Constructing Evaluation Model for Sustainable Development in Community Health and Welfare

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Abstract: In the recent years, an important issue in the process for sustainable development in Taiwan village communities has emerged as that our villages has been aging and the young people and men in their prime have been moving out into the cities for job reason, which results in the improper care for community elders and children physically and mentally. Our government has thus actively promoted various health welfare measures to improve community living environment and raise the living quality of community residents. We can see from these that community health and welfare have become issues needed immediate solutions in Taiwan's communities. This study applied Fuzzy Analytic Hierarchy Process (FAHP) to examine these issues and selected three communities in Miaoli County, Taiwan for real case survey, analysis and evaluation in order to propose the best guidelines for the future references in community self diagnosis, enhancing improvement and strategies planning. Our results indicated that, to create community health, it needed particularly to strengthen: community organizational operation flexibility, spontaneous sense of community, local self-sufficiency and link with the government to form excellent communities mutually helped by industries, government, school and citizen, and to realize their advantages and improve their disadvantages thru these guidelines.

Key-Words: Community health and welfare, Fuzzy Analytic Hierarchy Process (FAHP), Sustainable development.

1 Introduction

43% of the population on earth is living in metropolises (cities). The percentage is expected to go over 60% in 2030. The increasing number of people in metropolises causes complex changes in the development system of urban and rural communities. Related researches also expect that the current community development strategies, which are very loose, would seriously threaten the sustainable development [1][2][3]. The purpose of sustainable development is to meet our demands with the resources available and make sure there are enough of those left for the next generation while not taking away their right to use resources. In the recent years, Taiwan society frequently ignored the sustainability of community operation due to the development of economy or science technology industries, causing other social problems, like: young people and men in their prime are moving out of remote areas for job opportunities have been shifting toward cities, which results in the lack of proper care for children and elders in those families. In other words, while spurring economic development, the government should put more emphasis on medical treatment, hygiene and the well-being of a humanistic society; that is to say, community health and welfare should be considered an important issue in social development, which consisted of three sub-issues: community organization and awareness (B1), creating a community health (B2), and community income [4][5][6].

Promoting community health and welfare can begin with enhancing community organization and awareness (B1) plus lifting community residents' expectation of the future, thereby increases the participation inside the community, raises vitality of community organizational operation, ups the local self-sufficiency, so as to improve many problems in society, ecology, economy and environment, allowing communities' development be more diversified, innovative and sustainable; meanwhile, carrying out various items of creating a community health (B2) , like: health education program, care of community and children, etc., can increase care of community elderly and child population as well as community hygiene knowledge. Among all of these, health education programs are rather important for living quality and environment because many elders and children in Taiwan need these types of help and studies. Therefore, it is necessary to change our attitude toward community health and welfare and increase the proportion of health education and services, especially including the health care of

elders and children, because this is important to the standards of our society, environment and living. Moreover, living environment, welfare for the elders, care for children, family income and expenditure are very important for every family in the community [7]. However, in the aspect of community strategy development, the best decision can only be made with organizational operation flexibility; through this, the cohesion inside the community can be increased and thereon the enthusiasm and vitality can be raised; at the mean time, by coordinating the regional links between communities, every programs for the sustainable development inside the communities can be promoted [8], for example: how to decrease the poor population and provide sufficient employment opportunities in order to increase the average income of everybody. We can see from above that the evaluation of community health and welfare is a variable and complicated work. This research tried to construct a decisions evaluation model for sustainable development in community health and welfare with three communities in Miaoli, Taiwan as real case studies, so as to propose the best ways to solve the issues needed improvement in the communities, to keep their advantages and to reach the sustainable operation ideal in uniting the four aspects of industry, government, academic and citizen.

2 Literature Review

This study analyzed the influences of community health and welfare on sustainable development with FAHP, as illustrated as follows.

2.1 Community Health and Sustainable Development

Health is a central key point for the economic development policy of a country or community [9]. The construction of a community should follow the basic principle of the health and comfort of human lives, and pursue the co-existence with the environment according to the principle [10]. In the aspect of sustainable development, commonly shared health and environment can reduce and solve most problems [11]; therefore, everybody from government officer to community resident needs to have innovative means, ideas, flexible operational model and centripetal force toward the community to allow it operate and develop sustainably. Because, seeing it from many sides, the environment, ecology and social problems have been linking together with health following the trend of economic development and people's demands for living quality and attitudes[12]; every activities in the community can move smoothly if there are good living conditions, healthy quality, sufficient job opportunities and cohesion of community awareness; consequently, health is not only an index but also an important key factor in whether a community development can succeed or not; the assigning of sustainable health indexes shall define sustainable development more clearly. To promote health and sustainability at the same time, continuous efforts and collaboration are a must [13].

2.2 Community Welfare and Sustainable Development

Sustainable development is a conceptual standard while welfare policies are based on overall and individual ideas; in the concepts of sustainable development, ecological and environmental funds versus social capital and economic welfare are linked together [14]. In another word, the probing of sustainable development should be about a whole society instead of a small part of it [15]. So, while in the process of sustainable development, human needs must also be met and poor population must also be reduced [16]. Samuelson [17] contended that meaningful welfare measures pointed at «having equal importance to wealth». Therefore, while in the process of economic development, Taiwan society should also put emphasis on the problems of social welfare development and considers how to develop environment, ecology, economy and welfare at the same time. Consequently, how to integrate current issues, do away with traditional concepts and construct a healthy operational economic and social environment will be an important topic in the future [18].

2.3 Fuzzy Analytic Hierarchy Process (FAHP)

The theory of AHP was proposed by Saaty [19]. AHP is a kind of method which classifies decision procedures with Hierarchy style to help with decision analysis; its major application is on decision problems that are under uncertain situations and have several evaluation Criteria. This technique utilizes scale of 1 to 9 for analysis. General speaking, Saaty's AHP calculation method [20] uses 5 factors to evaluate and execute paired comparison, as shown in Table 1.

Fuzzy theory was proposed by Zadeh [21]. Because human subjective sense was usually applied to their judgment when evaluating criteria and programs, there existed many fuzzy features and could not be solved by two value logic; thus, using the features of Fuzzy theory to interpret the importance degree of problems allowed us to

establish an evaluation method for decision makers or other complicated systems.

Because there were many fuzzy features existed in the real life, joining Hierarchy analytic process and Fuzzy theory together could make up for what was missing in AHP alone [22]. FAHP was proposed by Laarhoven and Pedrycz [23]; this theory mainly utilized fuzzy methods to solve problems in AHP, like: subjectivity, uncertainty, fuzziness, etc. Steps in FAHP were illustrated as follows:

(1) Establishing hierarchy structure:

Evaluation criteria were established in the hierarchy structure after thorough literature analyses and expert interviews. The hierarchy structure of the decision management model of community health and welfare is shown in Fig.1.

(2) Questionnaire design and survey:

A paired comparison questionnaire was established within criteria to compare the relative importance among criteria. The membership function of degree of relative importance is shown in Fig. 2.

(3) Consistency check:

Consistency check was carried out after retrieving the questionnaire. The purpose of the consistency check was to examine whether the questionnaire results were consistent before and after in order to avoid wrongful decisions. The examination method is shown as follows:

$$C.I. = \frac{(\lambda_{\max} - n)}{n-1} \le 0.1$$

$\lambda_{\max}$: maximal eigenvalues

n : the number of hierarchical factors

$$C.R. = \frac{C.I.}{R.I.} \le 0.1$$

$R.I$: Random index

(4) Establishing fuzzy paired comparison matrix:

Paired comparisons were carried out within criteria in the order of certain criterion in each hierarchy; if there were 'n' number of criteria in certain hierarchy, then n(n-1)/2 pieces of paired comparison matrix would be carried out. The fuzzy comparison matrix is shown as follows:

$$\left[\tilde{A}^k{}_{ij}\right] = \begin{bmatrix} 1 & a_{12} & a_{13} & \dots & a_{1n} \\ a_{21} & 1 & a_{23} & \dots & a_{2n} \\ \dots & \dots & 1 & \dots & \dots \\ \dots & \dots & \dots & 1 & \dots \\ a_{n1} & a_{n2} & a_{n3} & \dots & 1 \end{bmatrix}$$

(5) Calculating relative weight:

Calculation of relative weight could proceed after the paired comparison matrix was established. The maximum feature value could be obtained by calculating the matrix feature value; and the corresponding feature vector of the maximum feature value would be the relative weight of the evaluation factor. It is shown as the following formula:

$$\begin{vmatrix} a_{11} - \lambda & a_{12} & \dots & a_{1n} \\ a_{21} & a_{21} - \lambda & \dots & a_{2n} \\ \dots & \dots & \dots & \dots \\ a_{n1} & a_{n2} & \dots & a_{nn} - \lambda \end{vmatrix}$$

3 Field survey

3.1 Selection of the sites

This study examined the developmental situation of each index in community health and welfare mainly through real case samples in order to propose the best improvement guidelines; as for the principles of selection, each community was thoroughly chosen by the unit of village and town in the Miaoli County (Miaoli City, Junan Town and Toufen Town) (Fig.3), which had closer degree of development. Firstly, communities were selected according to the degree of emphases and development in community health and welfare, community organization and awareness (B1), creating community health (B2) and community income (B3). Secondly, the selection bases were on the degree of development, population and area in the communities in the hope that this study might proceed with communities with relatively equal style of developments on each item. Lastly, communities with higher homogeneity were chosen so that the weight comparison among them would be more reliable. The results of selection are shown in Table 2.

3.2 General Situation of the sites

3.2.1 Wei-xin community

The area of Wei-xin community is about 1.130 square kilometers and the population number of it is 4968 persons. The main roads in the community are

Fuxing Road and Weixiang Street. More than 25% of the area is farm land, the main agricultural product is rice and the main supply markets for their rice are inside the country. Since farming is their major business in the community, the younger population has been moving out gradually for that reason; as the result of aging society, the elderly population increases gradually; therefore, Wei-xin community has put more and more emphases on the development of environmental protection, social welfare and medical treatment. Environmental protection volunteer teams are formed and many food waste buckets are set up in the community. The food waste collected is used for growing organic crops in order to promote and educate the concepts about environmental protection. The community also actively conducts various health seminars and advertises for hygienic habits; furthermore, consensus is formed thru residents' discussion to construct leisure place with available space in the community so that there is a location where elders, children and residents can interact.

3.2.2 Sheng-fu community

The area of Sheng-fu community is about 0.5 square kilometer and the population number of it is 4282 persons. The main roads in the community are Guangfu Road and Longshan Road. More than 80% of the residents are Min-nan folks; thus there are heavy Min-nan flavors instead of Hakka culture in the Sheng-fu community. This area has no hills and creeks, few factories and farmland/green field and is purely a community of residential style. Because the relationships between people are distant and indifferent, various activities are arranged in the community to bring residents closer and increase the cohesion of community awareness. The activity strongholds in the Sheng-fu community are Sheng-fu activity center and Sheng-fu Temple; between the two, Sheng-fu Temple is the biggest spot where many activities are held, like: community health seminars, etc. Sheng-fu community also spends NT$180,000 per year as funds for health seminars and education to increase emphases on elders and children as well as to promote the maintenance of environmental hygiene by community residents.

3.2.3 Zhong-shan community

The area of Zhong-shan community is about 0.5 square kilometer and the population number is 3830 persons. The main road in the community is Jian-feng Road. Because more than 80% residents are Hakka folks, there are heavy Hakka flavors and spirit in the Zhong-shan community. More than 35% of the area is farm land and the main agricultural product is rice; the major supply market for their rice is inside the country. The main leisure space for elders is Zhong-shan community activity center where many groups are formed, like: Croquet team, Folk dance team, etc., offering the elders a place to go for recreations and space for activities. As far as health education funds is concerned, there is insufficient self-controlled resources and smaller government financial aids; nevertheless, they try to invest NT$80,000 on health education programs mainly by seeking help and cooperation from outside volunteers and communities; consequently, they are able to promote and advertise the social welfare, medical treatment and health education as well as offer the community residents a good living environment and space of rather high quality

4 Study Results and Discussion

4.1 Analysis of Target Items

We can see from Table 3 and Fig.4 that community organizations and awareness (B1) was the most important evaluation level in the Aspects level of community health and welfare and the Local weights after analysis was 0.5770. In the sub-level, the most important item was organizational operation flexibility (C3) and the Local weights after analysis was 0.2567. Next to it, the results indicated that the Local weights after analysis for: spontaneous sense of community (C6), local self-sufficiency (C4) and security and disaster prevention system (C2) were 0.1935, 0.1745 and 0.1460 respectively. These data told us that C6, C4 and C2 were also important factors affecting B1; therefore, the coordination between local communities and government will be complementary; in the aspect of local communities, they must have C6 and increased cohesion to proceed all kinds of activities, establish facilities and strive for other community related welfare; concept of self-sufficiency must be promoted also to let communities build up the ideal of sustainable management and sustainable environmental maintenance. In the aspect of government, it must actively assist the establishment of C2 in the communities to avoid the situations that there was no proper disaster reducing concept before the disaster and no proper responding measures in the face of disaster, which resulted in bigger damages. Finally, in the evaluation level of B1, the analyzed Local weights of Criteria: the state of poor people (C1) and importance of regional links (C5) were the lowest as 0.1171 and 0.1121 respectively. Even though the analyzed Local weights value of C1 and C5 were low, these two items are still important

factors in promoting interaction between economy and communities, and are indispensible under the status of maintaining economic development and health welfare.

According to Table 3 and Fig.4, creating community health (B2) was the second important evaluation level in the Aspects level and the Local weights after analysis was 0.2480. In the sub-level of B2, there were three Criteria: health education program (C7), community and child care (C8) and creating community health (C9) whose Local weights after analysis were 0.2174, 0.3504 and 0.4322 respectively. The analyzed results indicated that C7 and C8 were two most important factors in the evaluation level of B1; if there was no proper and good health creation in the community, its environmental conditions would be low and further affected the residents within and the tourists from outside. C7 not only is helpful to community environment, giving it better visual enjoyment, but also has big influence on the residents physically and mentally; likewise, if there is no good C8, the community health and welfare will be affected; looking from the aspect of Taiwan's big environment, when children in the community are ignored and lack of care, it will not only cause damage in their hearts but also result in bigger problems for the society in the future; therefore, the sub-level item of C8 is also a rather important joint in the evaluation index of B1. In addition, in the evaluation level of B1, the Local weights of C7 was the lowest; but speaking of the direction of community health and welfare, sufficient C7 will help the community residents greatly in personal hygiene and environmental maintenance; consequently, looking from the overall evaluation levels, it will affect the degree of advantage/disadvantage in the evaluation results.

Lastly, according to Table 3 and Fig.4, community income (B3) was the third important evaluation level in the Aspects level and the Local weights after analysis was 0.1750. In the sub-level of B3, it consisted of average income of everybody (C10) and providing sufficient employment opportunities (C11) and the Local weights after analysis were 0.5184 and 0.4816 respectively. We can tell from the results that both sub-level factors are rather important; from the view of B3, both C10 and C11 affect the community economy and welfare greatly; that's probably the reason why their Local weights have not much difference.

Taiwan society has been aging gradually and families have been changing into double-income families due to financial pressure; consequently, cares toward elders and children in the families have been ignored gradually no matter where. At the same time, social preferences gradually move toward material enjoyment, which relatively lowers the environmental maintenance; hence forth, community health and welfare has become the most important issue whether in the aspect of environment protection or in the health welfare. When executing or planning all kinds of activities in community health and welfare, one must consider the current situations and understand the needs in the communities so that complete health education and social welfare can be offered; therefore, care of elders living alone, children's education and security, health education and promotion of environmental protection concepts in the communities have become very important joints for community health and welfare, and can only be accomplished by understanding and consideration.

Finally in the Influential factor Global weights of decisions for community health and welfare (Fig.5), organizational operation flexibility (C3) was the most important item with an analyzed Global weight of 0.1481. Because of this data, in the future, discussions and opinions between decision-maker/higher-up and community residents must be put into consideration when studying and planning community health and welfare to facilitate further evaluation and development. As for other evaluation factors, like: C6, C9, C4, C10, C8, C11, C2, C1, C5 and C7, their analyzed Global weights were 0.1117, 0.1072, 0.1007, 0.0907, 0.0869, 0.0843, 0.0842, 0.0676, 0.0647 and 0.0539 respectively. We can tell from these data that, if it's necessary to do overall evaluation for sustainable community health and welfare, one must consider each analyzed criteria according to their importance before moving onto the next stage of development so that each analysis and decision may satisfy the needs of current residents.

4.2 Analysis of Real Case Sites

This study used Wei-xin community of Miaoli City, Sheng-fu community of Zhunan Town and Zhong-shan community of Toufen Town as empirical real case sites for sustainable management of community health and welfare. The analyses and calculation methods for each real case site are interpreted as follows:

(1) The grades of the degrees of achievement for the items evaluated were divided into values or transformed values according to their scores (Table 4): and categorized into three grades (a, b, c). The average of all the communities was used in the calculation. The transformed values of the items evaluated were then classified.
(2) The value or transformed value of each item evaluated was multiplied by the weight of the third-level evaluation criteria to obtain the degrees of achievement of the third-level criteria.
(3) The degrees of achievement of the third-level criteria obtained in the previous step were multiplied by their corresponding second-level evaluation aspect weights. The rest could be done in the same manner. The degrees of achievement of the target level were obtained.

4.2.1 Community Organization and Awareness

According to Fig.6 and Table 4, the first group was the evaluation level with influences on community organization and awareness (B1), the six Criteria included was the state of poor people (C1), security and disaster prevention system (C2), organizational operation flexibility (C3), local self-sufficiency (C4), importance of regional links (C5) and spontaneous sense of community (C6):

(1) The state of poor people

We found out after investigative evaluation that in the state of poor people (C1), the rates of low-income household in Wei-xin community, Sheng-fu community and Zhong-shan community were 0.563%, 0.467% and 0.89% respectively. This data told us that the rate of low-income household increased in the remote area of Miaoli while it was lower in the better developed village/town closer to the center of city. The reason was obviously because there were more job opportunities in the community closer to the city center than in the remote area, so the family income increase and lower the rate of low-income household. Therefore, in the evaluation of C1, Wei-xin community and Sheng-fu community were listed as the second grade while Zhong-shan community was listed as the first grade for its rate of low-income household was higher than the average of Miaoli County.

(2) Security and Disaster Prevention System

In the security and disaster prevention system (C2), evaluation was based on the amount of hose saddles in the area. After survey, we found out that the amount of hose saddles in Wei-xin community, Sheng-fu community and Zhong-shan community were 8, 12, and 14 pieces respectively, indicating all three communities were within the average of Miaoli County and belonged to the second grade. Because these three communities all had caring base and Patrol party, and they also carried out disaster education and security protection, they were classified as the middle grade.

(3) Organizational Operation Flexibility

In the evaluation item of organizational operation flexibility (C3), the survey indicated that the proportion of usage on government aids given to Sheng-fu community was more than 400%; this also pointed out that the higher-up at Sheng-fu community was more flexible and active in utilizing their interior funds on all kinds of activities, so it belonged to the third grade. Yet the proportion of usage at Wei-xin community and Zhong-shan community were 11% and 66% respectively, which were both lower than the average of Miaoli County and were listed as the first grade. The reason for this difference was because Sheng-fu community used the money mainly on their residents and organizational flexibility on various policies could increase thru multi-facet discussion and broad acceptance of opinions.

(4) Local Self-Sufficiency

In the evaluation of local self-sufficiency (C4), the local self-sufficiency in Wei-xin community, Sheng-fu community and Zhong-shan community were all larger than the average of Miaoli County as NT$1,300,000, NT$230,000 and NT$300,000 respectively, and belonged to the third grade. The reason for the high grade was because the whole community was active and enthusiastic toward activities and there was high degree of willingness whether striving for funds from outside or residents help out of their own pockets; this increased the C4 and also promoted the community health creation indirectly.

(5) Importance of Regional Links

In the evaluation of importance of regional links (C5), road area enjoyed by community residents was used as basis for grading because the more road enjoyed the more links between districts. The road area enjoyed by each person at Wei-xin community, Sheng-fu community and Zhong-shan community was 20%, 13% and 20% respectively and all belonged to the first grade. The reason for the low grade was because there was no funds exchange between sub-communities, which lowered the

degree of C5 and causing the analyzed result lower grade.

(6) Spontaneous Sense of Community

In the evaluation of spontaneous sense of community (C6), the community participation rate was used as basis for survey and the degree of achievement in Wei-xin community, Sheng-fu community and Zhong-shan community was 3.52%, 4.27% and 4.18% respectively and was classified to the second grade; this indicated the cohesion within the community belonged to the middle grade as well.

4.2.2 Creating Community Health

According to Fig.7 and Table 4, the second group was the evaluation level of create a community health (B2). The three Criteria included was health education program (C7), community and child care (C8) and creating community health (C9):

(1) Health Education Program

In the evaluation of health education program (C7), the health education funds offered to each community by Miaoli County was used as basis for survey. Both Wei-xin community and Sheng-fu community belonged to the third grade with NT$270,000 and NT$180,000 respectively; yet Zhong-shan community belonged to the second grade (NT$80,000). The main reason for this phenomenon was because government offered better facilities to community closer to city center but less for remote district; meanwhile, community in the remote area did not put much emphasis on health education program either, which discouraged the government funds later on.

(2) Community and Child Care

In the evaluation of community and child care (C8), the social welfare assistance from Miaoli County was used as basis for survey. Wei-xin community, Sheng-fu community and Zhong-shan community all belonged to the first grade with NT$108, NT$104 and NT$39 respectively. The main reason for this phenomenon was because government offered rather low welfare assistance to each community while the population in each community was rather high (more than 3000 persons), which resulted in lower average welfare per person; this could cause even less welfare and care for children.

(3) Creating Community Health

In the evaluation of creating community health (C9), the average number of health education seminar held per year by each community was used as basis for survey. The results indicated Sheng-fu community held the most number of health seminar (5 times), next was Wei-xin community (3 times) and Zhong-shan community (1 time). The main reason for this variation was related to the degree of importance of health education and hygienic environment to the community members. For example, the direction of development for Zhong-shan community was mainly about farm products, which caused less emphasis on creating health; as for Wei-xin community, its inner cohesion was not enough, which caused low participation and low participation discouraged the arrangement of seminar.

4.2.3 Community Income

According to Fig.8and Table 4, the third group was the evaluation level affected the community income (B3), including average income of everybody (C10) and providing sufficient employment opportunities (C11):

(1) Average Income of Everybody

In the evaluation of average income of everybody (C10), the analyzed results indicated that the C10 in Wei-xin community, Sheng-fu community and Zhong-shan community varied from NT$20,000 to NT$30,000 and all were located in the second grade. The main reason for this was because all three communities located either away from city center or in the remote area, which limited the income; therefore, how to raise the average income of everybody in the future will be an important point for development.

(2) Providing Sufficient Employment Opportunities

In the evaluation of providing sufficient employment opportunities (C11), the average jobless rate was the basis for survey. The average jobless rate in Wei-xin community, Sheng-fu community and Zhong-shan community was 5.04%, 3.47% and 5.82% respectively. The reason for the bigger difference was because the addition of Zhunan Scientific Park in the developing Zhunan Town offered many job opportunities for local residents and lowered the jobless rate in Sheng-fu community. But in Zhong-shan community, their main business has always been farming; however, the natural disaster and drought in recent years has turned their farmland into fallow; consequently, the jobless rate has been increasing. There might be population out-flow in the future if the situations are not actively improved.

4.3 Comprehensive Analysis of the Second Hierarchy Evaluation Results

This study used three factors: Community Organization and Awareness (B1), Creating Community Health (B2) and Community Income (B3) for the second hierarchy aspect of evaluation on degree of achievement for community industry sustainable development. The evaluation results of Fig.9 indicated the score of degree of achievement in community organization and awareness (B1) for Wei-xin community, Sheng-fu community and Zhong-shan community was 11, 13 and 11 points respectively. We can tell from the survey and evaluation results that Sheng-fu community was better-off in community organization and awareness because there was caring base and safety patrol party in the community; besides, government offered more financial aids for its internal activities and seminars that Sheng-fu community can better implement the organizational operation. In the aspects of organizational operation flexibility, decision makers and residents of Sheng-fu community actively strive for governmental funds for various activities and seminars; they also actively promote all kinds of social welfare and health measures, which let Sheng-fu community get the highest score in degree of achievement in the aspects of community organizations and awareness.

According to Fig.9, in the aspects of creating community health (B2), the score on degree of achievement for Wei-xin community, Sheng-fu community and Zhong-shan community was 6, 7 and 4 points respectively. We found out from survey and evaluation results that, because the main business in Zhong-shan community was in farming, the residents put less emphasis on personal hygiene and environmental maintenance; neither were they active in arranging health education seminars, all these factors render them to get a lower score in B2.

According to Fig.9, in the aspects of community income, the score on degree of achievement for Wei-xin community, Sheng-fu community and Zhong-shan community was 3, 4 and 3 points respectively. We found out from survey and evaluation results, because Zhunan Scientific Park set up in area by Sheng-fu community, it offered many job opportunities, lowered the jobless rate and raised the look of community management. On the contrary, Wei-xin community and Zhong-shan community were away from city center or in a remote area, there were insufficient job opportunities and some of the population even moved out to other places for employment; therefore, both communities got lower score in B3.

4.4 Analysis of the Target level

The first hierarchy level of this study was the target level of sustainable community health and welfare. The performance grading method was adopted for evaluation (Fig.10) to probe the overall performance of those three communities' sustainability in decision evaluation of community health and welfare. Review and suggestions will be proposed to improve the current situation in community health and welfare and to promote the sustainability of village, town and community level.

The final results in Fig.10 indicated that the overall performance score in decision evaluation for sustainable community health and welfare of Wei-xin community, Sheng-fu community and Zhong-shan community was 60.61%, 72.73% and 54.55% respectively. Their grading was grade D, grade C and grade E (Table 5). It is showing that Zhong-shan community has great missing in executing performance which needs immediate improvement; health education and environmental maintenance needs to be promoted, proper planning is required on security and disaster prevention system, analyzes and corrects on the disadvantage, transmits the improvement data into management data bank, so as to feed back on the management of sustainable community health and welfare. As for the Wei-xin community, it needs improvement in management executing performance, like: organizational operation flexibility, importance of regional links, etc., however, Sheng-fu community is a better community with some improvement needed on importance of regional links, community and child care, etc., so that community health and welfare can move toward sustainable development.

5 Conclusion

After calculated and classified with Fuzzy Analytic Hierarchy Process (FAHP), this study exposed that in community organization and awareness aspects, some community need to enhance in organizational operation flexibility (0.2567), spontaneous sense of community (0.1935) and local self-sufficiency (0.1745). But in the aspects of creating community health, it needs improvement in create a community health (0.4322) and community and child care (0.3504) and increases residents' welfare. In the community income aspects, average income of everybody (0.5148) and providing sufficient employment opportunities (0.4816) have equal importance. Therefore, thru the survey and analysis of this study,

community residents will understand that community health and welfare needs to be sustainable.

Furthermore, applying the evaluating model this study established on three community cases can expose the advantage/disadvantage of their overall performance in sustainable community health and welfare, they are listed in order of their excellency: Sheng-fu community (72.73%), Wei-xin community (60.615) and Zhong-shan community (54.55%). Under each evaluated aspects, the results can distinguish the side of better performance, e.g. Sheng-fu community shows good performance in community organization and awareness (13 points). This item can help that community how to enhance thinking, improve each aspects of management, encourage opinion exchange, let community become resident-centered, become more sustainable in development. At the same time, paired comparison helps reflect the real features of each community, like: Sheng-fu community is better than Wei-xin community and Zhong-shan community in every ways. Therefore, this study can be a reference for community self-diagnosis, improvement and strategy planning.

In conclusion, this study uses suburb communities for case study, offer a complete evaluation model for sustainable community health and welfare, introduce the concept of fuzzy analysis, establish human specific fuzzy evaluation index. The development of sustainable community health and welfare model not only can turn abstract concept of sustainability into concrete transform, but also can quantify weight value with subjective mathematics, integrate diversified information into clear index, allow communities to control the development of current situation, and offer analysis as reference for decision makers.

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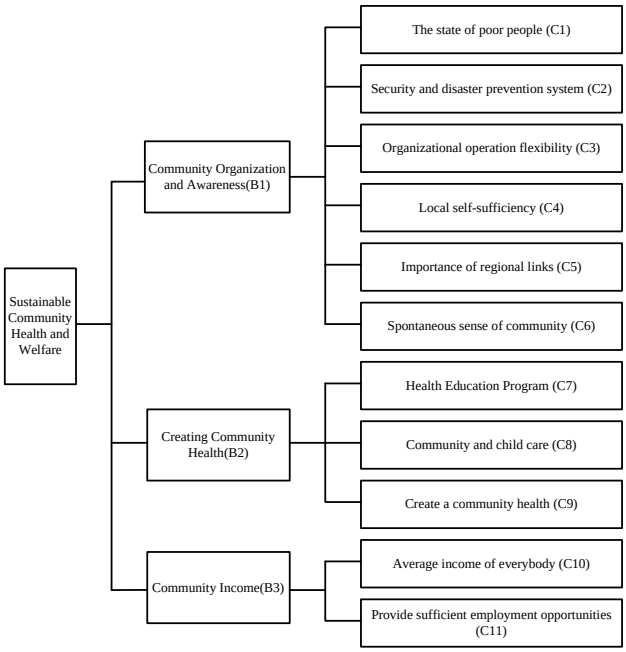

Fig.1 The hierarchy structure of community health and welfare

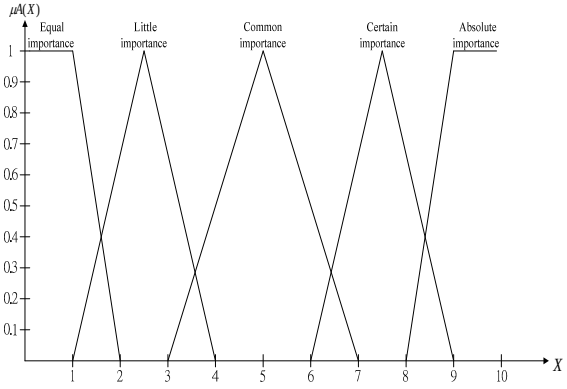

Fig.2 Membership Function of Degree of Relative Importance

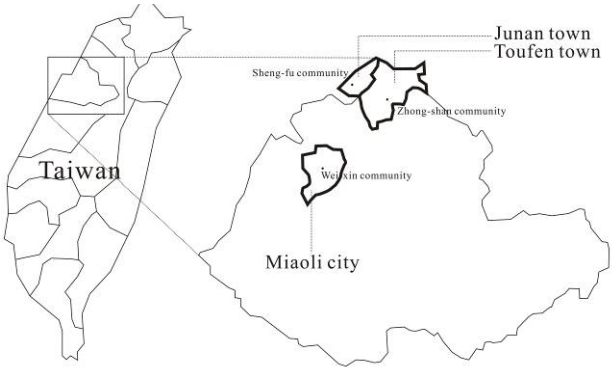

Fig.3 The Situation of Three Sites in Miaoli County

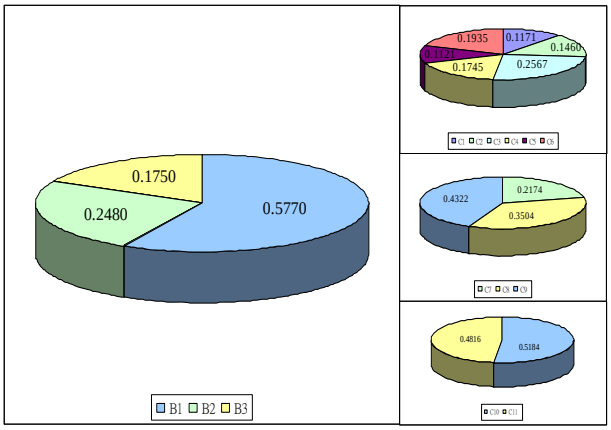

Fig.4 Influential Factor of Decision for Community Health and Welfare (Local weights)

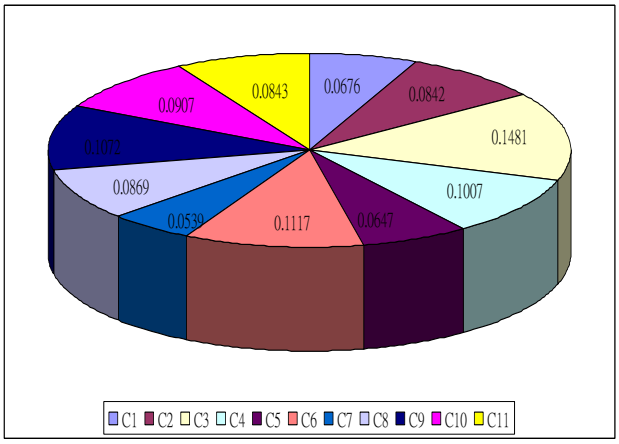

Fig.5 Influential Factor of Decision for Community Health and Welfare (Global weights)

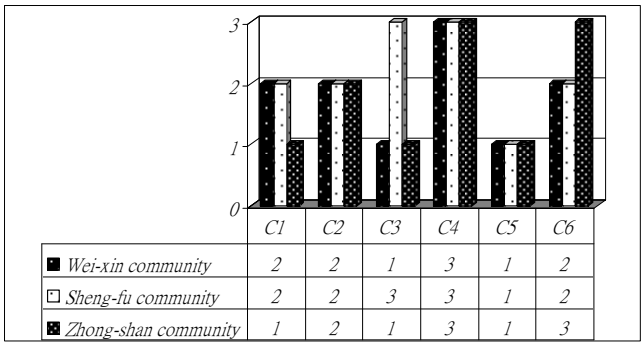

Fig.6 Grade Classification for Community Organization and Awareness

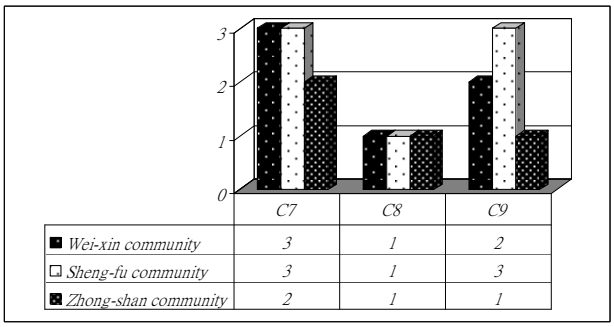

Fig.7 Grade Classification for Creating Community Health

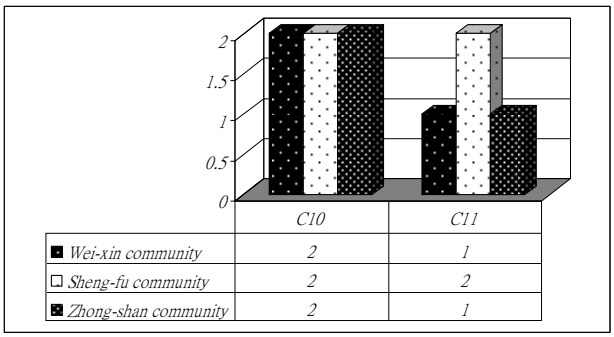

Fig.8 Grade Classification for Community Income

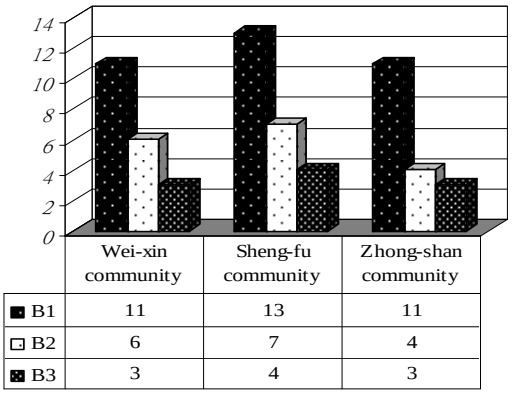

Fig.9 Degree of Achievement on Sustainable Community Health and Welfare Target in the Three Communities

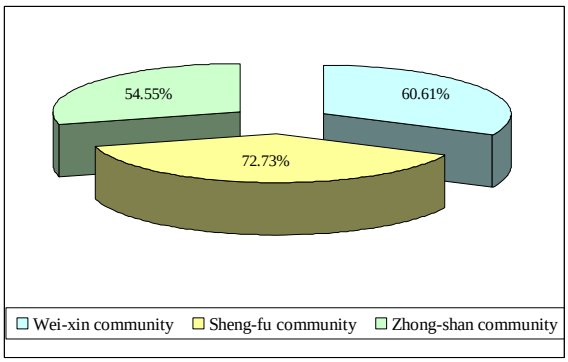

Fig.10 Analysis Chart of Target Level

Table 1 Paired Comparison Scale of AHP Preferences

Numerical rating	Verbal judgments of preferences
1	Equal importance
3	Little importance
5	Common importance
7	Certain importance
9	Absolute importance

Table 2 Result of Site Selection

	Name	Community health and welfare	Create a community health	Community organizations and awareness	Community income	Total score	Population	Houses
Miaoli city	Xin-ying community	0.2	0	1	1	2.2	2163	691
	Da-tung community	0.3	1	0	1	2.3	808	266
	Gua-miau community	0.2	1	0	1	2.2	3500	1181
	*Wei-xin community	0.4	1	1	1	3.4	4962	1368
	Sheng-li community	0.4	1	1	1	3.4	4826	1380
Junan town	Chia-hsing community	0.3	1	1	1	3.3	3864	1110
	Kung-kuan community	0.5	1	1	1	3.5	1525	417
	*Sheng-fu community	0.5	1	1	1	3.5	4108	1169
Toufen town	*Zhong-shan community	0.4	1	1	1	3.4	3830	900
	Xin-hua community	0.4	1	1	1	3.4	4900	1200
	Ho-ping community	0.4	1	0	1	2.4	1290	431
	Tung-chuang community	0	1	1	0	2	3185	1049

∗ Being Result of Selection

Table 3 Influential Factor Local Weights of Decision for Community Health and Welfare

Aspect	Local weights	Important level	Criteria	Local weights
Community Organization and Awareness (B1)	0.5770	1	The state of poor people (C1)	0.1171
			Security and disaster prevention system (C2)	0.1460
			Organizational operation flexibility (C3)	0.2567
			Local self-sufficiency (C4)	0.1745
			Importance of regional links (C5)	0.1121
			Spontaneous sense of community (C6)	0.1935
Creating Community Health(B2)	0.2480	2	Health Education Program (C7)	0.2174
			Community and child care (C8)	0.3504
			Create a community health (C9)	0.4322
Community Income(B3)	0.1750	3	Average income of everybody (C10)	0.5184
			Provide sufficient employment opportunities (C11)	0.4816

Table 4 Actual Evaluation Classification Method and Degree of Achievement of 3 Real Case Sites for Sustainable Community Health and Welfare

Item	Local weight	Value number	Wei-xin community	Sheng-fu community	Zhong-shan community
C1(Low income ratio of the residence population divided total population of Miaoli:a:≧0.85% , b:0.84-0.29%,c: ≦0.28%)	0.1171	0.5000 0.3333 0.1667	b 0.563%	b 0.467%	a 0.89%
C2(Each household have fireplug number of Miaoli: a:≦0.007seats, b:0.008-0.02seats,c:≧0.021seats)	0.1460	0.5000 0.3333 0.1667	b 0.008seats	b 0.012seats	b 0.014seats
C3(Take the rate of funds from Miaoli government for communities: a:≦69% b:70-81%,c:≧82%)	0.2567	0.3620 0.3333 0.3046	a 11%	c 400%	a 66%
C4(Community's funds of Miaoli city divided the rate that from the total amount of communities obtains:a: ≦75304NT,b:75305- 225912NT,c:≧225913NT)	0.1745	0.5000 0.3333 0.1667	c 1×106 NT	c 2×105NT	c 3×105NT
C5(Take Miaoli area of the road averagely for each person:a:≦20%,b:21-27%,c:≧28M2)	0.1121	0.3889 0.3333 0.2778	a 20%	a 13%	a 20%
C6(The ratio of Miaoli city participates in the number of people divided the total number of person: a:≦ 2.8% ,b:2.8-8.3%,c: ≧8.3%	0.1935	0.5000 0.3333 0.1667	b 3.52%	b 4.27%	b 4.18%
C7(The ratio of the health education expend of Miaoli city divided the total amount of community:a: ≦5237NT,b:5238 -15709NT,c:≧15710NT)	0.2174	0.5000 0.3333 0.1667	c 3×105NT	c 2×105NT	b 8×105NT
C8(The average expenditure for each person of government's social welfare:a:≦2858NT, b:2859-4653NT,c:≧4654NT)	0.3504	0.4130 0.3333 0.2536	a 108NT	a 104NT	a 39NT
C9(Take the average of health education times of communities of Miaoli:a: ≦1 time,b:2-4 times,c: ≧5 times)	0.4322	0.5556 0.3333 0.1111	b 3time	b 5time	a 1time
C10(Every per capita income of Miaoli city as a base:a:≦14568NT, b: 145 69- 43705NT, c:≧43706NT)	0.5184	0.5000 0.3333 0.1667	b 2.8×105NT	b 2.8×105NT	b 2.2×105NT
C11(The average rate of unemployment of Miaoli: a: ≧4.2 %,b:2%-4.1%,c:≧ 2.1%)	0.4816	0.4444 0.3333 0.2222	a 5.04%	a 3.47%	a 5.82%

a: First grade b: Second grade c: Third grade

Table 5 Degree of Achievement in Sustainable Development for Community Health and Welfare

Total Score	> 90 points	80 ~90 points	70~80 points	60~70 points	< 60 points
Level	A	B	C	D	E
Level language	Beyond the project goals	achieve the project objectives	Compliance	improvement	lack of urgent need to improve