

Full Length Research Paper

Multi-criteria SWOT-AHP analysis for the enhancement of agricultural extension services in Kano State, Nigeria

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The study analysed the strengths, weaknesses, opportunities and threats (SWOT) for the enhancement of agricultural extension services in Kano State, Nigeria. Agricultural extension officers (head of units and their deputies) were purposively selected for the study due to their responsibilities as administrators and planners. In this paper, the SWOT-AHP methodology was employed to assess and prioritize management strategies for the Kano State Agricultural and Rural Development Authority (KNARDA), as a means to facilitate efficient and effective extension services delivery to small scale farmers. Considering the mandate and management objectives of KNARDA, seventeen SWOT sub-factors were identified and used in rating four alternative management strategies. The major finding established that partnering with universities/research institutes to train and upgrade skills of extension agents (SO1) is the most important strategy, indicating that authorities must pay more attention to collaborative efforts given the limited budgetary support. It is recommended that KNARDA management authorities focus their attention on those four priorities from each TOWS group. Furthermore, prompt attention should be on the SO group to deploy the strengths and take adequate advantage of the opportunities identified.

Key words: Agricultural extension services, management, multi-criteria, SWOT-AHP analysis.

INTRODUCTION

The Kano State Agricultural and Rural Development Authority (KNARDA) was established as an Agricultural Development Project (ADP) following the observed success of the World Bank Financed enclave Agricultural Development Projects (ADPs) at Gombe, Funtua and Gusau in 1975. The KNARDA started as Kano State Agricultural Project (KNAP) in 1977 following a request by the State government to the Federal Department of Rural Development (FDRD) to provide the state with a

more coordinated approach to its rural development efforts. The Kano State Integrated Rural Development Project (KSIRD) was subsequently prepared by the then Agricultural Projects Monitoring, Evaluation and Planning Unit (APMEPU) of the Federal Ministry of Agriculture. Subsequently, an Agricultural Development Project (ADP) was created together along with the Kano State Agricultural Supply Company (KASCO) as its commercial subsidiary to improve the supply of agricultural inputs for

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technology adoption (KNARDA, 2018).

The project began full operation in January 1982, to be implemented over a period of five years (1982-1986). The objectives of the project at inception were to:

- (1) Increase the income of about 430,000 farm families cultivating 900,000 ha of Upland areas and 40,000 ha of Fadama land;
- (2) Enhance the living standard of rural dwellers by constructing 1,440 km of feeder roads, drilling 1000 boreholes and rehabilitating 1000 open wells; and
- (3) Strengthen state institution through the recruitment of qualified staff to assist in project execution, the improvement of Kano State's training capability and the provision of a management structure supported by adequate technical and administrative staff.

The KNARDA is headed by a Managing Director under the supervision of the Kano State Ministry of Agriculture and Natural Resources, whose primary aim is to revamp agriculture to boost food and cash crop production along with infrastructural and rural development. It is also responsible for Agricultural Extension Delivery to farmers in the state. The delivery of extension services to farmers came under critical review over questions of efficiency and competency of agricultural extension agents. As noted by Oakley and Garforth (1997), the whole extension process is dependent on the extension agents. According to Oladosu (2006), there are four roles of extension agents, namely process helpers, problem solvers, catalysts and resource linkers. However, a lot of criticisms have been levelled against public agricultural extension agents ranging from lack of professional and technical competencies, disproportionate extension agent to farm family ratio, ineffective services delivery and non-motivated extension agents resulting in the problems of low performance in extension service delivery. Unfortunately, development in the agricultural sector cannot be achieved without an efficient and effective extension service system. One important question that comes to mind is; are the extension agents who are responsible for the dissemination of innovations competent in performing their roles as agents of transformation? One needs to determine the degree of preparedness of extension agents, particularly over questions of their efficiency and competencies. These criticisms have been partly responsible for instigating the appraisal of the Kano State Agricultural and Rural Development Authority (KNARDA). Improvement in extension services delivery to farmers can be achieved by critically reviewing the current position of KNARDA in terms of efficiency and effectiveness of extension services delivery to the state. To this end, this study employs the combined SWOT-AHP methodology to assess the strengths, weaknesses, opportunities and threats with regards to management and prioritise the strategies to enhance the achievement of overall

objectives of KNARDA.

Multi-attribute evaluation method using the analytic hierarchy process (AHP)

SWOT-analysis

SWOT stands for strengths, weaknesses, opportunities and threats. SWOT analysis is a crucial brain-storming tool for decision-making, used to analyse an institution's internal and external environment (Kangas et al., 2003). Per Helms and Nixon (2010), SWOT analysis was described by Learned et al. (1969) and has since then grown to be one of the key tools for addressing complex strategic situations by reducing the number of data to enhance decision-making. SWOT analysis may be a simple yet useful planning tool to identify the 'Strengths', 'Weaknesses', 'Opportunities' and 'Threats' as a part of a strategic planning process. It is often employed when monitoring or evaluating a specific programme, service, product or industry and exploring measures for improvement (Harrison, 2002). Kotler (1994) explained that in the design process various factors influencing the operational environment are diagnosed in details. Helms and Nixon (2010) further noted that there is an agreement within the strategic management arena to the very fact that SWOT analysis provides the foundation for the realisation of the required alignment of organisational variables or issues.

The Analytic Hierarchy Process (AHP) is a comprehensive framework that is designed to accommodate the intuitive, rational, and also irrational aspects of decision making involving multi-objective, multi-criterion, and multi-actors, with or without certainty. The essential assumption is the functional independence of the groups (objectives and criteria) within the hierarchy, and therefore the items in each level of the criteria and alternatives (Lee and Kim, 2000). The AHP piggybacks on a precursory SWOT-analysis and its subsequent derivation of other strategic options by using the TOWS-matrix. It provides well structured, systematic decision analysis and support, incorporating both qualitative and quantitative attributes (Kurttila et al., 2000; Fiagbomeh, 2012). The AHP thus provides well structured, systematic decision making analysis and support, incorporating both qualitative and quantitative attributes. The AHP framework helps in analysing complex problems with all their relevant interrelations. Because of its usefulness in decision-analysis, the technique has been applied in cases dealing with strategic planning, including marketing applications and also within corporate strategy (Wind and Saaty, 1980; Wind, 1987). The technique has also been used in exploring the potential of agroforestry regimes (Suryanto et al., 2011), applied in forest certification (Kurttila et al., 2000), prioritization of strategies for protected area

management (Fiagbomeh and Bürger-Arndt, 2015) and exploring silvopasture adoption (Shrestha et al., 2004). Wrigley and Gould (2002), for instance, used SWOT to assess the necessity for recreation and ways to extend user participation in public park environment (Pukekura Park) in New Zealand, while the tool has also been used to recommend tourism development plans in Portugal (Ramos et al., 2000).

According to Saaty (1980), when applying the technique for decision making, a hierarchy of the problem or issue is constructed from which a matrix of pair-wise comparisons (Equation 1) is obtained. In a comparison matrix, the element a_{ij} is assumed to be equal to $1/a_{ji}$ so that when i is equal to j , then a_{ij} will also be equal to 1. The value of the weight w_i can also vary from 1 to 9, where 1/1 indicates equal importance while 9/1 then indicates extreme or absolute importance.

$$A = (a_{ij}) = \begin{bmatrix} 1 & w_1/w_2 & \dots & w_1/w_n \\ w_2/w_1 & 1 & \dots & w_2/w_n \\ \vdots & \vdots & \dots & \vdots \\ w_n/w_1 & w_n/w_2 & \dots & 1 \end{bmatrix} \quad (1)$$

During the pair-wise comparison of the decision factors by the decision-makers, some inconsistencies may occur. In a situation where A contains inconsistencies, the estimated priorities can be obtained using the matrix as shown in Equation 1 as the input for the eigenvalue technique expressed in Equation 2 (Saaty, 1980).

$$(A - \lambda_{max}I)q = 0 \quad (2)$$

In Equation 2, λ_{max} is the largest eigenfactor of matrix A of size n ; q is the correct eigenfactor, and I represents the identity matrix of size n . Saaty (1977) demonstrated that λ_{max} should be equal to n to satisfy the condition for consistency within the comparison of SWOT factors. Inconsistency may arise when λ_{max} deviates from n due to inconsistent pair-wise comparisons. It is therefore required that matrix A be tested for consistency using the consistency index CI in Equation 3 also derived by Saaty (1980).

$$CI = (\lambda_{max} - n)/(n - 1) \quad (3)$$

The CI estimates the extent of consistency for a comparison matrix. Since CI is dependent on n , a consistency ratio CR is calculated using Equation 4.

$$CR = CI / RI \quad (4)$$

The CI in Equation 4 is the consistency index; the RI represents the random index generated from a random matrix of order n , while CR is the consistency ratio. As a

general rule, for a matrix to be considered consistent, a $CR \leq 0.1$ or 10% should be maintained.

MATERIALS AND METHODS

Description of the study area

Kano State is situated in the Sudan Savannah agro-ecological zone of Nigeria except for its southern boundary where Guinea Savannah Vegetation dominates. The state lies between latitude $10^{\circ}3'$ to $12^{\circ}4'$ North and longitude $7^{\circ}4'$ to $9^{\circ}3'$ East, at an altitude of 472.45 m above sea level (Olofin and Tanko, 2002), with a total land area of about 42,592.8 km². The state has a population of about 9,401, 288 according to 2006 National Population Census (NPC, 2006). The annual growth rate was 3.34% and the projected population as at 2019 was 13,483,327 with proportion of 7,096,352 males and 6,386,974 females (Ahamed, 2014). The state is made up of 44 local government areas and classified into three administrative zones by the Kano State Agricultural and Rural Development Authority (KNARDA).

The state has two distinct climatic condition/seasons: the dry and wet seasons. The dry season spans the period between October/November to March/April, while the wet season spans the period between April/May and September/October, with an annual rainfall ranging between 787 and 960 mm and temperatures ranging between 15 and 33°C. Farming is the major occupation of the people who are predominantly of Hausa/Fulani ethnic origin. The major crops grown in the Kano State includes millet, sorghum, soybean, cowpea, maize, wheat, cotton, groundnut, rice, tomatoes, peppers, onion, garden egg, and sweet potato. Other agricultural activities carried out in the state are animal husbandry, fishery, processing and marketing of agricultural products.

Utilizing AHP in SWOT analysis

An analysis applying AHP in a SWOT framework permits a systematic evaluation of the SWOT factors and their relative intensities of importance to the objective of the decision and/or alternatives under consideration. The SWOT approach, in combination with the analytic hierarchy process, provides a quantitative measure of the importance of each factor considered in the decision-making (Saaty and Vargas, 2012). There are four steps involved in conducting a combined SWOT and AHP analysis. The steps are as follows: Step 1, perform the SWOT analysis; Step 2, conduct a pairwise comparison of the SWOT factors within every SWOT group; Step 3, Perform a pairwise comparison of the four SWOT groups (that is, Strengths group, Weaknesses group, Opportunities group, and the Threats group); and Step 4, involves strategy formulation and evaluation as outlined by Kurttila et al. (2000).

The strategic management assessment

The objective of the SWOT-AHP analysis of KNARDA is to identify and prioritize management strategies for the Kano State to facilitate the development and implementation of agricultural extension policies and technologies which seek to improve farming methods and management. The implementation of these management strategies is a prerequisite for increased agricultural production and productivity for food security and to enhance farm household income.

The proper execution of the management strategies and activities to achieve the authority's objectives is necessary to ensure that farmers are well informed and educated to adopt

improved farming technologies and practices to increase agricultural production in the Kano State.

The SWOT factors outlined in subsequently were derived from empirical data (interviews, discussions and surveys) collected during field studies. Some of the factors were confirmed through secondary sources and official documents of KNARDA. The SWOT factors listed are not exhaustive, however since there would be too many possible factors to analyse, the analysis was selective and concentrated on those factors that are critical in achieving the objectives of the Kano State Agricultural and Rural Development Authority. The factors under consideration are as follows and summarised in Table 1.

Strength factors

S1 - Highest number of extension agents: KNARDA has the highest number of agents on the pay role in Nigeria as compared to other states in the country. This means adhering to the recommended extension agent-farmers ratio of 1 to 1000. This enables it to have a large coverage of farmers.

S2 - Functional administrative zones: As a result of having a large area of coverage, KNARDA decentralized its activities by having three (3) administrative zones in addition to headquarters for easy implementation of its programme activities, that is, to minimize bureaucratic red tape.

S3 - Availability of office accommodation: There are office accommodations for all staff members as against prevalent conditions when compared with other states' ADPs for easy delivery of its services.

S4 - Highly mobile extension agents: KNARDA provides transportation facilities (motorcycles and vehicles, and some allowance for fuelling) which make it easier for the agents to move around to discharge their duties without any hindrance.

S5 - Averagely qualified extension agents: KNARDA, compared to agents in other ADPs, have averagely qualified personnel with one third possessing the Ordinary National Diploma in Agricultural, the minimum qualification required to be an extension agent.

S6 - Uplifting of women farmers income: The WIA train women farmers in additional income-generating ventures and value addition to increase income and improvement in livelihoods.

Weakness factors

W1 - Drifting of extension agents from crops to livestock production: KNARDA noted that as a result of the recently introduced disparity in term of salaries (remunerations) between those who have livestock production as a qualification against those who have crop production; agents are gearing to study livestock production at a higher level thereby putting aside crop production which caters for the needs of an overwhelming majority of the farmers.

W2 - Lack of trust among WIA agents thereby creating division: KNARDA noted an apparent lack of cordial relationship among women in agriculture agents based on the perception of favouritism which makes some of them feel side-lined thereby creating suspicion and divisions.

W3 - Lack of sponsorship for extension agents training: KNARDA notes that sponsorship for the training of its agents is usually not forthcoming; as such agents were only left with an

option of sponsoring their higher education using their salaries. This is what the agency refers to as the salary option.

W4 - Non-involvement of WIA coordinator in management meeting: KNARDA ascertained that WIA coordinator was not recognized as part of management and decisions concerning WIA agents were taken without their inputs which were not in line with standard procedure and best practice.

W5 - Retirements of extension agents in groups without sufficient replacement: KNARDA confirmed retirements of many agents without adequate replacements. This resulted in a huge gap in term of personnel needed at some points and that approval for recruitment by the government is done in large numbers and at the stipulated time set by the government.

Opportunity factors

O1 - Partnership with universities/research institutes: KNARDA recognized the importance of having linkages with universities and research institutes in terms of training assistance and other beneficial partnerships to the ADP.

O2 - Functional registered farmers associations: KNARDA recognized and ascertained the needs for establishing and registering farmer-cooperatives to attract partners by making sure that one of the cardinal requirements of the interventionist (government and NGOs) was met to reach out to large numbers of farmers by having a wider coverage and ease of extending innovations to farmers.

O3 - Partnership and collaboration with national and international NGOs thereby attracting funding: KNARDA has partnership arrangements with many national and international NGOs who assist the organization by funding some projects and programmes.

Threat factors

T1 - Inadequate funding by government which hinders the execution of projects: KNARDA noted inadequate funding by the government and often the budgeted amount is diverted for unexplained purposes other than execution of projects by the Ministry of Agriculture under which KNARDA as an agency is housed.

T2 - Duplication of programmes with Kano State Ministry of Agriculture: KNARDA noted some duplication of programmes by the Ministry of Agriculture which resulted in confusing its agents and farmers in general. Even though KNARDA has the mandate to execute the programme, it questions the Ministry's understanding of the difference in their mandate, job description and specification.

T3 - Non-consideration of staff hierarchy in appointment and promotions: KNARDA noted the apparent lack of consideration in term of appointment and promotions. It is deemed by the government to be a form of aggrandizement/privilege and not a right by making it to be a political appointment and fails to follow the guidelines. This often ends up in appointing the wrong people in positions. These infractions are often noticed during recruitments and promotions.

RESULTS AND DISCUSSION

After synthesising and analysing all the relevant data

Table 1. SWOT factors of Kano State Agricultural and Rural Development Authority.

| Factor | Positive | Negative |
|----------|---|---|
| Internal | Strengths: | Weaknesses |
| | S1. Highest number of Extension agents | W1. Drifting of extension agents from crops to livestock production |
| | S2. Functional administrative zones | W2. Lack of trust among WIA agents thereby creating division |
| | S3. Availability of office accommodation | W3. Lack of sponsorship for extension agents training |
| | S4. Highly mobile extension agents (transport) | W4. Non-involvement of WIA Coordinator in management meeting |
| | S5. Averagely qualified extension agents | W5. Retirements of extension agents in block without sufficient replacement |
| External | Opportunities | Threats |
| | O1. Linkages with Universities and research Institutes | T1. Inadequate funding by the government which hinder the execution of projects |
| | O2. Functional registered farmers associations | T2. Duplication of programmes with Kano State Ministry of Agriculture |
| | O3. Partnership and collaboration with National and International NGOs thereby attracting funding | T3. Non-consideration of staff hierarchy in appointment and promotions |

Table 2. Priorities of strength factors (CR = 5.9%).

| With respect to goal | S1 | S2 | S3 | S4 | S5 | S6 | Weights (%) | Rank |
|----------------------|-----|----|----|-----|-----|-----|-------------|------|
| S1 | 1 | 9 | 7 | 4 | 3 | 3 | 42.6 | 1 |
| S2 | 1/9 | 1 | 1 | 1/5 | 1/4 | 1/3 | 3.9 | 6 |
| S3 | 1/7 | 1 | 1 | 1/5 | 1/4 | 1/3 | 4.2 | 5 |
| S4 | 1/4 | 5 | 5 | 1 | 1/3 | 3 | 16.4 | 3 |
| S5 | 1/3 | 4 | 4 | 3 | 1 | 3 | 23.2 | 2 |
| S6 | 1/3 | 3 | 3 | 1/3 | 1/3 | 1 | 9.6 | 4 |

gathered, they were organised into four groups following the SWOT and TOWS matrices (Tables 1 and 7) and compared pair-wise. The pair-wise comparison matrices among the SWOT sub-factors are shown in Tables 2 to 5. The pair-wise comparison matrices and the priorities of the SWOT sub-factors were generated using the AHP Excel Template developed by Goepel (2013, 2018) and the Priority Estimation Tool (PriEsT), a decision-making tool for the analytic hierarchy process

(Siraj et al., 2015).

SWOT analysis of Kano Agricultural and Rural Development Authority

Table 1 presents an overview of the Strengths, Weaknesses, Opportunities and Threats of the Kano State Agricultural and Rural Development Authority (KNARDA). The ranking of the strength factors shows that S1 (0.426), S5 (0.232)

and S4 (0.164), at a consistency ratio CR = 5.9%, are the top three influencing factors among the six sub-factors considered (Table 2). Likewise, at a CR = 6.5%, the weakness sub-factors W1 (0.443), W5 (0.324) and W3 (0.116) are the most important weaknesses, with their associated factor weights (Table 3), that has the maximum potential to affect the achievement of the objectives of KNARDA. From the comparison weighting, opportunity factors were ranked O1 (0.474), O3 (0.376) and O2 (0.149)

Table 3. Priorities of weakness factors (CR = 6.5%).

| With respect to goal | W1 | W2 | W3 | W4 | W5 | Weights (%) | Rank |
|----------------------|-----|----|-----|-----|-----|-------------|------|
| W1 | 1 | 6 | 7 | 7 | 1 | 44.3 | 1 |
| W2 | 1/6 | 1 | 1/3 | 1/2 | 1/4 | 5.3 | 5 |
| W3 | 1/7 | 3 | 1 | 2 | 1/2 | 11.6 | 3 |
| W4 | 1/7 | 2 | 1/2 | 1 | 1/8 | 6.2 | 4 |
| W5 | 1 | 4 | 2 | 8 | 1 | 32.4 | 2 |

Table 4. Priorities of Opportunities factors (CR = 5.6%).

| With respect to goal | O1 | O2 | O3 | Weights (%) | Rank |
|----------------------|-----|----|-----|-------------|------|
| O1 | 1 | 4 | 1 | 47.4 | 1 |
| O2 | 1/4 | 1 | 1/2 | 14.9 | 3 |
| O3 | 1 | 2 | 1 | 37.6 | 2 |

Table 5. Priorities of Threat factors (CR = 5.6%).

| With respect to goal | T1 | T2 | T3 | Weights (%) | Rank |
|----------------------|-----|----|-----|-------------|------|
| T1 | 1 | 5 | 5 | 70.9 | 1 |
| T2 | 1/5 | 1 | 1/2 | 11.3 | 3 |
| T3 | 1/5 | 2 | 1 | 17.9 | 2 |

as first, second and third, respectively with a CR of 5.6% (Table 4). A pair-wise comparison of the threats factors at a consistency ratio of 0.056 ranked T1 (0.709), T3 (0.179) and T2 (0.260) as first, second and third threats, respectively (Table 5) that pose the most challenge to the operations of KNARDA. Also, ranking the most important strength (S1), weakness (W1), opportunity (O1) and threat (T1) revealed that inadequate funding by the government (T1) was ranked as the most important factor affecting operations of KNARDA. Further, linkage with universities and research institutes (O1), the highest number of extension agents (S1) and drifting of extension agents from crops to livestock production (W1) ranked second, third and fourth, respectively are the most notable influencing sub-factors shaping the overall operational outcomes.

Combined SWOT and TOWS strategies' analysis

The results of the proposed SWOT-TOWS management strategies for Kano State are shown in Table 7. The possible TOWS strategies attempt to overcome weaknesses to avoid the threats (W-T strategies). External threats could affect the operation of KNARDA on the account of the identified internal weaknesses. The weakness-opportunity strategy (W-O strategy) attempts to minimise the weaknesses and take advantage of the

identified opportunities. Institutions could identify opportunities but may have organisational weaknesses which may prevent them from taking advantage (Fiagbomeh, 2012). The S-T strategy is deployed to deal with identified threats. The aim is to maximise the strengths to fight against the threats, thus, using the strengths to mitigate the threats. The strengths-opportunities (S-O) strategies seek to depend on the strengths to benefit from the existing opportunities. Ultimately, successful institutions, even if they temporarily use one of the three previously mentioned strategies, will attempt to get into such a situation of using S-O strategies (Weihrich, 1982). Thus if they have weaknesses, they will strive to overcome, by turning them into strengths. If they face threats, they will cope with them so that they can focus on the opportunities (Fiagbomeh, 2012).

A pair-wise comparison of the twelve TOWS strategies developed indicated that SO1, WO2, ST1 and WT1 are the key management strategies to focus on for the achievement of the operational objectives of KNARDA (Tables 7 and 8). The ranking of the TOWS strategies is shown in Table 8 and Figure 1. The weighted priority of the TOWS strategies ranks the S-O strategies as: SO1, SO3 and SO2 as 1st, 2nd and 3rd, respectively with CR = 5.6% (Table 6). A pair-wise comparison at CR = 1.0% of the S-T strategies ranked the sub-factors from most to least important as follows: ST1, ST2 and ST3, respectively

Table 6. Ranking of TOWS (S-O, S-T, W-O, and W-T) strategies.

| With respect to goal | Ranking S-O strategies (CR = 5.6%) | | | | |
|----------------------|------------------------------------|-----|-----|-------------|------|
| | SO1 | SO2 | SO3 | Weights (%) | Rank |
| SO1 | 1 | 2 | 1 | 41.3 | 1 |
| SO2 | 1/2 | 1 | 1 | 26.0 | 3 |
| SO3 | 1 | 1 | 1 | 32.7 | 2 |
| | Ranking S-T strategies (CR = 1.0%) | | | | |
| | ST1 | ST2 | ST3 | Weights (%) | Rank |
| ST1 | 1 | 2 | 3 | 54.0 | 1 |
| ST2 | 1/2 | 1 | 2 | 29.7 | 2 |
| ST3 | 1/3 | 1/2 | 1 | 16.3 | 3 |
| | Ranking W-O strategies (CR = 1.9%) | | | | |
| | WO1 | WO2 | WO3 | Weights (%) | Rank |
| WO1 | 1 | 1/4 | 1/3 | 12.2 | 3 |
| WO2 | 4 | 1 | 2 | 55.8 | 1 |
| WO3 | 3 | 1/2 | 1 | 32.0 | 2 |
| | Ranking W-T strategies (CR = 1.9%) | | | | |
| | WT1 | WT2 | WT3 | Weights (%) | Rank |
| WT1 | 1 | 2 | 3 | 55.0 | 1 |
| WT2 | 1/2 | 1 | 1 | 24.0 | 2 |
| WT3 | 1/3 | 1 | 1 | 21.0 | 3 |

(Table 6). The W-O strategies were ranked, at CR = 1.9%, from most to least important as: WO2, WO3 and WO1 (Table 6). Likewise, the WT group was ranked WT1, WT2 and WT3 as first, second and third, respectively (Table 8 and Figure 1).

Prioritisation of the TOWS groups indicated that the SO group, with a priority weight of 0.522, is the most important set of strategies, followed by WO (0.182), ST (0.159) and WT (0.137), respectively (Table 8). These rankings are important because it emphasizes the set of strategies that could make the most impact, considering a situation of working in the framework of limited resources.

Further, the priority weights of the TOWS groups were applied to the sub-factors to generate the overall priority of the sub-factors. After the weighting process, SO1 (0.216) emerged as the topmost TOWS strategy (Table 8 and Figure 2), at a TOWS groups comparison consistency ratio of 3.5%. The comparison ranked WO2 (0.102), ST1 (0.086), and WT1 (0.075) as second, third and fourth, respectively with their associated priority weights in parenthesis.

Management and operational strategies evaluation

This evaluative study has been able to determine the priority ranks of all the SWOT factors taking into account

the priority weights applied to the factors after the pairwise comparison. The study has been able to identify the strategic factors that need to be given the utmost attention first but not to neglect other factors in the decision-making process to facilitate the operations and to achieve set operational and management objectives.

Overall, liaising with research and training institutions (SO1) was deemed the most important strategy for the operations of the KNARDA. Considering that the KNARDA has the highest number of employed extension agents but with only average qualifications as extension agents. Training to upgrade the skills and knowledge capabilities of the agricultural agents would ensure that the agents can provide the necessary technological knowledge to farmers within their operational areas. Furthermore, considering that the KNARDA is inadequately funded by the government which hinders the execution of projects, it becomes appropriate to take every advantage of partnerships with NGOs and research institutions (WO2) to offer training to the extension agents at reduced costs. From the S-T strategy, it is imperative to harmonise and streamline the functions and duties of KNARDA to avoid duplication of programmes with the State Ministry of Agriculture. Duplication of programmes and activities by stakeholders in agriculture would hamper progress and to a large extent, amount to a waste of scarce resources. Finally, the most important W-T

Table 7. Combined SWOT and TOWS strategies concerning KNARDA Management in Kano State.

| Strength | Weakness |
|---|--|
| <ol style="list-style-type: none"> 1. Highest number of extension agents 2. Functional administrative zones 3. Available office accommodation 4. Highly mobile extension agents 5. Averagely qualified extension agents 6. Uplifting of women farmers income | <ol style="list-style-type: none"> 1. Drifting of extension agents from crops to livestock production 2. Lack of trust among WIA agents thereby creating division 3. Lack of sponsorship for extension agents training 4. Non-involvement of WIA Coordinator in management meetings 5. Retirements of extension agents in groups without sufficient replacement |
| <p>Opportunities</p> <ol style="list-style-type: none"> 1-Linkages with Universities and research institutes 2-Functional registered farmers associations 3. Partnership and collaboration with National and International NGO's thereby attracting funding | <p>Threats</p> <ol style="list-style-type: none"> 1-Inadequate funding by the government hinder the execution of projects 2-Duplication of programmes with Kano State Ministry of Agriculture 3-Violation of staff hierarchy in appointments and promotions |
| <p>S-O Strategies</p> <p>SO1-Liaise with Universities/ research institutes to train and upgrade skills of extension agents</p> <p>SO2-Collaboration between NGOs, Universities and research institutes to train WIA agents for the uplifting women farmers income Generation activities</p> <p>SO3-Utilization of manpower and infrastructure to strengthen farmers organization</p> | |
| <p>W-O Strategies</p> <p>WO1-Harmonization and proper documentation of job designation of extension agents</p> <p>WO2-Explore the partnership between the Universities, research institutes and NGOs to reduce training cost thereby increasing the number of trained extension agents</p> <p>WO3-Provision of regular (fortnightly, MTRM and QTRM) training to improve succession among extension agents</p> | |
| <p>S-T Strategies</p> <p>ST1-Harmonize and streamline functions and duties of KNARDA to avoid duplication of programmes with the State Ministry of Agriculture</p> <p>ST2-Utilization of human and infrastructural resources available to attract funding from external sources</p> <p>ST3- Ensure to abide by the civil service rules by adhering to staff hierarchy in appointments.</p> | |
| <p>W-T Strategies</p> <p>WT1-Strict adherence to appointments and promotion guidelines for extension agents</p> <p>WT2-Conformity with job description and specification by all</p> <p>WT3-Elicit cooperation and improve the involvement of WIA in management decisions and strategies</p> | |

strategy is strict adherence to appointment and promotion guidelines for extension agents. Violation

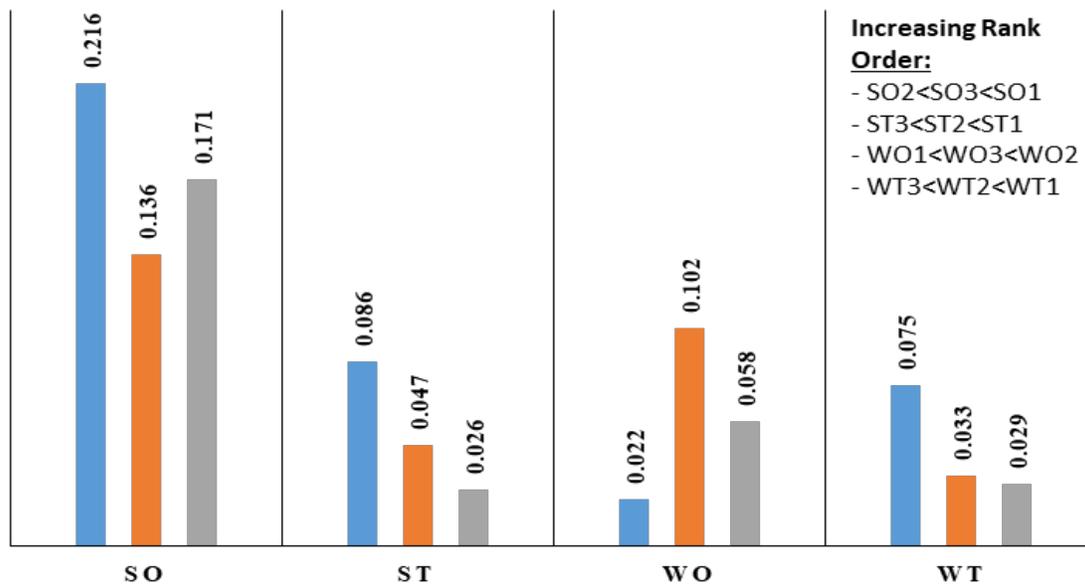
of staff hierarchy in appointments and promotion can potentially threaten the implementation of set

programmes and consequently affect the achievement of operational objectives. This strategy

Table 8. Priorities and consistency ratios^a of SWOT/TOWS groups and factors.

| TOWS Group | ^a Priority of the TOWS group | ^b TOWS factors | Consistency ratio (CR, %) | Priority of factor within the group | ^c Overall priority of factor |
|------------|---|---------------------------|---------------------------|-------------------------------------|---|
| SO | 0.522 | SO1 | 5.6 | 0.413 | 0.216 |
| | | SO2 | | 0.260 | 0.136 |
| | | SO3 | | 0.327 | 0.171 |
| ST | 0.159 | ST1 | 1.0 | 0.540 | 0.086 |
| | | ST2 | | 0.297 | 0.047 |
| | | ST3 | | 0.163 | 0.026 |
| WO | 0.182 | WO1 | 1.9 | 0.122 | 0.022 |
| | | WO2 | | 0.558 | 0.102 |
| | | WO3 | | 0.320 | 0.058 |
| WT | 0.137 | WT1 | 1.9 | 0.550 | 0.075 |
| | | WT2 | | 0.240 | 0.033 |
| | | WT3 | | 0.210 | 0.029 |

^aThe consistency ratio of the comparison between four TOWS groups was 3.5%. ^bThe definitions of the factors are presented in Table 7. ^cThe overall priority of the strategy factor is simply computed by multiplying the priority of the factor within the group by the priority of the group. The largest weights with respect to each TOWS group are highlighted.

**Figure 1.** The overall priority weights rank order of the TOWS groups sub-factors.

could help address the issue of agricultural agents from crops to livestock production.

Overall, implementation of the strategies will go a long way to facilitate the achievement of the objectives that have been set for the Kano State Agricultural and Rural Development Authority (KNARDA) leading to an increase in farmers' production and their standard of living.

Conclusion

The SWOT-AHP techniques have been applied in several fields including hospitality, engineering and resource management. Using these techniques, the identified SWOT groups and sub-factors were prioritized to determine which factors of SWOT deserve premium

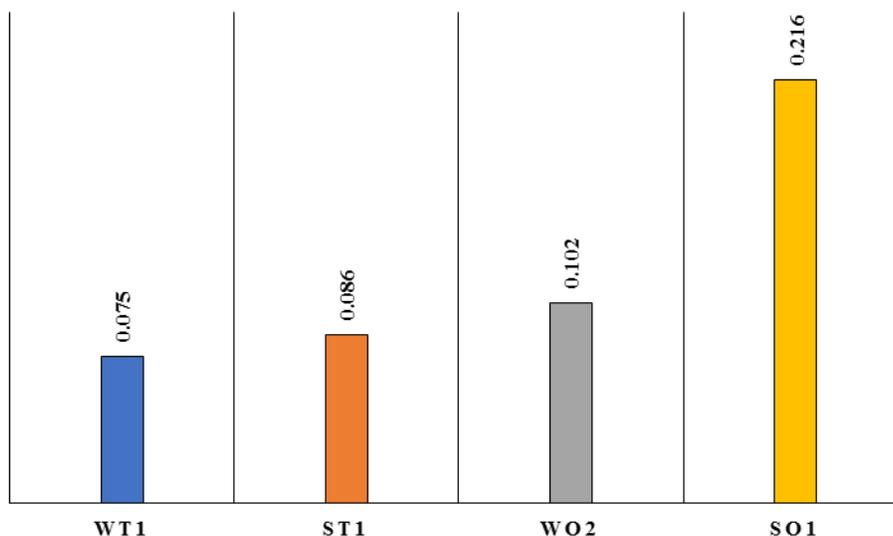


Figure 2. Priorities of the TOWS strategies for management.

attention, but also making sure not to neglect the other factors in the decision-making and implementation process. The SWOT-AHP analysis can determine both priorities of SWOT factors and the strategic management focus for the KNARDA. The technique also presents the opportunity to determine the effect of any change in the importance of main factors and sub-factors on which alternative strategy should be given the highest priority.

Agricultural extension services are not just an option but a necessity to improve agricultural technology transfer and improvement of farming practices, in an attempt to increase yields and generate adequate income for farm households.

The present analysis of KNARDA provides an illustrative reference for the management strategy evaluation of agricultural extension service agencies in Nigeria. This model would be beneficial for evaluating any other extension service operations and also provide a basis for comparing agencies for their extension service strategies in the country. The selection of various SWOT factors depends on the Agricultural Authority, and the profile of both material and human resources at their disposal. It should be noted that the qualitative analysis of these factors and strategies is highly subjective and may differ from one expert to another. This analysis concludes that among the TOWS sub-factors, SO1: Liaising with universities/research institutes to train and upgrade skills of extension agents turned out to be the most important strategy followed by 'WO2: Explore the partnership between the universities, research institutes and NGOs to reduce training cost thereby increasing the number of trained extension agents'. The strategy ST1: Harmonize and streamline functions and duties of KNARDA to avoid duplication of programmes with the State Ministry of Agriculture was found to be the most

important to address duplication of programmes and thereby maximising the use of scarce resources. Given the relative closeness in the ranking weights of the strategies in Figure 2, it is recommended that the KNARDA management authorities focus their attention on those top four strategies from each TOWS group. Furthermore, prompt attention should generally be on the SO group to deploy the strengths and take adequate advantage of the opportunities identified. That notwithstanding, they must also pursue the other strategies for comprehensive management that would be beneficial to the extension agents and the farmers as a whole.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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