INNOVATIONS

The Difference in the Economic Status of Farm FamiliesBefore and After Implementation of Infrastructure Development Projects in the Second District of Nueva Ecija, Philippines

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Abstract : In general, the study aimed to determine thedifference in the economic status of farm families before and after the implementation of infrastructure development projects in the second district ofNueva Ecija, Philippines.This study used a descriptive-quantitative correlation design.A total of 3 key informants and 90 farm families head composed of the respondents. A survey questionnaire was prepared as an instrument in gathering the required information.The mean of 51.69 years old signifies that most of the respondents' ages were at the prime working age. A majority (95.70%) of the households were headed by male farmers and had no other source of income other than farming. Job created, support services, and access to financial and market institutions by the respondents are significantly different before and after the implementation of the infrastructure projects. The level of adoption of rice production technologies registered a significant difference. However, vegetable production technologies registered no significant difference in the level of adoption before and after the implementation of the infrastructure projects. Farm inputs investment and profitability for rice and vegetable production before and after the implementation of the infrastructure projects in the first and second cropping seasons do not have a significant difference. While the net income registered a significant difference in two cropping seasons before and after the implementation of the infrastructure projects. The development of the infrastructure brings no significant difference with their livestock and vegetable production. On the other hand, rice production increases after the development of the infrastructure.Base on the results of the study the following recommendations are formulated:Continue the implementation of the infrastructure development especially to rural communities to spur the development of the communities; Consider the needs of the community when constructing infrastructure to address the needs of the residence in terms of infrastructure development; Connect the infrastructure development to other agencies like financial, market, health, education, extension services, transportation, labor, and employment for a more integrated development rural development program.

Keywords: 1. Difference **2**. Economic status 3. farm families 4. Implementation 5. Infrastructure development projects

Introduction

Rural infrastructure plays a key role in reaching the large mass of rural poor. When rural infrastructure has deteriorated or is non-existent, the cost of marketing farm produce can be prohibitive for poor farmers. Poor rural infrastructure also limits the ability of the traders to travel to and communicate with remote farming areas, limiting market access from these areas and eliminating competition for their produce. Construction of rural roads almost inevitably leads to increases in agricultural production and productivity by bringing in new land into cultivation or by intensifying existing land use to take advantage of expanded market opportunities. (IFAD, 1995).

The kind of infrastructure put in place also determines whether growth does all that it can to reduce poverty. Most of the poor are in rural areas, and the growth of farm productivity and non-farm rural employment is linked closely to infrastructure provision (World Bank, 1994). It is estimated that 15 percent of the crop production is lost between the farm gate and the consumer because of poor roads and inappropriate storage facilities alone, adversely influencing the income of farmers (World Bank, 1997).

The ADB (2007) finds that poor infrastructure and lack of investment in infrastructure have constrained growth. Poor infrastructure, a major factor for increasing the cost of doing business, has a significant adverse impact on the perceived competitiveness and attractiveness of the Philippines as an investment destination.

According to the 2017 World Economic Forum's competitiveness report, the Philippines ranked 97th in the world in terms of infrastructure. In a separate report by the United Nations, the Philippines ranked 5th in Southeast Asia in terms of access to physical infrastructure.

Tarique (2008) said the investment in infrastructure is essential to increase farmers' access to input and output markets, to stimulate the rural non-farm economy and vitalize rural towns, to increase consumer demand in rural areas, and to facilitate the integration of less-favored rural areas into national and international economies.

World Bank (2014) said, despite growing urbanization, 51% of the population of the Philippines remains rural. The contribution of the collective agribusiness sector accounts for 35% of the GDP and supports about 50% of the labor force. However, the Philippine rural economy has been characterized for many years by the low-income levels of primary producers, low levels of rural employment, lack of food security, weak agricultural competitiveness, and an overall high level of rural poverty. While the sector has not been the driver of overall economic growth, it has the potential for making it more inclusive.

The underlying reasons for the relatively poor performance of the sector have been extensively studied. Poorly developed infrastructure for transport, particularly roads, port facilities, and inter-island shipping, head the list of constraints. About half of rural villages in the country lack all-weather access to the main transport system. Out of the overall road network of 196,686 km, gravel roads make up about 52%, while 31% are earth roads. Only some 17% of the 121,442 km local (barangay) road network is paved, leaving a huge backlog of farm-to-market roads to be developed. The spread of modern agricultural technology has also been constrained by a weak extension system and the high costs of inputs. As a result, the yields of most crops are well below potential. High post-harvest losses further reduce profitability, with losses ranging from 15% to 50% for fruits and vegetables, 15% for rice, and 5% for corn. Market assistance has also been limited, contributing to poorly developed value chains for many commodities, while product standards and quality systems have been ineffectively regulated. The result has been an under-investment by the private sector in agriculture.

I-BUILD (2016) said Poor rural road conditions make the area often inaccessible, especially during the rainy season. The residents have difficulty transporting their agricultural

products to the market. Most of the farmers opt to plant crops just enough for their families' consumption due to the high cost of transportation and poor road network from the production area to the market.

Delapaz (2017) Investors think the country's macroeconomic environment is among the most attractive in the world, but their interest in the Philippine economy is being dampened by slow infrastructure development. Even if the Philippines' macroeconomic environment ranked 22nd out of 137 nations in the World Economic Forum (WEF) Global Competitiveness Index this year, it scored low in overall infrastructure.

The Philippines has underinvested in infrastructure – it was ranked 97th out of 137 nations in the WEF report for 2017-2018. Its score of 3.4 out of 7 is the same as Rwanda and even lower than that of Kenya, Cape Verde, and Albania."Inadequate supply of infrastructure" is one of the top 3 reasons the Philippines' score slipped even if it climbed a notch in the rankings. In terms of overall competitiveness, the country climbed to the 56th spot out of 137 economies in this year's report, from 57th out of 138 in 2016, even as its score slipped to 4.35 out of 7.

The report showed that the Philippines' overall infrastructure lags behind those of its Southeast Asian neighbors. The WEF investigated the quality as well as the availability of roads, railroads, ports, air transport, electricity, and telephones.

Warwick, M.K. (2017) of the World Bank, said, the impact of infrastructure on economic and social development is well documented in East Asia and around the world. Access to reliable, high-quality, efficient, and affordable infrastructure services is a critical factor in reducing poverty and inequality, promoting economic growth, and creating jobs. At the same time, for some of the global population, especially the world's poorest, limited access to basic physical assets such as roads, piped water supply, power generation, and electricity distribution remains a significant constraint on human health, quality of life, education, and employment, in urban as well as in rural areas.

However, studies using aggregated infrastructure data failed to reveal which types of infrastructure could account for the most significant impact on agricultural productivity. As Dercon et al. (2007) observed, these studies did not discuss whether it was the quantity or quality of infrastructure that mattered nor—in the absence of distributional data—did they show the impact of these investments on poverty. Thus, the type of rural infrastructure that yields the most significant impact must be identified for a more efficient allocation of resources.

In the Philippines, empirical studies on the impact of rural infrastructure on agricultural productivity are largely an unexplored territory Teruel and Kuroda (2004), and Balisacan and Fuwa (2004).

Objectives of the Study

In general, the study aimed to determine the difference in the economic status of farm families before and after the implementation of infrastructure development projects in the second district of Nueva Ecija, Philippines. In particular, the study seeks to:

1.Characterize the Socio-Economic Profile of the farm families in the project areas.

2.Describe the infrastructure projects implemented in the study area.

3.To find out the difference in the economic status of the farm families before and after the implementation of the infrastructure projects.

Review of Related Literature

A study of the socio-economic improvement, with roads, on the village development, based on a survey of 1662 villages in India, found that the effect of accessibility was greater for unimproved than for improved roads suggesting that in bringing about socio-economic change,

the existence of some kind of trafficable route is of major importance. Its quality is a second-order consideration (Bansal and Patil, 1979). In another study, macro data was used from 85 randomly selected districts of India to examine the role of rural roads, among other factors in agriculture investment and output. The study found that the road investment contributed directly to the growth of agricultural output, increased use of fertilizer, expansion of commercial banking operations, etc. (Binswanger et al., 1993).

There was also an observation regarding the positive impact of social development and irrigation intensity factors on the composite index of economic development at the district level (Gulati, 1997). Within the social development factors, the surfaced road length and electricity turned out to be the crucial infrastructure. In a state-level analysis for two periods of time, viz., 1970-71 and 1980-81, the inadequacy of infrastructure facilities has been observed as a major obstacle in the path of progress of developing states. It was observed that infrastructure had a positive impact on development, at least in six states while in another five, low development levels were associated with poor infrastructure development (Tewari, 1984). Another study for a recent period found a positive and significant relationship between the level of infrastructure and per capita net state domestic product between 1971-72 and 1994-95 (Ghosh and De, 1998). A positive correlation was also observed between infrastructure and agricultural development.

Most rural areas and informal settlements in peri-urban areas in developing countries suffer from the dearth of (or are characterized by) inadequate infrastructure that provides essential public services such as sanitation, clean water, electricity as well as transport (Parker et al., 2008). The absence of infrastructure through which these services are provided limit the chances of the poor engaging in economic activities, and therefore prevents them from improving their poor economic conditions. The provision of public services through infrastructure development enables the poor to focus on core economic activities instead of wasting unnecessary time in unproductive, mundane activities such as "collecting water and fuel, cooking and performing other such tasks" (United Nations Human Development Programme, 2015). The removal of these burdens frees the poor to concentrate on income-generating activities, which can play a vital role in improving their socio-economic conditions.

Ahmed and Hussain's (1990) empirical study demonstrate that fertilizer use in the agricultural sector increases with the improvement in the quality of the road. It should be noted that the transaction cost. That generally falls outside the cost of input prices can be one of the major components of the total cost of production in the agricultural sector and the infrastructure plays a dominant role in reducing the transaction cost. For example, the transportation cost incurred by the farmers in a particular region, both for transporting inputs to the field from the place of purchase and transporting the output to the marketplace for final sale, can be substantial in the absence of proper transportation facilities. Once the transportation infrastructure has been introduced, the transaction cost may considerably be reduced which has the bearing on the total marginal cost of production.

Webster and others (2003) find that investments in the rural areas, including rural infrastructure, are important for two reasons: (a) it creates an environment in which all citizens can enjoy basic living standards and (b) through better rural-urban linkage, it provides positive returns to both urban and rural dwellers. Efficient transportation infrastructure lowers the costs of labor-market participation, that is, travel time and cost, including search cost, and thus, eliminates an important barrier to labor market entry. Better physical infrastructure helps lower food costs for urban dwellers and allows rural labor to seek higher-paying jobs in the urban areas.

Just like road infrastructure, the provision of electricity in rural areas has also been linked to poverty reduction. The consumption of energy sources such as charcoal has health implications for local communities (Zulu & Richardson, 2013). On the other hand, lack of access to energy can be a barrier to engaging in certain economic activities. A study by Dinkelman (2011) found "that

electrification significantly raises female employment within five years. This new infrastructure appears to increase hours of work for men and women while reducing female wages and increasing male earnings. Several pieces of evidence suggest that household electrification raises employment by releasing women from home production and enabling microenterprises''. Supporting the link between infrastructure and poverty reduction, Ali and Pernia (2003) argue that, ''there is now wider recognition, including in the international donor community, that if governance and institutional frameworks are strengthened, the linkage between infrastructure and reduction of poverty can become stronger''. Against this backdrop, Calderón and Servén (2004) note that ''the conclusion that infrastructure both raises growth and lowers income inequality implies that infrastructure development may be a key win-win ingredient for poverty reduction''. This is because infrastructure, on the one hand, contributes to economic growth, and on the other hand, reduces poverty.

Calderón and Servén (2004) further argue that infrastructure development is strategic to poverty reduction as there is a positive correlation between the quantity and quality of infrastructure and the decrease in income inequality. Recognizing the linkage between infrastructure, development, and poverty reduction, advocates of this view have argued for massive public spending on infrastructure (Agénor, 2010). The argument is underpinned by the notion that extensive public and donor spending on infrastructure is instrumental in removing barriers to economic activities that are critical to economic development and poverty reduction.

The building of infrastructure and its ongoing maintenance require labor and therefore jobs and skills development is found leading to poverty alleviation. Confirming this argument, a study by Olawale and Garwe (2010) found that "The quality of infrastructure can affect the growth prospects of new SMEs especially in developing countries such as South Africa. Many developing countries suffer from a deplorable state of basic infrastructures like transportation, telecommunication, and electricity. Electricity supply in South Africa does not meet the demand leading to power cuts which can affect the production and turnover of new SMEs". Having explored arguments that support the view that infrastructure contributes to poverty reduction, we now turn our attention to reviewing opposing views.

Unlike those who argue that infrastructure development contributes to poverty reduction, opponents of this view note that infrastructure development does not have any bearing on poverty reduction, and the link between the two is too weak to argue for a causal relationship to be established. In their study, Ali and Pernia (2003, p. 3) summarised this argument into three key points: "First, though important for economic growth, infrastructure investment had little relevance to poverty reduction. Second, actual benefits from infrastructure were significantly less than anticipated. Third, weak governance and institutions gave way to corruption, distorted public investment choices, and neglected maintenance, thereby lowering infrastructure contribution to economic growth and diverting benefits intended for the poor''.

In line with these strands of arguments, Ogun (2010) argues that investment in infrastructure has little applicability to poverty reduction. According to Ogun (2010), weak governance, coupled with corrupt public officials, lowers the contributions of infrastructure to growth and diverts benefits to a few elite. The implication of this is that infrastructure tenders can be awarded to those with connections but with little capacity resulting in the delivery of poor infrastructure facilities that have a short lifespan and by implication insignificant impact in improving the socio-economic conditions of intended beneficiaries. Confirming the above thrust of the argument, a study that assessed the impacts of infrastructure investment in Mozambique and Vietnam, Otsuki, Read, and Zoomers (2016) found infrastructure ''seldom benefits marginalized communities''. They further note that there is little consideration for local participation in demanding equity of benefits associated with infrastructure development. Consequently, the voices of the poor are often absent in the planning of infrastructure.

Lerer and Scudder (1999,) note "increases in the prevalence of schistosomiasis, malaria, encephalitis, hemorrhagic fevers, gastroenteritis, intestinal parasites, and filariasis (including onchocerciasis and bancroftosis) have been documented after dam and irrigation projects". Since the poor are often without access to health facilities, these negative health outcomes associated with dam construction worsen their poor socio-economic conditions.

Research Methodology

This study used a descriptive-quantitative correlation design. The study was conducted in the second district of Nueva Ecija province. The second district in the province of Nueva Ecija is composed of two cities, San Jose City and the Science City of Munoz, and six municipalities that include, Talugtog, Lupao, Carranglang, Llanera, Rizal, and Pantabangan. The study population constituted 877 farm families from Calisitan, Science City of Munoz, Mayamot I of Talugtog, and Agupalo weste of Lupao. Head and members of farm families served as main informants for primary data gathered in this study. The secondary data in terms of school enrolment and attendance was gathered from the key informants from the elementary school. The total estimated respondentsinterviewed were 3 key informants and 90 farm families head. A survey questionnaire was prepared as an instrument in gathering the required information.

Results and Discussion

Profile of the Respondents

Looking at the distribution of the age of the respondents, data shown in Table 1, that more than 29% of the respondents belong to the age group of 54 to 59 years old. Next in order was the group of respondents with age brackets ranging from 48 to 53 and 60 to 65 years old with 21.51 and 13.98 percent respectively.

The mean of 51.69 years old signifies that most of the respondents' ages were at the prime working-age as stated in the Philippine Age Structure, 2020 (**www.indexmundi.com**). On the other hand, it can also be noted that there was a diverse distribution of the age of the head of the family based on the data as manifested in the standard deviation (11.61) yielded.

The long influence of being a patriarchal country was very evident in the data of the study which shows that the majority (95.70%) of the households were headed by male farmers.

Being head of the family, the respondents stated that aside from farming, the majority of them have no other source of income. Only 8.60% of them indicated that they were working as a construction worker, helper mechanic, sari-sari store owner, tricycle driver, and sideline jobs on their available time. None of the respondents declared their annual income.

Types of Infrastructure

Tabulated data in Table 2,shows that except for classrooms, all of the three barangays, namely Brgy. Mayamot I, Brgy. Aguinaldo and Brgy. Calista has Rural Health Center, multi-purpose building, and concrete roads. Concrete roads were constructed as early as 2013 in Brgy. Calisiitan and 2018 in Brgy. Mayamot I. Multi-purpose buildings in the three mentioned barangays were constructed in 2019 while rural health centers were established in 2016 in Brgy. Calisiitan and Brgy. Mayamot I and 2018 in Brgy. AgupaloWeste. Four classrooms were constructed in the years 2017 and 2020 in Brgy. Mayamot I and Brgy. Agupalo Weste respectively.

The difference in the economic status of the farm families before and after the implementation of the infrastructure projects.

The difference in the job created before and after the implementation of the infrastructure projects.

Data revealed that the job created is significantly different before and after the implementation of the infrastructure projects. Results indicated that the project brought new job opportunities to the community. Olawale and Garwe (2010, said that the building of infrastructure and its ongoing maintenance require labor and therefore jobs and skills development is found leading to poverty alleviation.

The difference in the support services before and after the implementation of the infrastructure projects.

Table 4, shows a significant difference in terms of support services provided by the concerned agencies in terms of technical assistance, training, and technology before and after the implementation of the infrastructure projects.Dercon, S., Gilligan, D.O., Hoddinott, J., and Woldehanna, T (2007) said that rural roads facilitate technology transfer. For example, by providing agricultural extension services, governments can make farmers aware of new agricultural technologies, advise them on best farming practices and assist farmers in dealing with adverse shocks such as insect infestations or plant diseases.

The difference in the Financial and Market Institutions before and after the implementation of the infrastructure projects

It can be gleaned from Table 5, except for banks from financial institutions and vegetable traders in the market institutions that registered no significant difference, all others variables indicated a significant difference. This implies that the construction of the infrastructure projects provided more opportunities and benefits to the farming communities.Binswanger et al. (1993), in a study of 13 states in India, found that investments in rural infrastructure increased farmers' access to markets, and led to substantial agricultural expansion. Better roads also lowered the transaction costs of credit services, resulting in increased lending to farmers, higher demands for agricultural inputs, and higher crop yields.

The difference in the level of technology adoption before and after the implementation of the infrastructure projects

It can be noticed from Table 6, that the level of adoption to land preparation and transplanting under rice production posted a no significant relationship, while, the rest of rice production technologies registered a significant difference in terms of the level of adoption before and after the implementation of the infrastructure projects. Results only show that the level of technology adoption was influenced by roads project. On the other hand, the vegetable production technologies registered a significant difference in terms of the level of adoption in seeds selection and seedlings preparation while other technologies posted no significant difference in the level of adoption before and after the implementation of the infrastructure projects.

The difference in farm inputs investment and profitability before and after the implementation of the infrastructure projects

Table 7, shows that the farm inputs investment and profitability for rice production before and after the implementation of the infrastructure projects in the first and second cropping seasons do not have a significant difference. Indicating that there were no changes in their farm inputs investment even in the presence of constructed roads. However, farm inputs investment in vegetable production specifically in seeds in the first and second cropping season, and inorganic pesticides in the second cropping season indicated a significant difference. while inorganic fertilizer got no significant difference in the two cropping seasons. Inorganic pesticides in the first cropping season posted a no significant difference also. Ahmed and Hussain (1990) said that fertilizer use in the agricultural sector increases with the improvement in the quality of the road. It should be noted that the transaction cost. That generally falls outside the cost of input prices can be one of the major components of the total cost of production in the agricultural sector and the infrastructure plays a dominant role in reducing the transaction cost.

The net income registered a significant difference in the two cropping seasons before and after the implementation of the infrastructure projects.

The difference inproduction level before and after the implementation of the infrastructure projects

The null hypothesis, ‘‘There is no significant difference in the socio-economic status of the respondent’s families before and after the implementation of the infrastructure projects was retained in livestock and vegetable production as shown in the result of the paired-sample t-test. It indicates that the development of the infrastructure brings no significant difference with their livestock and vegetable production.

However, the result exhibited a significant difference with the respondents’ rice production, thus rejecting the null hypothesis. It can be noted that rice production increases after the development of the infrastructure as shown in Table 8.

Conclusions

Concrete roads were constructed as early as 2013 and 2018 in the area of study. The frequency and time of travel of the respondents after the construction of the roads going to the market and other places were lessened/reduced.

Job created, support services, and access to financial and market institutions by the respondents are significantly different before and after the implementation of the infrastructure projects.

The level of adoption of rice production technologies registered a significant difference. However, vegetable production technologies registered no significant difference in the level of adoption before and after the implementation of the infrastructure projects.

Farm inputs investment and profitability for rice and vegetable production before and after the implementation of the infrastructure projects in the first and second cropping seasons do not have a significant difference. While the net income registered a significant difference in two cropping seasons before and after the implementation of the infrastructure projects.

The development of the infrastructure brings no significant difference with their livestock and vegetable production. On the other hand, rice production increases after the development of the infrastructure.

Recommendations

From the findings of this study, the following recommendations are formulated:
For the local and national governments,
1.Continue the implementation of the infrastructure development especially to rural communities to spur the development of the communities.
2.Consider the needs of the community when constructing infrastructure to address the needs of the residence in terms of infrastructure development.
3.Connect the infrastructure development to other agencies like financial, market, health, education, extension services, transportation, labor, and employment for a more integrated development rural development program.

For the future researcher,
1. Consider other variables that influence by the infrastructure development in the socio-
the economic status of the farming families.
2. Conduct a similar study to another research area with a greater number of respondents.
For the community
1.Protect and maintain the projects in their community to sustain their development.
2.Maximize the development of infrastructure as a stepping stone to further develop the community

Acknowledgment

The researchers would like to acknowledge the participation of the farm community members in the study area and the principals of the Department of Education in this study

Disclosure statement

The authors declare that they have no competing interests.

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Tables 1-8 of the study

Table 1.Profile of the Respondents

Age Group	**Frequency**	**%**
24 - 29	5	5.38
30 - 35	6	6.45
36 - 41	11	11.83
42 - 47	4	4.30
48 - 53	20	21.51
54 - 59	27	29.03
60 - 65	13	13.98
66 - 71	2	2.15
72 - 77	4	4.30
78 - 83	1	1.08
Mean	51.69	
Standard Deviation	11.61	
Minimum	24.00	
Maximum	80.00	
Sex		
Male	89	95.70
Female	4	4.30
Main Source of Income		
farming	85	91.40
not reported	8	8.60
Other Source of Income		
construction worker	6	6.45
helper mechanic	1	1.08
sari-sari store	1	1.08
tricycle driver	3	3.23
whatever part-time is available	2	2.15
no other source of income	80	86.02

Table 2. Types of Infrastructure

Type of Infrastructures	**Location**	**Infrastructures Information**		
		Number of Classrooms	**Year Constructed**	**Single/Two-Storey**
Classroom	Brgy. Mayamot I, Talugtug, NE	4	2017	Two-story
	Bgy. AgupaloWeste, Lupao, NE	4	2020	Two storey
		Square meter	**Year constructed**	**Single/Two Storey**
Rural Health Center	Brgy. Calista, Munoz, NE	1	2016	Single
	Brgy. Mayamot I, Talugtug, NE	80	2016	Single
	Bgy. AgupaloWeste, Lupao, NE	80	2018	Single
		Square meter	**Year constructed**	**Single/Two Storey**
Multi-purpose Building	Brgy. Calisitan, Munoz, NE	1	2019	Single
	Brgy. Mayamot I, Talugtug, NE	126	2019	Two
	Bgy. AgupaloWeste, Lupao, NE	1	2019	Single
		Length (meters/kilometers)	**Year Constructed**	
Concrete Road	Brgy. Calisitan, Munoz, NE	1.25	2013	
	Brgy. Mayamot I, Talugtug, NE	1	2018	
	Bgy. AgupaloWeste, Lupao, NE	2	2014-2014	

Table 3. The difference in the job created before and after the implementation of the infrastructure projects.

Job Created	**p-value**	**Interpretation**
Checker	<0.01	There is a significant difference.
Carpenter	<0.01	There is a significant difference.
Mason	<0.01	There is a significant difference.
Laborer	<0.01	There is a significant difference.
Machine operator	<0.01	There is a significant difference.
Tile setter	<0.01	There is a significant difference.
Plumber	<0.01	There is a significant difference.
Electrician	<0.01	There is a significant difference.
Welder	<0.01	There is a significant difference.
Secretary	<0.01	There is a significant difference.
Driver	<0.01	There is a significant difference.
Machinist	<0.01	There is a significant difference.

Table 4. The difference in thesupport services before and after the implementation of the infrastructure projects

Support services	p-value	Interpretation
1.Technical assistance		
1.1. Farm visit	<0.01	There is a significant difference.
1.2. Technical advice and information to production activities	<0.01	There is a significant difference.
1.3. Organize farmers organization	<0.01	There is a significant difference.
2.Training on:		
2.1. Rice production	<0.01	There is a significant difference.
2.2. Vegetables	<0.01	There is a significant difference.
2.3 Livestock	0.01	There is a significant difference.
2.4 Poultry	<0.01	There is a significant difference.
2.5 Fish	0.04	There is a significant difference.
2.6 High-value fruit trees	0.03	There is a significant difference.
3. Technology		
3.1 Rice production	<0.01	There is a significant difference.

3.2 Vegetables	<0.01	There is a significant difference.
3.3 Livestock	<0.01	There is a significant difference.
3.4 Poultry	<0.01	There is a significant difference.
3.5 Fish	0.06	There is a significant difference.
3.6 High-value fruit trees	0.01	There is a significant difference.
[a]Ho: The distributions of Before and After are the same.		
[b]e significance level is 0.05.		
[c]Asymptomatics significance		

Table 5.The difference in the Financial and Market Institutions before and after the implementation of the infrastructure projects

Financial and Market Institutions	**p-value**	**Interpretation**
1. Financial institutions		
A. Formal		
a.1. Banks	0.039	No significant difference.
a.2. Cooperative	0.066	There is a significant difference.
B. Informal		
b.1. Barangay local lenders	0.01	There is a significant difference.
b.2. Rice traders	<0.001	There is a significant difference.
b.3. Vegetable traders	0.024	There is a significant difference.
2. Market		
2.1. NFA for rice	0.003	There is a significant difference.
2.2. Rice traders/mill	0.01	There is a significant difference.
2.3. Vegetable traders	0.473	No significant difference.
2.4. Public market for vegetables	0.008	There is a significant difference.
2.5. Livestock and poultry traders	0.002	There is a significant difference.
2.6. Farm inputs	<0.001	There is a significant difference.
2.7. Basic commodities	0.001	There is a significant difference.
[a]Ho: The distributions of Before and After are the same.		
[b]e significance level is 0.05.		
[c]Asymptomatics significance		

Table 6. The difference in the level of technology adoption before and after the implementation of the infrastructure projects

Technologies	**p-value**	**Interpretation**
A. Rice Production Technologies		
a.1. Seeds selection	0.040	There is a significant difference.
a.2. Seedlings preparation	0.070	There is a significant difference.
a.3. Land preparation	0.197	No significant difference.
a.4. Transplanting	0.617	No significant difference.
a.5. Water management	0.010	There is a significant difference.
a.6. Fertilizer management	0.070	There is a significant difference.
a.7. Insecticides application	0.007	There is a significant difference.
a.8. Herbicide application	0.002	There is a significant difference.
B.Vegetables Production Technologies		
b.1. Seeds selection	0.042	There is a significant difference.
b.2. Seedlings preparation	0.317	There is a significant difference.
b.3. Land preparation	1.000	No significant difference.
b.4. Transplanting	1.000	No significant difference.
b.5. Water management	0.317	No significant difference.
b.6. Fertilizer management	0.317	No significant difference.
b.7. Insecticides application	0.317	No significant difference.
b.8. Herbicide application	1.000	No significant difference.
[a]Ho: The distributions of Before and After are the same.		
[b]The significance level is 0.05.		
[c]Asymptomatics significance		

Table 7. The difference in farm inputs investment and profitability before and after the implementation of the infrastructure projects

Farm Inputs		First Cropping		**Second Cropping**
	p-value	Interpretation	p-value	Interpretation
A. Rice production				
a.1.Seeds	0.314	No significant difference.	0.315	No significant difference.
a.2.Fertilizer				
a.2.1. Inorganic	0.411	No significant difference.	0.324	No significant difference.
a.3.Pesticides				
a.3.1. Inorganic	0.292	No significant difference.	0.324	No significant difference.
B. Vegetable production				
a.1.Seeds	<0.001	There is a significant difference.	<0.001	There is a significant difference.
a.2.Fertilizer				
a.2.1. Inorganic	0.336	No significant difference.	0.524	No significant difference.
a.3.Pesticides				
a.3.1. Inorganic	0.488	No significant difference.	<0.001	There is a significant difference.
C.Net Income	<0.001	There is a significant difference.	<0.001	There is a significant difference.

Table 8.The difference in production level before and after the implementation of the infrastructure projects

Production Level	**Paired-Samples t-test**			**Interpretation**
	t	**df**	**p-value**	
Rice (in cavans)	-10.108	87	<0.001	There is a significant difference.
Vegetables (in cavans)	-2.072	8	0.072	No significant difference.
Livestock (in heads)	-0.00130039	21	0.091	No significant difference.