastation on fields, crops and property,
- Annual flooding was reported by almost 33% of farms polled,
- Infection with fungus (rice blast). Rice blast is another major issue in the HVIP area. The disease infects the crops as a result of the cultivation of sensitive rice cultivars, lowering yield. Pest and disease infestations were reported by almost 13% of respondents.
- The Quela Birds' Threat. The main pests causing serious damage to the developing crops in the area are Quela quela and Sudan golden sparrow (*Passer leutus*).
- The *typha* grass has been reported to provide a convenient nesting location for the multiplication of birds. In addition, 13% of respondents said they had been infested by birds.
- Farm produce marketing outlets are limited. Farmers in HVIP areas typically lacked the ability to efficiently investigate the various marketing options available to them. Poor marketing sources were noted by about 5% of respondents as a concern. Nonetheless, some attempts were made.

CONCLUSION

One of the study's goals was to look into the interaction between water management and socio-cultural institutions. The study looked at modern socio-cultural systems as well as indigenous institutions. One of the study's results is that both of these institutions have been merged in the irrigation of the Hadejia Valley Irrigation

Project (HVIP). The benefit of utilizing local management systems is that individuals are not forced to adjust to new laws and regulations. The implication is that the organization of water consumption does not cause the stress that comes with learning to adapt into new bureaucracy.

Communities in the irrigation zone will not be able to function as they did before the project. As a result, the population chooses seniors based on physical habitat in relation to water sectors, age, knowledge and excellent overall behavior in the community, rather than community groups. This is a response to the new environment, in which community-based social structure would be impractical. The farmers' relative liberty in making decisions about water management and crop selection strengthens their sense of ownership of the irrigation project while also allowing for individual family preferences and priorities. This helps to explain the irrigation project's relative success in comparison to larger, more bureaucratic projects. The findings of the study are similar to those of [22] in this regard.

Gender roles in irrigation in the Hadejia Valley Irrigation Project (HVIP) have been adjusted in some jobs to account for limited labor resources. Men and women conduct tasks that were formerly only handled by women (for example, harvesting). This contradicts the conclusions of other research, which claim that if the division of labor in agriculture is changed, women will gain access to tasks previously reserved for men [23]. Women, on the other hand, are more involved in processing and household activities than men in cash crops. As a result, women have to do a lot of work in addition to their domestic duties. This is in line with past research that have demonstrated that agricultural development initiatives have increased women's labor in particular [24] This study contradicts the findings of [25], which claim that women in Kibirigwi irrigation only participate in cash crops.

However, an increase in women's labor in the project area does not imply that men are idle. Irrigation, according to the study, has increased labor demands on both men and women. It was also discovered that the tasks with the highest work demand are those where traditional labor division has been adjusted. This is an example of culture adapting to the demands of everyday living. Although the change is visible in food crops, it is more pronounced in cash crops. Cash cropping is also more likely to see technological advancements (rice for sale are planted and weeded using the plough and tractors, while the hoe is used in vegetable gardens cultivated for home

consumption and sale). We can conclude that men are likely to be enthusiastic about any crop that is or becomes a "cash crop." Food cropping, on the other hand, is a hotbed of technical innovation.

Recommendations: The following are suggested based on the results of the following tests:

- Farmer cooperatives should be strong. If better pricing rules were implemented, farmers' revenue would increase. The development of a robust cooperative could help to reduce extreme price fluctuations. A robust cooperative would also be in a stronger position to push for more markets and cargo space for the farmers' produce and the government should assist such cooperatives,
- Attempts should be taken by relevant government organizations, for example, to ensure markets for farmers and make appropriate cold storage facilities accessible so that delays in marketing do not have a significant impact on farmers. Currently, if product is not gathered on the day of harvest, it perishes, resulting in losses for farmers. To compensate for the disadvantage farmers have as a result of the high cost of inputs such as fertilizer and pesticides, low-interest loans should be made available to them,
- The government should implement crop zoning to prevent the market for various crops from becoming flooded. Farmers might argue for loans from their produce purchasers if they had strong and reliable marketing groups,
- Agronomists should conduct research to see if it is possible to cultivate crops that require less fertilizer and pesticides. Because these inputs, together with labor demands, place the greatest strain on farmers, crops that require less of them would relieve the strain. Studies on newly discovered pests' resistance to insecticides currently in use in the area are related to this and are equally important. Hopefully, research will reveal what pest control changes should be undertaken. More research is required to determine the hazardous levels of pesticides in use and whether or not they are safe to use,
- Farmers express concern about drowsiness caused by pesticide application. Continued use of such pesticides by women may have long-term consequences, particularly for foetal development and nursing babies,
- In addition, a study on the effect of irrigation on food and diet, focusing specifically on the nutritional

standards of the people in the irrigation (especially children) using a more technical methodology (e.g. anthropometry), would complement the findings of this study, providing a more quantifiable nutritional standards assessment,

- Irrigation has boosted the number of jobs available in the area. Despite the fact that this was one of the project's goals, farmers believe that labor scarcity is affecting their social lives because they have little time to spare. They are only allowed to see friends and relatives in an emergency. Greater use of appropriate technology could help to reduce labor demands,
- Exposure to technology innovations would reduce women's labor demands in the study area and
- Technological innovations would reduce the environmental degradation associated with irrigation. Water efficiency is also required, which applies to both farmers and project authorities.

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