Integration of SWOT-AHP Approach for Measuring the Critical Factors Affecting Rural Development

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Abstract. This study uses the combined method of SWOT and Analytic Hierarchy Process (AHP) to assess the factors affecting the process of new rural development (NRD) in An Giang province Vietnam. Objectives of the study is assessing the current situation of NRD and factors affecting the NRD process in An Giang province, Vietnam, on the basis of research to propose and select strategic options and key solutions to improve efficiency program implementation in the next phase.

Keywords: Rural Development · New Rural Development Programme · The Combined Method of SWOT and AHP · Weights · Factors

1 Introduction

The problems of rural development in countries around the world are also very diverse, with specific characteristics for each region and each country. In Vietnam, agricultural policy is associated with rural development policy in tasks and activities. The goals include building a developed and modern agricultural sector through the improvement of the new countryside in terms of "modern social and economic infrastructure; rationalize economic structure and organize production, improve living standards for rural residents and develop sustainably" [1]. NRD or rural transition or rural development is at the heart of developing countries' strategies. Among the top priorities, addressing the issue of income growth and poverty, the gap between urban and rural areas, between leading and lagging regions, and between ethnic groups is among the most essential [2].

Referring to suggestions from NDR-related studies at home and abroad as a basis for determining the factors affecting NDR of the topic. First of all, there is the element of direction and administration of the state, the suggestion of this factor is from the leading role of the government in the Saemaul Undong program [3], viewpoints, orientations and socio-economic development goals [4], the formulation of a scientific NDR plan, in accordance with planning [5] or the decisive role in development planning, decentralization of implementation management [1] in which the leading role is the state.

The role and participation of the people is also an important factor to be considered as the NRD cannot succeed without the joint participation and contribution from both

the Government and social capital [6], it is necessary to shift current policy priorities, ensure the pivotal role of farmers and develop the NDR Rule [7]. Other factors related to this factor could also be the improvement of people's awareness or locally available force.

Financial assistance can positively affect the incomes of rural households through investments in roads, income enhancement models, and technical training [2]. This shows that it is necessary to evaluate the factors related to investment, infrastructure development as well as support programs and projects for the research area. Capital for implementation and the context, characteristics, socio-economic development situation and a prominent issue in the current context that cannot be ignored is the impact of the Covid-19 epidemic.

To study more deeply about NRD, we realized that it is possible to use the Combined SWOT and AHP Model to apply to the analysis for this problem. Although SWOT - AHP method has been used quite commonly in many different fields in the world, according to the author's knowledge, there is no studies using this method to assess the factors affecting the NRD process, especially the research area was carried out in Vietnam to solve many urgent problems. That makes the research meet the practicality and novelty of scientific research on the principle of solving rural development problems. The research results will be a reference for local leaders and managers to orient and propose strategies and solutions suitable to current actual conditions in order to improve NDR efficiency. The study also provides necessary recommendations on governance implications and proposes solutions to enhance the effectiveness of program implementation.

2 Methods

2.1 SWOT and AHP

SWOT analysis is a strategic management tool used to align organizational goals [8]. In SWOT, the internal and external factors that are most important to the future of the business are grouped into four categories: Strengths, Weaknesses, Opportunities, and Threats. By applying SWOT in the strategic planning process, the aim is often to develop and apply a strategy that leads to a good fit between internal and external factors.

However, the SWOT does not include the analytical means that determine the importance of factors or assess the concordance between the SWOT factors and the decision alternatives [9]. On the other hand, the Analytical hierarchical process (AHP) proposed by Thomas L. Saaty is a suitable method for structured analysis of a complex decision. For many years, this approach has been widely studied and applied, especially in multi-criteria decision problems [10]. Therefore, to address the technical limitations of SWOT due to the lack of quantitative analysis, Kurttila [9] introduced the combined method of SWOT - AHP which increased the usability of the SWOT method.

2.2 SWOT - AHP Methodology

The purpose of applying the hybrid approach is to improve the quantitative information base of strategic planning processes [9]. The combination of the SWOT and AHP

methods can result in marking a starting point for developing specific strategies for the most important factors identified through the SWOT matrix. Therefore, the results of the SWOT - AHP method are both qualitative and quantitative and point towards future directions both in strategic planning and in decision making [11]. SWOT provides the basic framework for performing decision situation analysis, and AHP assists in doing SWOT more analytically and building the analysis so that strategic decisions can be made replacement may be preferred. The steps are described as follows [9, 12–14]:

Step 1. Building a SWOT matrix based on identifying internal and external influencing factors through interviews or questionnaires with experts [14] (Table 1).

Step 2. Convert the content of the SWOT matrix analysis to the tree structure model. The tree structure model allows arbitrary in-depth analysis of strengths, weaknesses, opportunities, and threats in the SWOT matrix. This is the outstanding advantage of the tree structure model over the tabular model of SWOT. This model has 4 levels [14]:

Level 1: Describes the goal the organization aspires to achieve.
Level 2: Describes four groups of influencing factors identified in the SWOT analysis.
Level 3: Describe the influencing factors of each group S, W, O, T.
Level 4: Describe the created strategic groups: SO, ST, WO, WT (Fig. 1).

The proposed strategies as follows:

(SO) Strategy to focus resources for implementation for the pilot communes: Concentrating resources such as investment capital, prioritizing projects, supporting programs, training knowledge and focusing attention directing, inspecting, and guiding the District

Table 1. SWOT matrix for implementation NRD.

| Strengths (S)	Weaknesses (W)
(S1) The role of the District NDR Steering Committee has always been actively promoted. (S2) The members of the District Steering Committee are well-versed in expertise and procedures. (S3) Solidarity, unity, and coordination in the whole political system. (S4) The experience performed in the previous period is accumulated.	(W1) The new staff in charge of rural areas is still limited in capacity. (W2) Some communes have not paid due attention to NRD implementation. (W3) Propaganda and mobilization activities are still limited. (W4) The starting point of the district is lower than that of other districts.
Opportunities (O)	Threats (T)
(O1) Many programs and projects are interested in investment and support. (O2) Border economy is interested in investment and development. (O3) Infrastructure is increasingly invested and perfected. (O4) Agricultural application of high technology is increasingly interested in development.	(T1) Investment capital of superiors is still limited compared to actual needs. (T2) The Covid-19 epidemic is still complicated. (T3) The participation of people and businesses in the NRD is still limited. (T4) The situation of people leaving the locality to work far away is increasingly common.
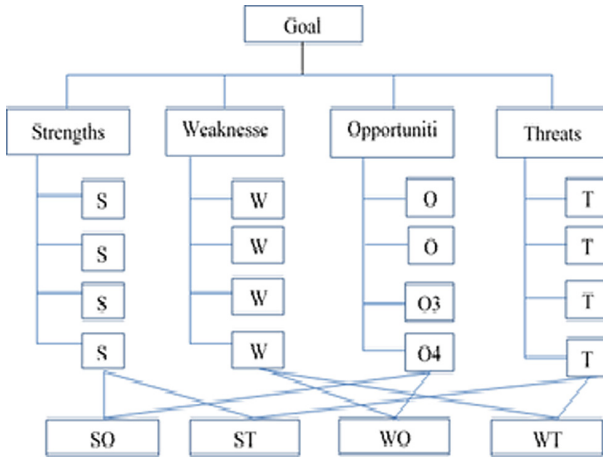
Fig. 1. Tree diagram for implementation NRD.

Steering Committee for several selected pilot communes that have a high number of criteria and have favorable conditions and capabilities to complete the NRD as soon as possible.

(WO) Strategies for "last support", increasing resources for implementation for the communes behind: This strategy aims to focus resources, attention to directing, checking, and guiding to create good conditions for the communes at the bottom to strongly and quickly improve the results of the implementation of the criteria and targets to catch up with the progress of the leading communes.

(ST) Strategy for implementation according to the roadmap for each criterion and each commune: To strongly promote the general directing and operating role of the District Steering Committee for the communes. Develop an implementation roadmap for each criterion and each commune, in which resources will be distributed equally to communes, divided by year, and at the same time directing communes to fulfill the criteria, targets have strengths and are easy to achieve depending on the conditions of each commune, regularly guide, check and urge according to the proposed roadmap.

(WT) Strategy to focus on directing from the grassroots level, mobilizing resources from the people: For this strategy, it is necessary to focus on overcoming existing limitations at the grassroots level, especially in terms of quality staff and interest as well as capacity in directing and administering at the grassroots level. Communes need to focus on implementing criteria and targets without prior capital and mobilizing resources as well as the response, coordination, and participation of the people.

Step 3. Determine the relative importance of the factors referring to the parent factor and the overall goal of the organization based on the results of the assessment of the experts (Table 2).

Let $C = \{C_j \mid j = 1, 2,\ldots, n\}$ is the set of criteria. The result of a pairwise comparison on n criteria can be summed up in an evaluation matrix (nxn) A where every element a_{ij} (i, j = 1, 2,.., n) is a quotient of the weights of the criteria. This pairwise comparison

Table 2. Evaluation of criteria in pairs based on priority.

Intensity of Importance	Definition	Explanation
1	Equal Importance	Two activities contribute equally to the objective
2	Weak or slight	
3	Moderate importance	Experience and judgment slightly favor one activity over another
4	Moderate plus	
5	Strong importance	Experience and judgment strongly favor one activity over another
6	Strong plus	
7	Very strong or demonstrated importance	An activity is favored very strongly over another; its dominance demonstrated in practice
8	Very, very strong	
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation

can be shown by a square and inverse matrix.

$$A = (a_{ij})_{nxn} = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ . & . & . & . \\ . & . & . & . \\ . & . & . & . \\ a_{n1} & a_{n2} & . & a_{nn} \end{bmatrix} \tag{1}$$

Step 4. Calculate the weights for the main criteria such as S, W, O, T and the secondary criteria such as S1,…Sn, W1,…Wn, O1,…On, T1,…Tn.

From matrix A, calculate the components of the eigenvector matrix (W) according to the formula:

$$w_{i,j} = \frac{a_{i,j}}{\sum_{i=1}^{n} a_{i,j}} (i = \overline{1, n;} \ j = \overline{1, n}) \tag{2}$$

$$W = (w_{i,j})_{nxn} = \begin{bmatrix} w_{11} & w_{12} & \cdots & w_{1n} \\ w_{21} & w_{22} & \cdots & w_{2n} \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ w_{n1} & w_{n2} & \cdot & w_{nn} \end{bmatrix} \tag{3}$$

From the matrix W, calculate the value of the weight vector component wj according to the following formula:

$$w_j = \frac{\sum_{i=1}^{n} w_{i,j}}{n} (j = \overline{1, n}) \tag{4}$$

In there: wj is the weighted score of the criterion j and $\sum_{j=1}^{n} w_{i,j} = 1$.

It should be noted that the output quality of AHP is related to the consistency of pairwise comparison judgments. Consistency is determined by the relationship between the elements of A: $a_{ij} \times a_{jk} = a_{ik}$ [15]. The consistency index (CI) can be calculated, using the following formula [16]:

$$CI = \frac{\lambda \max - n}{n - 1} \tag{5}$$

In there: $\lambda\max = \sum_{i=1}^{n} wi * \sum_{j=1}^{n} aij$

Using the consistency ratio (CR) it is possible to conclude whether the assessments are sufficiently consistent. CR is calculated as the ratio between CI and random index (RI) [17]:

$$CR = \frac{CI}{RI} \tag{6}$$

In all cases, the CR should not be greater than 10% [16]. For 3x3 matrices, CR needs to be no larger than 5%, and the corresponding value for 4x4 matrices is 9%. If the CR is greater than the above-mentioned levels, it indicates an inconsistency in the expert judgment and needs to be re-evaluated and recalculated [18].

Step 5. Calculate the priority of the strategic options: SO, ST, WO, WT according to each criterion.

In this step, people calculate for each criterion, the calculation is the same as in Step 3 and Step 4, but the data included in the evaluation is the result of comparing the priority of the options considered according to each criterion. Thus, the evaluator has to perform n matrices for n different criteria. As a result, we have n matrices of 1 column m rows. Consistency ratio checks should also be performed to ensure that the results obtained have adequate confidence.

Step 6. Calculate points for options and choices.

This is the final step in the evaluation and planning process. We concatenate n 1-column m-row matrices that are the result in Step 5 into m-row n-column matrix. Multiplying this matrix by 1 column n rows is the result of Step 4, resulting in a matrix m rows 1 column. The resulting matrix will indicate the best option to choose, the one with the highest result value.

3   Results and Discussion

Through the opinions of experts, the criteria groups are arranged in the following order of priority: Strengths > Opportunities > Weaknesses > Threats.

Rank the sub-factors as follows: S3 > S1 > S4 > S2, W2 > W3 > W1 > W4, O3 > O1 > O4 > O2, T2 > T3 > T1 > T4 (Fig. 2 and Table 3).

Through the evaluation and ranking results for strategic options, the strategy of focusing on directing from the grassroots and mobilizing resources from the people is the most appreciated strategy. This result is quite reasonable when the resources to implement the program are very limited, in addition, the inspection, urging and direction of the District NRD Steering Committee cannot cover and regularly cover all communes. Therefore, the initiative and self-discipline of the communes is the most important, besides that, the subject role of the people also needs to be widely promoted, mobilize resources from the people to cope with limited resources state regulation helps to reduce pressure on investment capital, overcome expectation and dependence. However, this strategy has limitations as it is necessary to build a team of cadres with enthusiasm and full capacity in performing tasks, especially the roles and responsibilities of leaders and executives. People's perception of their role in the NRD may vary from place to place and from time to time, making it difficult to mobilize resources from the people (Table 4).

To effectively implement this strategy, the authors would like to propose an implementation organization system as shown in Fig. 3.
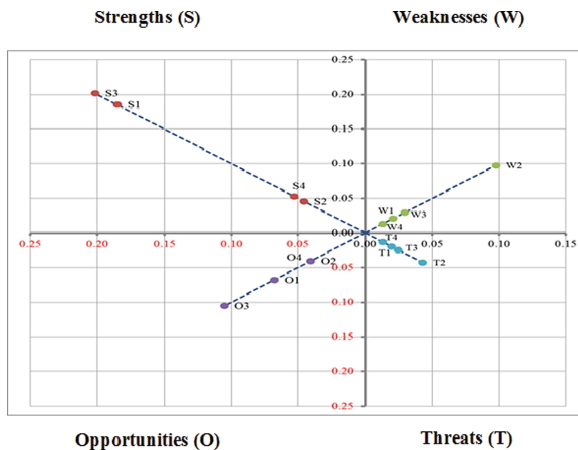

Fig. 2. Overall weight chart of factors.

Table 3. Random Index (RI) for the number of selection criteria.

n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
RI	0,00	0,00	0,58	0,90	1,12	1,24	1,32	1,41	1,45	1,49	1,51	1,54	1,56	1,57	1,59

Table 4. Final ranking calculation results of criteria in pairs based on priority.

| SWOT Group	SWOT Factors	Weights	SO	ST	WO	WT
Strengths	Weight S	0.48569				
	S1	0.38128	0.26612	0.35674	0.11349	0.26365
	S2	0.09422	0.44386	0.21047	0.08886	0.25681
	S3	0.41534	0.32231	0.14950	0.08476	0.44343
	S4	0.10915	0.35240	0.22785	0.07992	0.33983
	Calculation results		0.31562	0.24282	0.09557	0.34599
Weaknesses	Weight W	0.16035				
	W1	0.12839	0.34011	0.23328	0.24300	0.18360
	W2	0.60878	0.16010	0.16691	0.19351	0.47948
	W3	0.18278	0.11680	0.18561	0.15418	0.54341
	W4	0.08006	0.12594	0.26722	0.26849	0.33835
	Calculation results		0.17256	0.18688	0.19868	0.44188
Opportunities	Weight O	0.25447				
	O1	0.26639	0.36575	0.14151	0.14228	0.35046
	O2	0.15947	0.37340	0.20160	0.13019	0.29481
	O3	0.41392	0.39846	0.18946	0.10217	0.30992
	O4	0.16021	0.27538	0.21812	0.08859	0.41791
	Calculation results		0.36603	0.18321	0.11515	0.33561
Threats	Weight T	0.09949				
	T1	0.19362	0.18201	0.13181	0.13247	0.55371
	T2	0.43067	0.24454	0.36485	0.11855	0.27206
	T3	0.24437	0.14684	0.22317	0.14868	0.48131
	T4	0.13134	0.09646	0.13690	0.17784	0.58880
	Calculation results		0.18911	0.25517	0.13639	0.41933
Final ranking calculation results			0.29292	0.21991	0.12115	0.36602
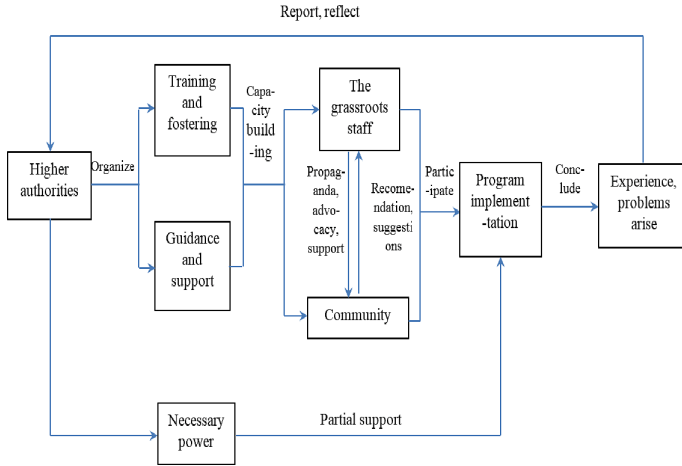
Fig. 3. Organizational system for implementing the proposed strategy.

4   Conclusion

In this paper, we have identified strategic factors that are important to the NRD process using a combination of SWOT and AHP methods. The analysis results show that: For the main group of criteria, Strength is rated the highest; For sub-criteria groups, the most important evaluated factors are: Unity, unity, and coordination in the whole political system (Strengths); some communes have not paid due attention to the implementation of NRD (Weaknesses); infrastructure is increasingly invested and perfected (Opportunities); The Covid-19 epidemic factor is still complicated (Threats). In addition, the study also proposes strategic options and through the results of calculation and ranking, the strategy of focusing on directing from the grassroots, mobilizing resources among the people is the most appreciated.

To improve the effectiveness of the program implementation in the coming period, not only the system of solutions proposed above but also pay attention to some very important solutions that need special attention such as: Improving staff capacity staff and community as a basis for implementing the proposed strategic plan; Interested in the development and application of science and technology; Pay attention to developing the program one product per commune and forms of production organization, supply chain linkage, and Ensure sustainable development in many aspects for accessing the program. However, the article has not yet analyzed more deeply the solutions that are integrated and diversified in many fields, so more detailed studies are needed to exploit and propose specific solutions for each problem. In addition, in this new period, there may be new guidelines, orientations, sets of criteria, implementation and application of digital transformation in NRD or the changing situation of the COVID-19 epidemic, etc. Therefore, studies will be needed to complete and better suit the actual situation.

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