

Keywords: community; Dong Nai; infrastructure; rural; transport; Vietnam

Dinh Tuan HAI*

Hanoi Architectural University
Faculty of Civil Engineering
Km 10 Nguyen Trai Road, Thanh Xuan District
Ha Noi City, Vietnam

Nguyen Xuan QUYET

Hochiminh City University of Food Industry
Faculty of Business Administration
140 Le Trong Tan, Tay Thanh, Tan Phu, Ho Chi Minh City, Vietnam

Duc Anh NGUYEN

National University of Civil Engineering
Faculty of Department of Building and Industrial Construction
55 Giai Phong street, Ha Noi, Vietnam

*Corresponding author. E-mail: haidt@hau.edu.vn

COMMUNITY PARTICIPATION FOR DEVELOPING RURAL TRANSPORT INFRASTRUCTURE IN DONG NAI PROVINCE, VIETNAM

Summary. Developing countries are facing sustainability problems in developing rural transport infrastructure; the problems arise from the lack of financial resource and public support. Enhancing community participation promises to resolve these challenges. Demographics has a strong influence on community participation; however, how demographic characteristics interact with community participation has been yet to be focally studied. Dong Nai, a southern province in Vietnam, was selected as the case study owing to its high requirement of rural transport infrastructure. Questionnaires were sent to 438 households. An analysis of data was performed descriptively and with logistic regression. Community participation was recorded as financial, labor, material, and land contribution. Household composition, education, income, and member in household as community leader are among the highest influential factors to community participation. With the importance of community participation, the results of the study benefits both policy makers and local governments in planning, predicting the success of local development programs, and enhancing community participation, which increase the chance of success in rural transport infrastructure.

1. INTRODUCTION

The current total length of district and commune roads in Vietnam is about 176,863 km, making up to 60.57% of the country's road network. This includes district roads of 45,999 km (15.75%) and commune roads of 130,864 km (44.81%). In addition, there are 2,360 rivers and channels in Vietnam with a total length of 80,000 km, of which 41,900 km with sufficient depth for waterway transportation (Hoang, 2019). The value of the multi-billion-dollar rural transport system, if not properly exploited, managed, and maintained would be a great waste and affect the majority of beneficiaries [5]. Until 2030, Vietnam would need approximately 150-160 billion USD for investment in infrastructure development and improvement (of which 40 billion for electricity, 53 billion for road, three billion for railway, and 25 billion for ports) [2], which would require a capital of approximately 15-16 billion USD every year. The current national capital

sources including government budget capital, Official Development Assistance (ODA), and bonds can meet only about 50% of that investment demand [13]. Consequently, the government cannot afford to build infrastructure for all levels, and the participation of all other stakeholders is inevitable.

Different from national and urban infrastructure systems, rural infrastructure serves the community in that rural area itself. The participation of the community is therefore essential, as it ensures sustainability [1]. To mobilize community participation in rural infrastructure development, erroneous and incomplete infrastructure should be avoided. Theoretical and practical bases are first necessary to be studied for proposing suitable solutions and policies. Policy makers and local governments in Vietnam are facing conundrums in planning successful investment in rural transport infrastructure and predicting outcomes of current developing programs as these actions request much and in-depth knowledge of the country's current and future resources, local demands, and socio-economic attitudes toward the programs [6, 8].

This study aims to explore the current status of community participation in Vietnam through a case study of Dong Nai province, a typical southern delta zone that is in heavy need for rural transport infrastructure. The second purpose of the study is to examine the relationships between demographic characteristics and community participation itself. As demographic and socioeconomic trends and community concerns belong to the most important factors that affect transportation planning, the results of this study can help policy makers and governments in solving the tandem conundrums of developing rural transport infrastructure.

2. LITERATURE REVIEWS

Present participation of community on developing infrastructure for rural transportation had been studied by many authors in Vietnam and the world (e.g. [15, 10, 3 and 7]). They concluded for developing infrastructure of rural transportation, there are needs of mobilizing social resources with community participation (society, enterprises, community, and local government). From practical view, the World Bank ([17]) also confirmed a more reliance on Public-Private Partnerships, parts of which are based on community and community network. Public-Private Partnerships belong to a strategy that has been applied for rural transport infrastructure development by many countries in the world.

Owing to the characteristics of rural transport infrastructures, the processes of construction and development happen in the long-term periods, with many community-participated activities, such as define planning demands; establish costs and participated policies; contribute physical resources (money, labour, materials, land); site construction; supervise and check; manage and maintain; and utilize and evaluate. Among these, physical contributions are commonly indicated by several authors (such as [9, 6 and 14]).

Therefore, the participation of community on developing infrastructure for rural transportation is affected by 10 factors, including age, sex, background, education, the number of main supporters on households, household classification, household members working as local officer, households' average income, income from agriculture, and living conditions in the area.

3. RESEARCH METHODOLOGY

From the literature, demographic factors that affect community participation are synthesized. Questionnaires were devised and included in surveys sent to local households in DongNai, a southern province in Vietnam.

Data obtained from the surveys, combined with data from the Department of Statistics of DongNai province [4], were analyzed descriptively to reveal a general snapshot of the demographics of Dong Nai province and the current status of community participation. Then, a logistic regression was performed to explore the influence levels of demographic factors to community participation.

Results were carefully considered to explore potential directions to improve the effectiveness of transportation planning, to predict the outcomes of considered projects, as well as to enhance community participation itself in certain circumstances.

4. DATA ANALYSIS

4.1. Community Participation for Developing Rural Transport Infrastructure in DongNai Province

4.1.1. Status and Needs of Rural Infrastructure Development

- a) *Current situation of rural transport infrastructure:* as one of the leading provinces in the country for new rural development with high concentration for rural road infrastructure development, by the end of 2013, DongNai had 1,374 km of inter-communal roads (concrete / asphalt 946 km, 69% of the total number), 1,592 km of inter-hamlet roads (concrete / resin 840 km, equivalent to 53%), 2,250 km of inter-linked roads (1,156 km, accounting for 51%), 2,182 km, 1,084 km, equivalent to 50%), and 1,106 km of inner-field trunk (377 km, 34%). Under the assessment of the community, the quality is quite good for inter-commune roads those managed by district authorities because of better investments. Inter-village roads have generally bad quality owing to the decentralization of investment to commune levels in term of management and development while the investment is limited and the scope of networks is wider.
- b) *Demand for developing rural road infrastructure:* Annual development of rural transport infrastructure in DongNai has been increasing. In 2019, the province had implemented 522.5 km of roads (of which district roads were 179 km - equivalent to 34.3% and commune roads were 343.5 km - equivalent to 65.7%). In 2018, the province has approved the plan of constructing 665.9 km of roads (including 212.3 km of district roads and 453.6 km of commune roads). With the current transport infrastructure status, until 2018, DongNai needs to develop (concrete / harden) 3,435.1 km of roads (district roads 215.7 km, commune roads 198.4 km, village roads 1094 km, alley roads 1098 km, and internal spindle roads 729 km). The necessity and urgency of the local people tend to lead to development of rural road infrastructure, alleys, inter-village roads, and inter-village roads. Therefore, on the whole, the need for rural infrastructure development of DongNai is now urgent for the community in general.

4.1.2. Status of Community Participation

a) *Analyze the participation by forms of participation*

- *The community surveyed 438 households in the locality.* Overall, 94.7% of households provided information for each type of road, and only 5.3% did not participate. Participation depends on the interests of the community itself and the policy of calling for participation, that is, want the community to participate; it is necessary for the community to see the benefits of their participation. At the same time, to improve the effectiveness of participation, it is very important to promote and encourage participation, according to each type of locality.

- *The community has contributed professional comments.* The survey has 67.8% of households involved in contributing ideas for one or more stages (identification of needs and planning, policy development planning, resource contribution, direct construction, inspection, supervision, operation and maintenance, maintenance, and efficiency evaluation). Contributions are mostly voluntary because participants must have a clear understanding of what they are involved in. As a result, 32.2% of the surveyed households did not comment on any of the stages of the rural infrastructure development process, as they thought they were not well understood, or were not proficient.

- *The community has participated in policy formulation:* Participation in policy formulation includes participation and calling for investment, calling for participation, and rights and responsibilities of organizations, people, communities, etc. in the development and construction of rural transport infrastructure. Policy formulation has long been understood as the work of local authorities and community organizations.

- *Community contributes material values (money, labor, material, land, ...)*

- (i) *Monetary contributions:* This is a form of economic contribution: from 2006 to 2010, the contribution from the people was more than VND 38.7 billion divided equally over the years; in

2012, the community contributed VND 97.64 billion (18% of total investment capital) to the development of 432.69 km of rural road infrastructure; in 2013, the total donation was VND 89.93 billion (accounting for 25.7% of the total investment capital) for 343.5 km, and the planned 2014 plan called for the contribution of VND 111.6 billion to 453.6 km. Importantly, the voluntary contribution of people for repairs and development of rural transport is not spontaneous statistics, and organizations and local communities do not report.

- (ii) *Labor and material contributions*: Most development of rural transport infrastructure is involved in public works, especially planning and construction. The contribution of communal day is high owing to the socialist model of the socialist period, with common characteristics and shared meals, and is considered a good image of the spirit of the family unity. At present, types of material contributions are also common, especially where materials are available (stone, sand, gravel, ...), with the motto "what contributes", ...
 - (iii) *Land contribution activities*: With the current Land Laws of Vietnam, participation may be voluntary (land donation) and exchange (compensation). Therefore, issues such as complaints, grievances, disputes, corruption, etc. or slow progress are common in the process of building and developing rural transport infrastructures in general. In summary, in the process of contributing to the development of rural infrastructure, the contribution of the community is not limited in term of forms of participation. The practice of calling for participation should be flexible to all forms of participation, to enable the community to choose their appropriate ways of participation and maximize the involvement of community.
- b) *Analyze participation according to the level of participation results*: the survey of 438 households in the study area is as follows (Tab. 1):
- *Regarding money contribution*, 376 households (85.8% of surveyed households) contributed 1009 million VND, of which Trang Bom was the highest with 157 households (97.5%), which contributed 411 million; Nhon Trach, with 80 households (96.4%), contributed 302.9 million; Xuan Loc households (79.8%) contributed 203.6 million; one district/province worker (14.3%) contributed 1.5 million VND; and Vinh Cuu had 43 households (63.2%), which contributed 90.1 million VND. The contribution of money for rural infrastructure development is quite high. Highly effective localities are localities that have good economic conditions and encourage open and transparent participation.
 - *Regarding the contribution of labor (workday)*, there were 435 households participating (99.3% of surveyed households), contributing 3864 people, of which 3 localities participated in 100%: Nhon Trach contributed 807,5 working days, Trang Bom contributed 1615.5 workers, and Xuan Loc 835.5 workers; moreover, Vinh Cuu had 65 households (95.6%), contributing 515.5 workers, and a group of contributed 100% staff participated in the monitoring with 90 working days. As a result, the sense of community in the locality is good, with simple thinking; "There are no conditions for contributing money to work day", typically Vinh Cuu, with the lowest contribution rate (63.2%), but labor contribution was 95.6%.
 - *Regarding material contribution*, 282 households (accounting for 64.4% of surveyed households) contributed material for construction of RTs equivalent to 673.1 million VND, of which Nhon Trach had 68 households (86.1%), and the main materials were soil, paving stone, cement, and embankment, worth 358 million; Xuan Loc had 76 households (78.8%), contributing sand and stone to the road, worth 109 million; Trang Bom had 85 households (53.8%), contributing mainly stone, soil and broken bricks, and paving the way, worth 113.7 million; Vinh Cuu had 33 households (52.4%), contributing broken bricks, paving stones, etc., worth 37.4 million. Local district / provincial staffs also actively contributed to the role of the collective, with 80% of households contributing the possible materials worth VND 55.2 million. The participation rate of this type of contribution is quite low, due to the different conditions of participation of households in the community, with the idea of "contributing".
 - *Regarding the land contribution*, 310 households participated (accounting for 70.8% of the surveyed households), contributing 2953.8 square meters of land, of which Nhon Trach had the highest share of 65 households (82.3%), contributing 965.8 m²; Xuan Loc had 86 households (78.8%), contributing 640m²; Trang Bom had 108 households, contributing 865.2 m²; Vinh Cuu had 30 households (47.6%), contributing 229.8m², and district / province officials had 21 households (84%),

contributing 253m². The contribution / donation of land for rural infrastructure development is quite good, with contributions depending on the needs of rural's infrastructure development and advocacy.

Table 1
Results of Community Resource Contributions Based on Local Analysis

No.	Targets	Unit	Nhon Trach	Trang Bom	Vinh Cuu	Xuan Loc	CB rate	Total
1	Survey number	Individual	83	161	68	119	7	438
2	Participation number	Individual	80	157	43	95	1	376
	Survey number	%	96,4	97,5	63,2	79,8	14,3	85,8
3	Money Contribution	Million VND	302,9	411,0	90,1	203,6	1,5	1.009
	-Average	Million VND / Individual	3,8	2,6	2,1	2,1	1,5	2,7
	-Participation number	Individual	83	161	65	119	7	435,0
	-Participation rate	%	100,0	100,0	95,6	100,0	100,0	99,3
4	Labor contribution	Day	807,5	1615,5	515,5	835,5	90	3.864,0
	- Average	Day / Individual	9,7	10,0	7,9	7,0	12,9	8,9
	- Participation number	Individual	72	88	38	81	3	282
	- Participation rate	%	86,7	54,7	55,9	68,1	42,9	64,4
5	Material contribution	Million VND	387,1	118,5	53,0	109,8	4,9	673,1
	- Average		5,4	1,3	1,4	1,4	1,6	2,4
	- Participation number	Individual	69	111	35	92	3	310
	- Participation rate	%	83,1	68,9	51,5	77,3	42,9	70,8
6	Land contribution	m²	1054,8	905,2	310,3	667,5	16	2953,8
	- Participation rate		15,3	8,2	8,9	7,3	5,3	9,5

4.2. Analysis of Demographic Factors Affecting Community Participation

The model of Binary Logistic Regression (Equation 1) [11] is often shown as follows:

$$\ln \left[\frac{P(Y_j = 1)}{P(Y_j = 0)} \right] = \beta_0 + \sum_{i=1}^n \beta_i X_i \quad (1)$$

where $P(Y_1=1)$ is the odds that the community is involved, $P(Y_1=0)$ is the odds of not participating, and $\beta (0, i = 1..n)$ are the coefficients. The independent variables X_i are defined with convention as follows:

- X_1 - age,
- X_2 - gender (male/ female),
- X_3 - professional training (certificate, 2-year college, 3-year college, university, and postgraduate),
- X_4 - level of education (primary school, secondary school, and high school),
- X_5 - number can provide workforce in the household,
- X_6 - income class (poor, lower income, middle income, and higher income),
- X_7 - member(s) in the household as community leaderships,
- X_8 - average income per capita in the household,
- X_9 - proportion of income from farmwork, and
- X_{10} - terrain of living area (mountainous, hilly, plain, and others).

The data were analyzed in IBM SPSS 25. As the first step of any regression procedure, data screening - collinearity check - is performed for the variables (Fig 1).

The scatter plot in Fig. 1 shows some correlation between some pairs of variables such as income per capita and education level, as well as income per capita and training level, which are reasonable and predictable. The remaining variables do not appear to form any curvilinear patterns, implying a high robust when applying logistic regression.

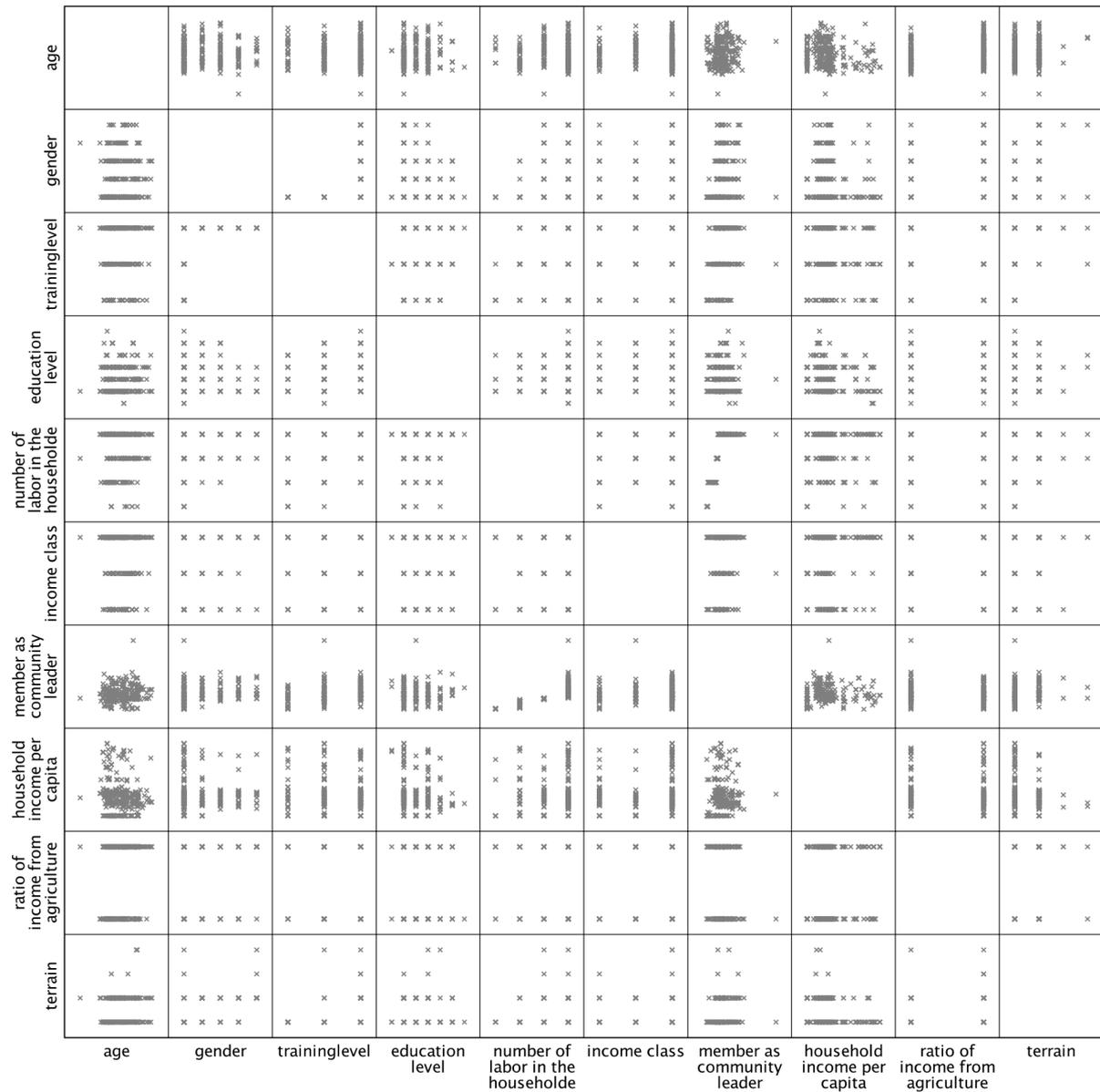


Fig 1. Collinearity Check of Ten Variables

Results of Analysis. Tab. 2 depicts the results of the analysis, whereby:

- X_i - input variables as defined in the legends of Equation (1),
- Y_1 – financial contribution,
- Y_2 – labor contribution,
- Y_3 – material contribution, and
- Y_4 – land contribution.

In the test, $P(Y_1=1)$ is the probability that the community financial contribution $P(Y_1=0)$ is the probability otherwise. Tab. 3, 4, and 5 show statistics for the test of financial contribution. Tabular

statistics of other tests (labor contribution, material contribution, and land contribution) are omitted for the sake of the paper's concision; however, those values are discussed in paragraphs.

Table 2

Analysis Results

Output	Intercept	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10
Y1	2.975	0.015	-0.184	0.075	0.125	-0.128	0.425	-0.061	0.037	0.023	-0.051
Y2	122	0.115	-0.367	-3.573	1.071	-0.145	-21.962	7.424	0.159	-0.029	-12.577
Y3	0.48	0.003	-0.265	0.507	-0.35	0.022	-0.198	0.057	0.006	0.004	0.34
Y4	2.314	0.002	-0.394	-0.046	0.071	0.017	-0.103	0.795	0.017	0.018	0.22

Financial Contribution

Regression analysis based on the significance level (Sig.) of the Wald test shows that from X₁, to X₅ and X₇, there is Sig., all > 0.05. Therefore, the correlations were not significant for the Y₁ variable, with a 95% confidence interval; The X₆ has Sig. < 0.1. Therefore, the correlation coefficients are significant for the Y₁ variable, with a reliability of 90%. The variables X₈ and X₉ have Sig <0.01. Mean, the correlation coefficient was significant for Y₁, with a reliability of 99%.

Table 3

Variables in Predicting Yes/No for Financial Contribution

	B	S.E.	Wald	df	Sig.	Exp (B)
Step 1 ^a x1	.015	.014	1.180	1	.277	1.015
x2	-.184	.297	.383	1	.536	.832
x3	.075	.206	.131	1	.718	1.077
x4	.125	.297	.177	1	.674	1.133
x5	-.128	.121	1.128	1	.288	.880
x6	.425	.245	3.012	1	.083	1.530
x7	-.061	.405	.023	1	.881	.941
x8	-.037	.014	6.874	1	.009	.964
x9	.023	.008	8.281	1	.004	1.024
x10	-.051	.204	.062	1	.803	.950
Constant	2.975	1.277	5.428	1	.020	19.582

a. Variables in step 1: x1, x2, x3, x4, x5, x6, x7, x8, x9, x10.

Validation of the model: with 376 participants, the model predicted 375 or 99.7% correct. Hence, the correct forecasting rate of the whole model is 85.6% (Tab. 4).

Omnibus testing shows Sig. <0.05 (95% confidence). Thus, independent variables are related as shown on Tab. 5.

As a result of the analysis, the average income and income from agriculture and household economy have a direct effect on the contribution of community money to rural infrastructure development. Specifically, up to 42.50% of households decide to donate money for every 100 households and increase their income (from poor to near-poor households / from near-poor to middle-income households / from middle income to good income households) to one million VND. The average household income and 1.00% increase in the household's income from agriculture will increase by 3.70% and 2.30%, respectively, of community contribution to rural infrastructure development. Thus, the household economy has the greatest effect on the decision to contribute because if the household income is relatively high, the contribution will be good, and if the economy of households is good, the demand for

participation will be higher. This is a matter of concern when mobilizing the community to contribute their money.

Table 4

Classification Table

	Observed data	Prediction		
		Communities have contributed money		The exact percentage
		No	Yes	
Step 1	Communities have contributed money	No 0	Yes 62	.0
		1	375	99.7
	Common rate			85.6

Table 5

Omnibus Test Modeling Factors

	Chi-square	df	Sig.
Step 1 Step	18.519	10	.047
Sector	18.519	10	.047
Model	18.519	10	.047

Labor Contribution

In the test, $P(Y_2=1)$ is the probability of the community to contribute labor, and $P(Y_2=0)$ is the probability otherwise.

Regression testing based on the significance level (Sig.) of the Wald test shows that X1, X2, X4-X6, and X8-X10 have Sig. all > 0.05 . Therefore, the correlations were not significant for the Y2 variable, with a reliability of 95.00%. The X7 has Sig. = 0.012 < 0.02 . Therefore, the correlation variable is significant Y2, and the reliability is 98%. The variables X3 have Sig < 0.01 . The correlation coefficients were significant for Y2, with a confidence level of 99%.

Validation of the model: with 432 households participating, the model predicted 432 true, so the correct rate is 100%. The remaining 6 households did not participate, but the predicted model was 2, and the true rate was 33.30%. The predicted accuracy rate of the whole model is 99.1%; Omnibus inspections show Sig. < 0.01 (99% confidence). Thus, independent variables have linear relationships with dependent variables in the aggregate. The model selection is appropriate.

In conclusion, having family members working as community leader in households greatly affects the contribution of labor, with the rate of every worker having a cadre of staff at least 7.42 working days for development of Rural Transport Infrastructure, often staffed by staff members, is more likely to be involved in and advocate for "role models". This can be considered as a solution in the promotion of community participation.

The professional qualification of the head of household affects the total number of working days which is contributed with 3.57 unskilled laborers per working day. However, the use of skilled workers should be planned and surveyed for appropriate use in order to effectively engage in, because of the need for manual / non-professional work and vice versa.

Material Contribution

In the test, $P(Y_3=1)$ is the probability of community contributing material, and $P(Y_3=0)$ is probability otherwise.

Regression testing based on significance level (Sig.) of Wald test shows that X1, X2, and X4-X9 have Sig. > 0.05. So, the correlation variable does not make sense with Y3 variable, with 95% confidence. The X10 has Sig. = 0.017 < 0.02. Therefore, the variables are meaningful with the Y3 variable, 98% confidence. Variable X3 has Sig = 0.002 < 0.01, meaning the correlative variables are significantly variable Y3, with 99% confidence.

Validation of the model: with 279 contributing, the model predicts exactly 252 households, so the correct rate is 90.30%. A total of 159 households did not participate, but the predicted model was 28, the true rate was 33.3%. Therefore, the predicted correct rate of the whole model is 63.9%, Omnibus Test Sig. = 0.002 < 0.01 (99% confidence). Thus, independent variables have linear relationships with dependent variables in the aggregate. Therefore, this model is selected.

From the results of the analysis, the level of expertise of the community has a high effect on the contribution of materials, with a predicted level of 1 that will contribute more valuable material than 0, VND 51 million per household compared to non-qualified persons. It is argued that those with higher levels of competence are more capable and conscious of contributing; they often suggest different forms of participation when they are not able to participate in forms such as love. They like to work because they are busy because they have no land near the road to donate land.

The site / natural conditions are the conditions that stimulate the community to contribute material, with the level of one household having material conditions in place will tend to contribute material with a value higher than 0.34 million VND / household compared with people without conditions. Thus, the contribution of material depends on the condition, the availability of the community, and/or the ability to mobilize the material.

The contribution of material is not only dependent on the economic condition of the household but also on the contrary to the specific characteristics of the rural economy. On the spot, with the motto "what contributes" and this is considered as a breakthrough solution in enhancing the participation of rural communities for rural infrastructure development. Because this solution encourages many people to participate and limit the difficulties of the People's Council, creating fairness in participation.

Land Contribution

In the test, $P(Y_4=1)$ is the probability of community land donation, and $P(Y_4=0)$ is probability otherwise.

Regression testing based on the significance level (Sig.) of the Wald test shows that X1, X3-X6, X8, and X10 have Sig. > 0.05. Consequently, the correlations were not significant for the Y4 variable, with a 95% confidence interval. The X2 and X7 have Sig. = 0.086 and 0.030 < 0.1. Consequently, the correlations were significant for Y4, with a reliability of 90%. Variable X9 has Sig = 0.002 < 0.01. The correlation coefficients were significant with Y4, and the reliability was 99%.

Validation of the model: with 307 households involved in land contribution, the model correctly predicted 296 households, and the correct rate is 96.40%. The remaining 131 households did not participate, but the predicted model was 14, and the true rate was 10.70%. Therefore, the predicted correct rate of the whole model is 63.9%; The Omnibus test shows that Sig. = 0.001 < 0.01 (99% confidence). Thus, independent variables have linear relationships with dependent variables in the aggregate. Select the appropriate model.

The percentage of income from agriculture and household with family members working as community leader directly affects land contribution. In which, the number of staff involved in land use and land contribution is better than that of other community members by $0.795m^2$. This is also explained by the "role model". The percentage of income from agriculture also has an impact on the contribution of land, with an impact of 1.80% of the value of the contribution, which is interpreted to mean that rural people have lower incomes than urban land prices. Therefore, the decision on land contribution does not depend much on income, but the land contribution is only related to households with land near the road to be expanded. Beside the relative distance from their houses, contribution propaganda is important to the community of people involved.

5. DISCUSSION AND RESULT IMPLICATIONS

Results indicate a few factors that have medium to high effect on each category of community participation. A preliminary validation, obtained by common sense arguments, is followed.

- Financial contribution: *gender* (negatively medium), *education* (positively medium), and *household number of workforce* (negatively medium). Because of the way *gender* was coded (0 is female and 1 is male), the result means that households that are represented by male citizens tended to participate more in financial contribution. The reason behind this observation, though interesting, requires another socio-economic study. It is suffice to assume that the more educated citizens are, the more they are aware of the benefits of local transport infrastructure to themselves; furthermore, they can afford to contribute financially. Hence, the effect of *education* is confirmed. The negative effect of *household number of workforces* can come from the famous negative correlation between the number of children to the financial well-being of families in Vietnam.
- Labor contribution: *occupational training level* (negatively medium), *income class* (negatively high), *household member as community leader* (positively high), and *terrain of living area* (positively high). If a person is highly trained occupationally, it is not surprised that he/she works fulltime in that occupation, hence less free time to contribute labor to the local projects. Similarly, a high-income household would rather contribute financially than direct labor. The high effect of *household member as community leader* is interesting. This confirms the motivation of the good social model as verified in literature, as why people volunteer. The positively high effect of *terrain of living area* was hard to reason, but one potential explanation could be the relationship between types of jobs of the local people and the terrains that surround them.
- Material contribution: *sex* (negatively medium), *occupational training level* (positively high), *education* (negatively medium), and *terrain of living area* (positively medium). Effects of these characteristics are hard to reason about as there should be further studies of which types of materials contributed to the projects.
- Land contribution: *sex* (negatively medium), *household member as community leader* (positively high), and *terrain of living area* (positively medium). Land contribution is by far the most interesting observation in community participation, and this type of contribution was one of the most important factors that affect all infrastructure project schedule in Vietnam. Again, *household member as community leader* plays an important role in determining whether a household will donate their land to community. The medium effect of *terrain of living area* could be resulted from the land requirements from rural transport projects: projects located in flat surface areas are more common and require more land.

The findings of this study can benefit the government in the following areas:

a. The planning process for the government in developing rural transport system.

“Public [community] participation is a continuous effort of every transportation planning and project development process... transportation planners need to be aware of the expectations of an effective and successful program” [12].

Many variables must be considered in the process of planning transport systems. As the governments are fully aware of each areas' demographics, they can predict demands and resources of these areas, which in turn profiting the planning process.

b. The capability of the government to predict the outcomes of current development programs.

Any model built by the government to predict the outcomes of a development program would use community participation as an input variable. In circumstances where community participation has not been first-order determined (e.g., by surveys), an understanding of demographic characteristics can provide a shorthand for community participation.

c. An opportunity to increase the probability of success of considered programs through increasing community participant.

Revisiting the classification by Shye (2009) [16], causes of community participation come from three major classes: demographic antecedents, motivations, and circumstances. Aside from demographic antecedents, which were determined previously, the latter two notions can be facilitated as well to increase the community participation.

Increasing motivations of local citizens. This is out of the scope of this study but is no doubt an interesting route for future research.

Facilitating circumstances. This route can be started with two activities.

Activity 1. Develop flexible participation mechanisms with a well-coordinated process among stakeholders. The purpose of this activity is to organize the community, community, and government together to create regulations that facilitate the participation of stakeholders. There are 4 actors involved:

- (i) Government: government link with community organization representatives to discuss mechanisms and policies for participatory planning, as well as through organization. This is to implement community consultation.
- (ii) Community Organization: Representative, Participatory Mechanism / government, or participatory mechanisms, participation mechanisms, and participatory mechanisms; coordinate with mass organizations and / or self-media, consult and consult the community for issues that require broad consultation, such as participation mechanisms, participation, and participation levels. individual of the community; coordinate with specialized units, consultation consultants, consult with professional content related to ICT infrastructure development, to improve the knowledge and communication of community communication, ensure maximum transparency.
- (iii) Community participation: Participation mechanism is to collaborate with community organizations to engage in discussion, feedback, information provision, etc. on issues related to participation and information. Related news; associate with mass organizations and professional advisory units to capture relevant information in support of participation decision.
- (iv) Mass organizations: the mechanism of action is to coordinate with the authorities to propagate mechanisms and policies for the participation and information provision of community organizations (coordination in propaganda) and community (extended communication); volunteering to contribute as a pioneer organization of the community organization to involve the community, ...;
- (v) Specialized units: operational mechanism is to coordinate with the authorities in consultation, discussion, ... issues related to the profession; collaborate with community organizations to explain, provide relevant information, and support communication.

Activity 2. Develop a transparent participation procedure. A transparent procedure will facilitate the readiness of local citizens in volunteering. The procedure is depicted in Fig. 2.

- Step 1: the government or community organization representatives propose / initiate the need for rural infrastructure development and propose participation, with public consultation.
- Step 2: the government or community organization representative consult with specialized agencies on issues, content, and participation.
- Step 3: the government or community organization representatives consult with mass organizations about communication issues related to ICTD development and participation.
- Step 4: the government or community organization representatives agree on issues related to ICTD development and participation.
- Step 5: a mass organization and / or technical advisory unit in collaboration with community organization representatives to communicate issues related to ICTD development and participation to the individuals in the community
- Step 6: the representative of the community organization consulted the contents to discuss and communicate the information related to the development of rural transport infrastructure and participation.
- Step 7: the community entity decides to contribute directly to the process.
- Step 8: it is to summarize, evaluate, and draw experience, draw lessons for participation in participatory process, as well as participation of stakeholders.

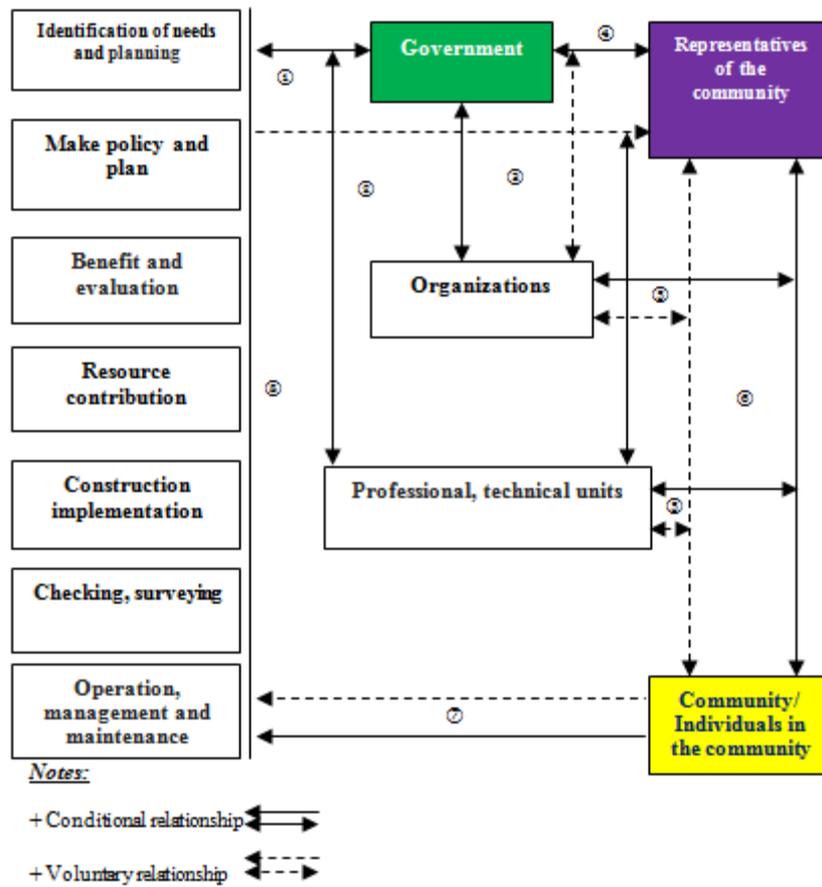


Fig. 2. Proposed participation procedure which prioritizes transparency

6. CONCLUSIONS

In developing countries such as Vietnam, community participation benefits the development of rural’s transport infrastructure in many aspects: providing alternatives of financial resources and enhancing public support.

This study examined current status of community participation through a case study and explored the relationship between demographic characteristics and community participation. Results show that community participation in rural transport programs in Vietnam has appeared as four types: financial contribution, labor contribution, material contribution, and land contribution. Household composition, education, income, member in household as community leader affect community participation more than other factors.

Governments and policy makers can be benefited from this study in the planning process, predicting success outcomes, and increasing the effectiveness of rural transport development. Moreover, policies should make rural transport programs to be clearer to local citizens and should facilitate contribution in various forms. Flexible participation mechanisms and transparent participation procedure are also strongly advised to boost community participation.

Future research might expand to other areas in Vietnam, as well as other developing countries to validate the influence of demographic characteristics.

Acknowledgement

This work has been sponsored and funded by Ho Chi Minh City University of Food Industry under Contract No. 69/ HÐ-DCT.

References

1. Anh, T.T. New countryside construction work in some countries around the world. *Communist Review*. 2019. Vol. 4. P. 68-75.
2. CCOP - Central Committee of the Party. *Resolution No. 26 / NQ-TW dated August 5, 2008 of the 7th Conference of the Central Committee of the Communist Party (Xth Congress) on "Agriculture, Farmers and Rural Areas"*. 2008. 320 p.
3. David, W. *Guide for Effective Community Participation*. Available at: <http://cec.vcn.bc.ca/mpfc/modules/par-bevt.htm>. 2014.
4. DoSDN - Department of statistics of Dong Nai Province. *Social and Economics Statistics Book 2020*. Dong Nai Published House. 2020. 180 p.
5. Dong, N.N. *Rural Transport in Rural Construction and Rural Modernization*. 2017. Available at: <http://www.dr.vn.gov.vn/>. 2008.
6. Dung, L.T. *Planning Method with Community Participation*. Available at: <http://www.ashui.com/mag/chuyenmuc/quy-hoach-do-thi/405-ve-phuong-phap-quy-hoach-co-su-tham-gia-cua-cong-dong.html>. 2008.
7. Hai, D.T. *Research on model for management of rural 's technical infrastructure system on process of establishing new rural on Hanoi City*. Research Project for Hanoi City, Code: 01C-04/10-2013-2. 2013. 430 p.
8. Hai, D.T. Communities' physical contributions for developing rural transport infrastructure in Dong Nai Province, Vietnam. *The Open Transportation Journal (TOTJ)*. 2020. Vol. 14. P. 14-21.
9. Hien, D.P. *Community Participation in the Transfer of Advanced Technologies in Agriculture to Farm Households in the Mountainous Region of Northern Vietnam*. Verlag Grauer, Beuren, Stuttgart. 2007. 350 p.
10. Jupp, D. *Identification and Preparation of Second Rural Roads and Markets Improvement Project: Community Participation in Rural Infrastructure Development*. Available at: http://www.unescap.org/sites/default/files/pub_1867_ch6_0.pdf. 1995.
11. Menard, S. *Applied Logistic Regression Analysis*. 2nd edition. Sage publications. 2001. 540 p.
12. Meyer, M.D. *Transportation Planning Handbook*. John Wiley & Sons. 2016. 430 p.
13. MoTC - Ministry of Transport and Communication. *The National Strategy for Vietnam's Rural Water Supply Through 2020 with a Vision to 2030*. 2018. 330 p.
14. Nho, L.T. và Duong, P.H. Participation of ethnic communities in poverty reduction activities in Northern Mountainous Areas of Vietnam. *Journal of Science and Development of Vietnam*. 2013. Vol. 11. No. 2. P. 249-259.
15. Rostow, W. The process of economic growth of New York, Association for Evolutionary Economics. *Journal of Economic Issues*. 1979. Vol. 13(1). P. 261-265.
16. Shye, S. *The motivation to volunteer: A Systemic Quality of Life Theory*. Social indicators research. 2010. Vol. 98(2). P.183-200.
17. World Bank. *Experience of the World Bank's Community-based Decentralized Rural Infrastructure Project in Vietnam*. 2010. 680 p.

Received 05.01.2020; accepted in revised form 07.05.2021