Actualization Of Agricultural Extension in West Nusa Tenggara, Indonesia: Actor Collaboration Based on Triple Helix

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Abstract

Organizing agricultural extension services to support farmers is crucial for developing the agricultural sector in West Nusa Tenggara (NTB) Province. Agricultural extension cannot operate optimally without the actualization of stakeholder collaboration among the involved actors. This research aims to describe the implementation of agricultural extension in NTB by analyzing the involvement of actors using the concept of triple helix collaboration between the government, academics, and business actors. The data was analyzed using a logic model to describe the situation of implementing extensions, combined with a multi-actor analysis of agricultural sector stakeholders using MACTOR (Matrix of Alliances and Conflicts: Tactics, Objectives, and Recommendations). The description of agricultural extension implementation shows that the major issue is increasing the production of agricultural commodities. The main providers of extension policies are the government, universities through assistance in rural empowerment communities, and business actors in the private sector, while extension services to farmers are facilitated by farmer groups in the region. Multi-actor analysis shows that agricultural extension centers play the most active role, and farmers have the highest level of interest in the implementation of agricultural extension. The research findings relate to the implementation of triple helix-based extension, namely forming a consensus space. Dominant actors must play an active role in realizing the priority goals of agricultural extension through synergy in designing planning, communication patterns, and coordinating rural community assistance activities. The impact of this collaboration will be to address the obstacles to implementing counseling in NTB.

Keywords: Agricultural Extension, Actor, Actualization of Collaboration.

1. Introduction

Development of the agricultural sector through the delivery of rural extension services in developing countries seeks to increase production, which has an impact on farmers' welfare while still paying attention to nature conservation and strengthening the intensification of sustainable

small-scale agricultural systems in Indonesia. 5,48,61,64,75 Extension as an agricultural development effort aims to increase farming knowledge, which helps in increasing crop production through coaching and mentoring activities for farmer groups as well as accelerating the diffusion of relevant technological policies. 12,13,79. Improving farmers' welfare includes the technology transfer process. Various functions, including policy management, business capital, research and development, extension, and research functions can be provided by extension officers, farmers, universities, and the private sector by transferring knowledge and technology to the community.14,40,55

Stakeholder interactions as groups or individuals impact the policies made by the government or government agencies towards groups or organizations, users of local natural resources, and networking between actors as an issue to encourage the success of intergovernmental cooperation policies in the context of network implementation.8, 23,36 The triple helix theory provides a general paradigm, analytical framework, and method for studying the relationships between innovation actors at the system level.17,71 The development of the triple helix framework outlines a trilateral network consisting of academia, industry, and government, which has an important role and contributes to socio-economic progress in agricultural areas. 4,18,19,29,49 The main goal of development is collaboration among stakeholders through extension as a transfer of knowledge and innovation for economic growth and social transformation.37,42,67

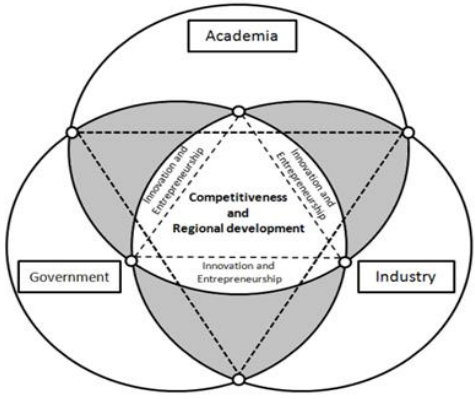

Figure I. Triple-hhelix triangulation model

Source: (Farinha & Ferreira, 2013)29

The triple helix interaction pattern, with more strategic contributions from actors actively participating in the implementation of social functions, facilitates consensus and the formation of commitment that leads to certain initiatives.17,35,47 This concept has become a reality and is used by various organizations, from local governments to international institutions, as a framework to encourage collaborative interactions.16 Therefore, it seems appropriate to apply the triple helix perspective to developing countries, which aim to develop a more knowledge-

based economy in meeting society's needs, encouraging the need to consider other stakeholder entities in development.30,41,46

West Nusa Tenggara (NTB) is known as Bumi Gora, where agriculture remains the leading development sector, contributing more than one-fifth of the gross regional domestic product (GRDP). The agricultural sector's contribution of 22.8% is the largest compared to other sectors in NTB (Central Bureau of Statistics NTB, 2022). The vision and mission are stated in the NTB Regional Medium Term Development Plan for 2018-2023, namely Building a Glorious West Nusa Tenggara, as stated in Mission V, "NTB is Fairly Prosperous and Independent" through overcoming poverty, reducing disparities, and inclusive economic growth based on agriculture as one of the main sectors.

Productivity will influence on-farm activities, and the effects from upstream and downstream agricultural sectors can have important feedback effects on agricultural producers.20 The overlapping entity and role system modeling approach emerges as a solution for accommodating complex problems with stakeholder involvement methods. Therefore, recent developments propose a technique called stakeholder analysis in sustainable food system economics, emphasizing and including the various actors who play a role in food production, processing, distribution, and consumption.10,32

Agricultural development is important in the NTB region. Extension as a bridge to agricultural development is hampered by a limited number of extension workers. From 2022, number of extension workers (PPL) in NTB Province will be 1.917 people, consisting of 787 civil servant, 68 PPPK, and 10 THL-TBPP as non-civil servant workers with 26.686 number of farmer groups in NTB Province. The ideal number of personnel in the practice system is such that each agricultural worker conducts coaching by visiting the target groups in their work area 16 times with each PPL serves 300 families in village area (Agriculture and Plantation Training Center, 2022). Indonesia Law Number 16/2006 concerning Extension Systems, Agriculture, Fisheries, and Forestry requires community participation in the process of disseminating information. Multi-actor governance allows for better adaptation to local community conditions and enhances the role and tasks of the agricultural consultation system.11,43,53

The implementation of triple helix-based agricultural extension is a model that is analytical, normative, theoretical, practical, and relevant to policy. It describes the role of actors and the involvement of each helix in development consistently to meet the changing needs and patterns of network actors.14,26,34,80 This concept examines the actualization of the role of stakeholders in the development of extension services, particularly focusing on the expected role of each stakeholder. It leads to a pattern of agricultural stakeholder relations and a commitment to resource utilization.24,89,62,69,73

The limitations of extension services in providing and disseminating information, normatively as a connecting bridge are restricted to technical services of a sectoral nature under the main duties of the government. This causes farmers to feel that extension services are not yet optimal.24,74 The research contribution describes integrative stakeholder involvement as the core objective of an organization, which is to create maximum value for its stakeholders through the implementation of agricultural extension.33,50 The aim of this research is to describe the

performance of agricultural extension in NTB and analyze actor involvement in agricultural extension using the concept of collaborative cooperation between the government, universities, and business actors. These entities work together to support extension services to achieve agricultural development goals, especially in NTB.

2. Methods

Scope

This research will be carried out in West Nusa Tenggara Province, Indonesia, which is located between 115°46' to 119°5'E and 8°10' to 9°5'S, from January to April 2024. This research is limited to the implementation of agricultural extension by government officers, universities, and business participants, analyzed from the perspective of the role of stakeholders as agricultural development actors.

Data Collection and Analysis

Primary data was obtained through interviews with 15 key informants and direct observation of research objects as sources for collecting research data.22,72 Secondary data was obtained through document studies, including strategic plans and extension programs, performance reports, and available documents regarding business activities related to extension performance in empowering farmers in NTB in 2023. This research describes the empirical reality of collaborative actor involvement in extension performance, maps actors based on their interests and influence, and investigates the relationship between the roles of actor collaboration in supporting the implementation of extension in NTB.

The collaboration of triple-helix actors who play a role in agricultural extension is analyzed using logic model analysis, which describes the situation of implementing extension, input, output, and outcome for each stakeholder as the implementation of a program or policy. This method can be used as a tool to build evaluation designs that are relevant for agricultural development in NTB. 6,33,68 Stakeholder interaction in the triple helix model uses multi-actor analysis developed by Michel Godet, which emphasizes actor perspectives and interests as well as patterns of connection between all system actors. This approach aims to identify the influence and interests of actors that tend to be coherent and to understand the effects of actor actions on key factors in the development of a system.9,15

Multi-actor analysis uses MACTOR (Matrix of Alliances and Conflicts: Tactics, Objectives, and Recommendations) to analyze the relative strength between actors or stakeholders and actor convergence in achieving goals.25,39,66 The stages are: (1) determining system actors; (2) determining a set of goals; (3) describing the actor's power relationship as measured on a scale of 0 (no influence) to 4 (very high influence); (4) describing the actor's attitude (level of resistance) towards the goal as measured on a scale of (+) supporting, (0) neutral, and (-) opposing; and (5) describing the importance of the goal for the actor as measured on a scale of 0 (not important) to 4 (very important).44,66, The actor categorization is divided into four categories: key players, context setters, subjects, and crowds, in a 2x2 matrix.

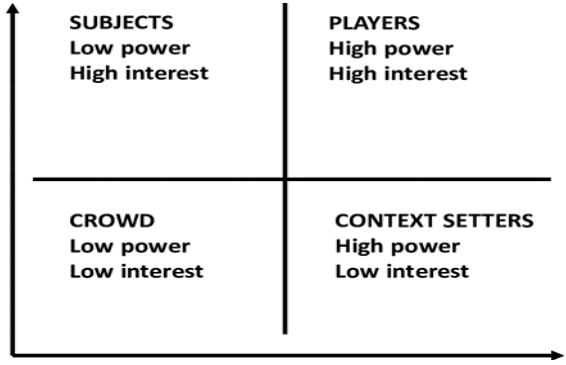

Figure 2. Actor influence-interest matrix.

Source: (Ackermann & Eden, 2011)1

3. Results and Discussion

Implementation of Agricultural Extension in NTB Province

Since the implementation of regional autonomy and decentralization, the implementation of agricultural extension in NTB, which concerns aspects of planning, institutions, personnel, programs, management, and financing, has become the mandatory authority and responsibility of the district or city government. A description of the implementation of extension based on logical aspects and strategic issues of synergistic agricultural development in NTB is as follows:

Table 1. Analysis of Issues in Implementing Agricultural Extension in NTB Province

Condition	Problem	Purpose	Achievement of Goals
Productivity of food crops; Paddy; 53.99 ku/Ha Corn; 63 ku/Ha Soya bean; 12.2 ku/Ha	Still low production; application of location-specific integrated cultivation technology; occurrence of pest disturbances.	Increase productivity by: Paddy: 54.65 ku/ha Corn: 70.31 ku/ha Soybean: 14.44 ku/ha	Assistance with technology demonstrations, dissemination of extension materials, and empowerment of farmer institutions.
The farmer group consists of 12.215 beginner classes, 9.757 advanced classes, 1.088 intermediate classes, 60 main classes, and 1.756 that have not been assessed.	Management and administration of farmer groups.	Increasing the capability of farmer groups.	This includes assistance with procedures for preparing farmer group administration in the form of activity reports and regular group class assessments.
Agricultural Extension Center (BPP) as Agricultural Strategic Command (Kostratani)	BPP's role as Agricultural Strategic Command (Kostratani)	Increasing the Capacity of BPP as an Agricultural Strategic Command (Kostratani)	Increasing the Capacity of the Agricultural Extension Implementation Center as an Agricultural Development Post
The cultivation, processing, and marketing of crop products do not meet quality standards	Plant cultivation and post-harvest handling have not been implemented according to quality standards	Increase the capacity of agricultural instructors in the implementation of cultivation, processing, and marketing of crop products	Socialize agricultural extension policies and information on agricultural development programs through cross-sectoral coordination forums and agricultural extension

		according to quality standards	commission forums in districts and cities.
Utilization of yard land by the Women Farmers Group (KWT)	Sustainable Food Yard (P2L) activities have not been implemented optimally	Maximize the function of yard land through P2L program activities	Increase the use of yard land through the Sustainable Food Yard program.
Optimizing the Role of Extension Workers	The role of extension institutions and the capacity of extension workers to help farmers and business actors implement integrated agricultural technology	Strengthen the role of extension institutions and PKS as the spearhead of organizing extension activities at the farmer level	Increase the capacity of extension agents and agricultural extension officers through training

West Nusa Tenggara Province is quite reliable as a production area for agricultural commodities and has received assignments to increase national production. This aligns with the target stated in the Strategic Plan of the NTB Provincial Agriculture and Plantation Service, which aims for an increase in regional agricultural production by an average of 0,35% per year with a base figure in 2020, or an increase in production of 1,05% by 2023 for all strategic agricultural commodities. Interestingly, there has been a decrease in the percentage or portion of the population working in the agricultural sector from 45,29% to 29,69%. The average monthly net income from the agricultural sector is IDR 952.555, the lowest compared to the industrial sector at IDR 1.446.486 and the services sector at IDR 1.465.460 in West Nusa Tenggara Province.21 The role of extension organizations in policy making, technology use, and information dissemination influences service decision-making that contributes to social, economic, and cultural development in areas of explicit involvement as part of the extension network.14,63,77

To achieve these production targets, the production achievement scenarios encompass the entire process from pre-production, cultivation, and post-harvest. Pre-production support for cultivation is essential to supporting production achievements. Pre-production support includes the provision of agricultural production infrastructure, such as land, agricultural tools, and machinery. Cultivation support comes in the form of seeds, fertilizers, and other necessary inputs. Furthermore, after cultivation, support is also needed in the harvest and post-harvest process, which can include assistance with harvesting and post-harvest tools and machinery as well as processing agricultural products. Collaboration with stakeholders is one of the efforts to disseminate technology and knowledge so that it can be optimally utilized by users and influence policies made by the government or government institutions towards groups or organizations that are users of local natural resources.8,23,27,36

Table 2. Logical Aspects: Strategic Roles and Interactions Between Stakeholders in the Implementation of Extensions

Sub system	Stakeholders	Strategic Role	Interaction between stakeholders
Inputs	NTB Provincial Agriculture and Plantation Department	Coordination and synchronization of extension programs between central and regional governments, as well as other service providers, are essential for effective collaboration	Regulators who produce policies for implementing extension services and facilitate the intermediation of farming institutions. They also act as facilitators of cooperation in agricultural development
	BSIP NTB Province (Ex. BPTP)	Based on Minister of Agriculture Regulation No. 11 of 2019, the main tasks are to carry out the study, assembly, development, and	Engineering collaboration and technology trials, internships, and fieldwork practices, as well as assembling extension materials and

		dissemination of location-specific appropriate agricultural technology.	disseminating the results of assessments of location-specific appropriate agricultural technology, are used by extension agents.
	University	Improving the quality of human resources and knowledge, as well as the actors involved in socio-economic development, is part of the tri-dharma function. This includes driving new technology and transferring knowledge to society	It is hoped that the results of research by university academics will serve as education, provide a means of service, offer solutions to government problems in determining policies and regulations, and foster cooperation with the community and business actors.
	Processing Industry Participants	A business sector with a profit orientation carries out social responsibility in rural areas and markets its products by integrating cooperation programs that involve agents in agricultural extension services to rural communities	Obligated to contribute to creating a favorable business climate by creating market opportunities, committing to corporate social responsibility (CSR), and partnering with the government to support economic growth.
Process	Field Agricultural Extension Officer	An agent implementing development programs and policies acts as a liaison through efforts to transfer agricultural technology innovations to farmers in the form of non-formal education.	Empowerment of farmers and their families, along with the agribusiness community, and acting as a liaison in accessing government policies, market information, technology, capital, and other resources.
	Agricultural Extension Technical Implementation Center	The Technical Implementation Unit of the Agricultural Service functions as the basic administrative unit (satminkal) for extension workers, playing a role in coordinating, synergizing, and harmonizing agricultural development activities within their working area.	Efforts to facilitate institutional development and partnerships between key actors and business actors include increasing the capacity of extension workers and carrying out the learning process through piloting and developing business models in collaboration with relevant stakeholders
	Researcher/Extension Officer BSIP NTB Province	Assess the application of technological innovations according to specific locations and institutions to address problems faced by agricultural communities in production	Integration of collaboration with relevant stakeholders in assisting, monitoring, and evaluating technology development, with extension agents serving as a bridge to farmers
	Private sectors	Provider of agricultural production facilities and establishing a product marketing network	Collaboration in market information services to support each other and synergize in advancing agricultural businesses, aiming to increase efficiency, improve the quality of cultivated products, and enhance competitiveness.
Outputs	Government	Reporting serves as a control mechanism for the implementation of extension activities related to changes in knowledge, attitudes, and skills, as well as farmer participation	Trial assistance programs, including demonstration plots and demonstration areas, are funded by central and regional budgets and CSR funds
	Farmers	Recipients and users of extension services benefit from improvements in knowledge, skills, and attitudes related to farming	This strengthens the capacity of farmers to manage their farming operations independently

Outcomes	Farmers Group	A multi-stakeholder dialogue forum for planning and extension activities according to the needs of rural communities	This includes the growth and development of farmer economic institutions as well as increasing the capabilities of group classes
	Rural farmer	The dissemination of educational information to rural communities involves strengthening the abilities of assisted farmers in community farming and increasing farmer awareness of applying technology according to recommendations	This aims to improve farming practices, enhance business operations, and increase welfare by collaborating with other actors.

In general, the major issues in implementing agricultural extension in NTB Province are increasing production, strengthening institutions, and increasing the capacity of agricultural instructors so that farmers with limited land can try to increase their production.2,60 As shown in Table 2, the main provider of extension services is the government, while extension services to farmers are facilitated by farmer groups in the region. However, these services are limited due to financial reasons. Extension services provided by the private sector are mostly related to the marketing of company products, such as fertilizers, seeds, machinery, and chemicals.

Stakeholder support for the implementation of good extension services depends on the local government's consistency in the extension system, which bridges farmers and innovation and encourages farmers to change their behavior and solve their problems.38 Development in the fields of food technology, agro-industry, biosystems, market chain studies, technology, and marketing institutions carried out by the University of Mataram includes a holistic program of village development and empowerment, mangosteen garden digitization activities, as well as real-work lecture activities focusing on the development of natural resource potential based on regional potential in NTB. Extension assistance through stakeholder collaboration certainly has an impact on strengthening farmers' capacity as a form of empowering village communities by increasing production.11,55

Stakeholder mapping in the implementation of agricultural extension

Agricultural extension is a dynamic process and has developed into several relevant roles that can provide biodiversity benefits.5,52 Collaboration with stakeholders is one of the efforts to disseminate technology and knowledge so that users can utilize them optimally. Similarly, the NTB Agricultural Technology Assessment Center, an institution that produces technology in the agricultural sector, requires good cooperation to effectively market the agricultural technology it produces. Stakeholder theory states that the core goal of an organization is to create maximum value for its stakeholders.50,

Table 3. Direct and indirect influences between actors

MDII	Dep.Agr	BSIP	Researcher	PPL	Univ./PT	Trader	Industry	Distributo	Retailer	UPT BPPP	Farmers	Ii
Dep.Agr	22	16	17	20	14	13	14	14	12	18	24	162
BSIP	18	15	15	14	14	14	11	12	10	16	16	140
Researcher	17	16	16	15	14	14	10	11	10	16	16	139
PPL	19	14	16	21	10	16	15	16	14	18	23	161
Univ./PT	16	16	18	16	14	12	13	14	13	14	18	150
Trader	18	13	16	18	15	22	18	18	16	15	21	168
Industry	15	11	15	17	14	19	18	18	16	13	20	158
Distributo	17	12	16	19	14	18	18	19	16	16	22	168
Retailer	16	12	16	17	14	19	17	17	15	14	20	162
UPT BPPP	22	16	19	22	15	15	15	16	13	18	26	179
Farmers	16	14	16	17	12	12	15	16	13	16	18	147
Di	174	140	164	175	136	152	146	152	133	156	206	1734

Based on Table 3, according to Godet's (1991) rules, it is known that actors who have direct and indirect influence have the highest value.25,66 The actor with the greatest influence on other actors is the UPT Agricultural Extension Center (Ii = 179), while farmers have the greatest dependence on other actors (Di = 206). This involves determining their own interests through in-depth consideration of the power and interests of stakeholders in influencing the direction of the organization, developing stakeholder management strategies, and determining how and when it is the right time to do it.1,54,59

Broadly speaking, there are three indicators for analyzing the role of actors in development: (1) Actor involvement: identifying who the actual stakeholders are in each situation. (2) Interest and influence: exploring the impact of stakeholder dynamics, recognizing the diversity and interdependence of interactions between stakeholders, and understanding that access to means and influencing the behavior of other entities is variable, with discrete and continuous features. (3) Relationships and roles: describing the form of intervention to change or develop the basic interests of individual stakeholders. The actor mapping is shown in the following image:

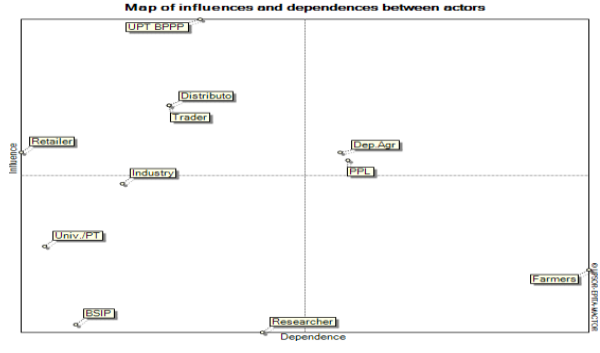

Figure 3. Mapping of stakeholder influence and interests in organizing extension

The UPT Agricultural Extension Implementation Center, as the technical manager for the implementation of sub-district-level extension, is an actor classified as a context setter in agricultural extension within the extension work area. This actor has the power to influence other actors, but its dependence is low. Farmers are actors who have a high interest in the implementation of agricultural extension but do not have influence in organizing these activities. Farmers need agricultural extension services aimed at forming an interrelated business system from upstream sub-systems, farming sub-systems (off-farm), and downstream sub-systems (on-farm). The goal of the extension is to provide motivation and assistance to the community regarding the correct procedures for managing agricultural land to increase farmers' income and enhance the competitiveness of their produce in domestic and global markets.7,28

Table 4. Position of Each Actor for Each Goal of Organizing Extension

3MAO	Policies	Technology	Disseminat	Agent	Education	Market	Partners	Sale	Product	Served	Income	Mobilisation
Dep.Agr	2,9	1,9	1,0	3,8	1,0	1,0	1,0	1,0	1,9	1,0	1,0	17,3
BSIP	2,7	3,6	3,6	1,8	1,8	0,9	0,9	0,9	0,9	0,9	0,9	18,7
Researcher	3,2	3,2	1,6	0,8	1,6	0,8	0,8	0,8	1,6	0,8	0,8	16,1
PPL	2,9	1,9	1,0	2,9	1,9	1,0	1,0	1,0	1,9	1,0	1,0	17,2
Univ./PT	0,0	1,0	1,0	1,0	3,0	1,0	1,0	1,0	0,0	1,0	1,0	11,2
Trader	1,1	1,1	1,1	1,1	1,1	4,4	3,3	3,3	1,1	2,2	1,1	20,7
Industry	1,0	1,0	1,0	1,0	1,0	3,1	2,1	3,1	1,0	1,0	2,1	17,6
Distributo	1,1	1,1	1,1	1,1	1,1	4,5	3,3	2,2	2,2	2,2	1,1	21,2
Retailer	1,1	1,1	1,1	1,1	1,1	2,3	2,3	2,3	2,3	4,6	1,1	20,7
UPT BPPP	4,9	3,7	2,4	3,7	2,4	1,2	1,2	1,2	2,4	1,2	1,2	25,7
Farmers	2,3	1,5	0,8	2,3	3,1	0,8	0,8	0,8	0,8	0,8	2,3	16,1
Number of agreements	23,2	21,2	15,7	20,7	19,2	20,8	17,6	17,5	16,2	16,7	13,6	
Number of disagreements	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	
Degree of mobilisation	23,2	21,2	15,7	20,7	19,2	20,8	17,6	17,5	16,2	16,7	13,6	

Through principled stakeholder engagement with the aim of solving problems and creating value in society for rural development,27,51,56 mapping the objectives of organizing extension according to the level of importance illustrates the stronger the actor's support for these objectives. Based on Table 3MAO, it is known that the Technical Implementer of the Agricultural Extension Center is the most active actor in developing the implementation of agricultural extension in rural areas, with a mobilization value of 25.7. Meanwhile, the aim of the extension policy to increase production is a goal or objective expected to become the main issue that provokes reactions from other actors, with a degree of mobilization value of 23.2. The implementation of extension in NTB is not only top-down but also needs to pay attention to the needs of farmers to avoid potential conflicts.

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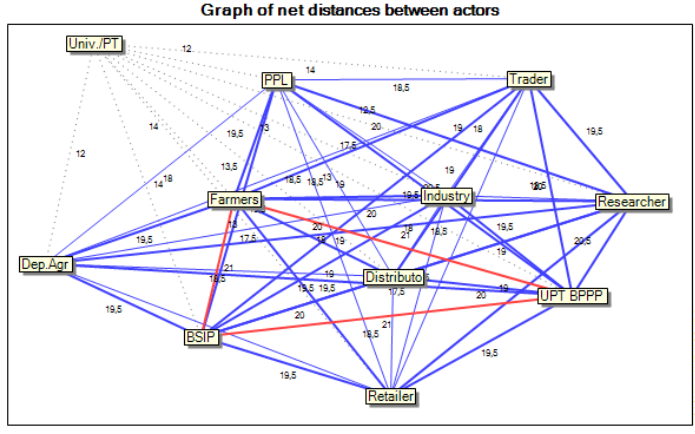

Figure 4. Intensity of convergence between actors

Figure 4 shows the similarity of actors' attitudes towards goals. The UPT Center for Extension Administration, the BSIP research institute, and farmers form a group of actors who can create a very strong alliance for the success of implementing extension services in NTB. According to Minister of Agriculture Regulation No. 11 of 2019, BSIP collaborates with extension technical implementing units to conduct research, study and assemble appropriate agricultural technology, prepare extension materials, provide technical guidance on extension materials, and disseminate the results of technology studies and location-specific appropriate agricultural technology to support implementation.57 This includes programs to increase production and strategic agricultural activities for the welfare of farmers.

Collaborative governance model for providing extension

The trilateral relationship of the triple helix model operates through regulatory standards (government), cooperation between the demand for knowledge and innovation (industry), and the provision of knowledge and innovation (universities) as a contribution of agricultural extension to increasing productivity.26,31,65,78 The collaborative governance dimensions of strengthening extension implementation include interaction patterns, legitimacy of activity rules, and administrative and practical feasibility. Most collaborative initiatives occur as farmer capacity development policies in NTB Province.45,70,76

Regulation of the Minister of Agriculture Number 27 of 2023 concerning the Strengthening of Agricultural Extension Functions requires easy access for farmers and business actors to sources of information, technology, and other resources to develop their businesses. This includes facilitating access to research institutions, universities, banking, and other sources of

agribusiness information.58 The aim of increasing production using technology for the welfare of farmers, supported by all actors, must be a priority in the implementation of extension in NTB Province. Dominant actors must play an active role in realizing these priority goals through synergy in designing plans, communication patterns, and coordinating rural community assistance activities.

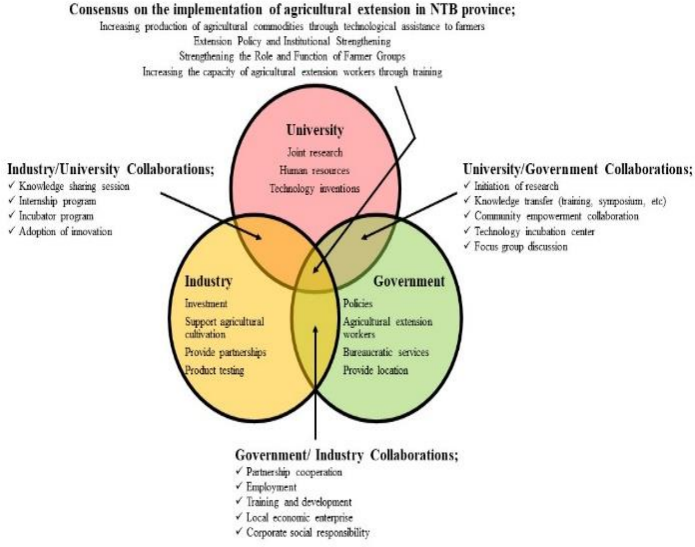

Figure 5. A framework proposed by the researcher based on the actualization of triple helix actors for agricultural extension development in West Nusa Tenggara.

Policy-making for the implementation of agricultural extension in NTB Province is carried out by the NTB Province Agriculture and Plantation Department as a key stakeholder. The relevant department has the authority to formulate policies for agricultural, plantation, and livestock programs.24,32, Agricultural instructors, as officers under the auspices of these departments, implement extension programs for farmers in accordance with central and regional government policies. The level of village community participation tends to decrease in terms of initial acceptance and adoption of the program when there are differences in political views or a lack of support for elected leaders.3,69 The findings of this research serve as recommendations for organizing agricultural extension in synergy with a collaborative pattern involving the three-helix entities in NTB Province.

Implementation of agricultural extension based on triple-helix actor collaboration involves actor participation in the preparation of technical and strategic policies through holding Regional Development Planning Conferences (Musrenbang) in the field of food and agriculture. The multi-actor governance consensus space is facilitated by individuals and institutions from the government and the private sector, regulating joint affairs that are framed normatively for a vision of the future. The provision of extension is not limited to the main tasks and functions of

the NTB Agriculture and Livestock Service but encompasses the goal of rural community development through the initiation of actor collaboration, which has not been explicitly outlined in previous research.1

4. Conclusion

Implementation of agricultural extension is a crucial element in development in NTB Province. Limited extension resources need to be supported by the synergy of government actors as policymakers, universities as educational institutions, and the private sector through business actors. This collaboration is expected to overcome obstacles in implementing extension and achieve the primary goal of increasing production, which is challenged by institutional and extension capacity issues. Research findings through a logical model that describes the conditions of extension as input for analysis of actor involvement indicate the need for operational-level consensus. A coordination system should be established by the competent authorities in the future, specifically the NTB Provincial Agriculture and Livestock Department, with appropriate regulatory aspects.

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WORKS CITED

Ackermann F, Eden C. Strategic management of stakeholders: theory and practice. Long Range Planning. 2011;44(3):179–96. https://doi.org/10.1016/j.lrp.2010.08.001

Agriculture and Plantation Training Center. Agricultural Extension Program NTB 2023. 2022.

Alemu T, Tolossa D, Senbeta F, Zeleke T. Factors influencing smallholder farmers' decision to abandon introduced sustainable land management technologies in Central Ethiopia. Caraka Tani J Sustain Agric. 2022;37(2):385–405. https://doi.org/10.20961/carakatani.v37i2.60720

Altaf A, Hassan IE, Batool S. The role of ORIC in the evolution of the triple helix culture of innovation: The case of Pakistan. Technol Soc. 2019;56:157–66. https://doi.org/10.1016/j.techsoc.2018.09.014

Amadu FO. Peer effects in agricultural extension: Evidence from community knowledge workers in rural Uganda. Soc Sci Humanit Open. 2023;7(1).. https://doi.org/10.1016/j.ssaho.2023.100484

Aminah S, Fatchiya A. Strengthening rural extension services to facilitate community towards sustainable development goals in three districts in Indonesia. Jurnal Penyuluhan. 2018;14(1):134-44..

Angela. Peran penyuluh pertanian terhadap meningkatkan partisipasi petani di Desa Ilomangga Kecamatan Tabongo. Agrinesia. 2021;5(2):148-54.

Arbain T. Actor relation in the dynamic of inter-regional cooperation policy (case study: development program of metropolitan area of Banjar Bakula, South Kalimantan Province). IAPA Proceedings Conference. 2019;69–87.

Avelino F, Wittmayer JM. Shifting power relations in sustainability transitions: A multi-actor perspective. J Environ Policy Plan. 2016;18(5):628–49. https://doi.org/10.1080/1523908X.2015.1112259

Azhar AA, Hadiwijoyo SS, Umbu N, Nau W. Peran multi-aktor dalam mewujudkan ketahanan pangan nasional melalui pengelolaan food loss and waste di Indonesia. JUKIM. 2023;2(4). https://doi.org/10.56127/jukim.v2i04

Van den Ban AW, Hawkins HS. Penyuluhan pertanian. Yogyakarta: Kanisius; 1999..
Beaman L, Benyishay A, Magruder J, Mobarak AM, Coen T, Kelleher N, et al. Can network theory-based targeting increase technology adoption? J Econ Lit. 2020;16(13):1–9.
Biswas B, Mallick B, Roy A, Sultana Z. Impact of agriculture extension services on technical efficiency of rural paddy farmers in southwest Bangladesh. Environ Challenges. 2021; 5:100261. https://doi.org/10.1016/j.envc.2021.100261
Borah D, Massini S, Malik K. Teaching benefits of multi-helix university-industry research collaborations: Towards a holistic framework. Res Policy. 2023;52(8):104843. https://doi.org/10.1016/j.respol.2023.104843
Bryson JM. What to do when stakeholders matter: Stakeholder identification and analysis techniques. Public Manag Rev. 2004;6(1):21-53. https://doi.org/10.1080/14719030410001675722
Cai Y, Etzkowitz H. Theorizing the Triple Helix model: Past, present, and future. Triple Helix. 2020;7(2-3):189-226. https://doi.org/10.1163/21971927-bja10003
Cai Y, Liu C. The role of university as institutional entrepreneur in regional innovation system. In: Innovation and Entrepreneurial Opportunities in Community Tourism: Emerging Research and Opportunities. 2020. p. 133-55. https://doi.org/10.4018/978-1-7998-0174-0.ch007
Calzada I. (Un)Plugging smart cities with urban transformations: Towards multi-stakeholder city-regional complex urbanity? URBS. 2016;6(2):25-45.
Carayannis EG, Rakhmatullin R. The Quadruple/Quintuple Innovation Helixes and Smart Specialisation Strategies for Sustainable and Inclusive Growth in Europe and Beyond. J Knowl Econ. 2014;5(2):212–39. https://doi.org/10.1007/s13132-014-0185-8
Carpenter CW, Van Sandt A, Loveridge S. Food and agricultural industry locational determinants research: Aggregation bias and size measurement in the agricultural support industry. Agric Resour Econ Rev. 2022;51(3):558–78. https://doi.org/10.1017/age.2022.21
Central Bureau of Statistics NTB. West Nusa Tenggara Province in Figures 2022.
Creswell JW. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. 4th ed. Sage Publication Ltd; 2014.
Derak M, Cortina J, Taiqui L. Integration of stakeholder choices and multi-criteria analysis to support land use planning in semiarid areas. Land Use Policy. 2017; 64:414–28. https://doi.org/10.1016/j.landusepol.2017.03.006
Dewi MR, Dwi Nurfani H, Nur A, Borneo A, Arung R. Analisis Peran Stakeholder dalam Pengembangan Agropolitan Kabupaten Kutai Kartanegara. Specta. 2020;4(1):35–41.
Elmsalmi M, Hachicha W. Risk Mitigation Strategies According to the Supply Actors' Objectives through MACTOR Method. International Conference on Advanced Logistics and Transport. 2014. p. 362–7.
Emeis S, Fallmann J. Unsatisfying transfer of climate research to urban planning: The regulatory trap in the Triple Helix. Triple Helix. 2022;60(2). https://doi.org/10.1163/21971927-bja10035
Emerson K, Nabatchi T, Balogh S. An integrative framework for collaborative governance. J Public Adm Res Theory. 2012;22(1):1-29. https://doi.org/10.1093/jopart/mur011
Kusuma E, Refian R. Pemberdayaan masyarakat bidang pertanian oleh penyuluh pertanian lapangan (PPL) wilayah binaan Desa Buniseuri Kecamatan Cipaku Kabupaten Ciamis. Moderat. 2019;5(4):460-73.
Farinha L, Ferreira JJ. Triangulation of the Triple Helix: A conceptual framework [Internet]. 2013. Available from: https://www.triplehelixassociation.org/wp-content/uploads/2013/01/Triangulation-of-the-Triple-Helix-A-Conceptual-Framework.pdf
Fidanoski F, Simeonovski K, Kaftandzieva T, Ranga M, Dana LP, Davidovic M, et al. The triple helix in developed countries: When knowledge meets innovation? Heliyon. 2022;8(8) https://doi.org/10.1016/j.heliyon.2022.e10168
Floyd RE, Floyd RE. Industry and academia: Together spells success.
Freeman RE, Mc Vea J. A stakeholder approach to strategic management. In: Handbook of strategic management. Oxford: Blackwell Publishing; 2004.
Freeman RE, Sachs S. Stakeholder engagement: Clinical research cases. Vol. 46. Springer; 2017. Available from: http://www.springer.com/series/6077
Gachie W. Higher education institutions, private sector and government collaboration for innovation within the framework of the Triple Helix Model. Afr J Sci Technol Innov Dev. 2020;12(2):203-15. https://doi.org/10.1080/20421338.2019.1631120

Galvao A, Mascarenhas C, Marques C, Ferreira J, Ratten V. Triple helix and its evolution: a systematic literature review. J Sci Technol Policy Manag. 2019;10(3):812-33. https://doi.org/10.1108/JSTPM-10-2018-0103.

Hidayat NC, Setijaningrum E, Asmorowati S. Analisis Stakeholder Pengelolaan Sumber Daya Hutan di Kabupaten Jember. J Ilm Ilmu Adm. 2020;3(2):179-89.

Hu Q, Entebang H, Puah CH. Status and Development of Agricultural Public-Private Partnership Program Implementation in China. Caraka Tani. 2024;39(1):223-34. https://doi.org/10.20961/carakatani.v39i1.83311.

Iskandar E, Vitayala A. The Prominent Role of Agricultural Extension System on Cocoa Agribusiness Development in Aceh, Indonesia (Peran Utama Sistem Penyuluhan Pertanian dalam Pengembangan Agribisnis Kaka). J Penyul. 2020;16(02):199-212. https://doi.org/10.25015/16202029298.

Jumiati, Ali MSS, Fahmid IM, Mahyuddin. Stakeholder analysis in the management of irrigation in Kampili area. IOP Conf Ser Earth Environ Sci. 2018;157(1):012069. https://doi.org/10.1088/1755-1315/157/1/012069.

Kerua W, Glyde S. Beyond the cocoa farm: a new look at farmers' choices in livelihood activities and impact on productivity in selected areas of Papua New Guinea. Rural Ext Innov Syst J. 2016;12(1). http://www.apen.org.au/rural-extension-and-innovation-systems-journal.

Kim H, Huang M, Jin F, Bodoff D, Moon J, Choe YC. Triple helix in the agricultural sector of Northeast Asian countries: A comparative study between Korea and China. Scientometrics. 2012;90(1):101-20. https://doi.org/10.1007/s11192-011-0517-4.

Kolade O, Adegbile A, Sarpong D. Can university-industry-government collaborations drive a 3D printing revolution in Africa? A triple helix model of technological leapfrogging in additive manufacturing. Technol Soc. 2022;69:101960. https://doi.org/10.1016/j.techsoc.2022.101960.

Koopmans ME, Rogge E, Mettepenningen E, Knickel K, Šūmane S. The role of multi-actor governance in aligning farm modernization and sustainable rural development. J Rural Stud. 2018;59:252–62. https://doi.org/10.1016/j.jrurstud.2017.03.012

Lafourcade B, Chapuy P. Scenarios and Actors' Strategies: The Case of the Agri-Foodstuff Sector Part 1: The Agricultural and Agri-foodstuffs Sectors at Stake. Technol Forecast Soc Change. 2000;65.

Lahat L, Sher-Hadar N. A threefold perspective: conditions for collaborative governance. J Manag Gov. 2020;24(1):117–34. https://doi.org/10.1007/s10997-019-09465-1

Lee YH, Kim YJ. Analyzing interaction in R&D networks using the Triple Helix method: Evidence from industrial R&D programs in Korean government. Technol Forecast Soc Change. 2016;110:93–105. https://doi.org/10.1016/j.techfore.2015.10.017

Lerman LV, Gerstlberger W, Ferreira Lima M, Frank AG. How governments, universities, and companies contribute to renewable energy development? A municipal innovation policy perspective of the triple helix. Energy Res Soc Sci. 2021;71 https://doi.org/10.1016/j.erss.2020.101854

Lestari S, Billah MT, Kusnadi D. Pemberdayaan Wanita Tani dalam Penerapan Low External Input and Sustainable Agriculture (LEISA) untuk Rumah Pangan Lestari di Kecamatan Cibeureum. Agrimor. 2021;6(3):127–37. https://doi.org/10.32938/ag.v6i3.1422

Leydesdorff L. The triple helix—University-Industry-Government relations: A laboratory for knowledge-based economic development. EASST Rev. 1995;14(1):14–9..

Loureiro SMC, Romero J, Bilro RG. Stakeholder engagement in co-creation processes for innovation: A systematic literature review and case study. J Bus Res. 2020;119:388–409. https://doi.org/10.1016/j.jbusres.2019.09.038

Luoma-aho V, Paloviita A. Actor-networking stakeholder theory for today's corporate communications. Corp Commun. 2010;15(1):49–67. https://doi.org/10.1108/13563281011016831

Lupia F, Pulighe G. Water use and urban agriculture: Estimation and water saving scenarios for residential kitchen gardens. Agric Agric Sci Procedia. 2015;4:50–8. https://doi.org/10.1016/j.aaspro.2015.03.007

Mahmoudi H, Knierim A, Mahmoudip H, Knierimp A. Risk communication for farmers' adaptation to climate change: A new task for agricultural advisory services. Int J Performability Eng. 2015;11(6). https://www.researchgate.net/publication/284732055

Manghayu A, Heny A, Nurdin M. Manajemen pemangku kepentingan dalam ranah pengambilan keputusan pemerintah daerah. Manaj Pemerintahan. 2018;5(2):109–23.

Mardikanto. Sistem penyuluhan pertanian. Surakarta: UNS Press; 2009.

McComb EJ, Boyd S, Boluk K. Stakeholder collaboration: A means to the success of rural tourism destinations? A critical evaluation of the existence of stakeholder collaboration within the Mournes, Northern Ireland. Tour Hosp Res. 2017;17(3):286–97. https://doi.org/10.1177/1467358415583738
Ministry of Agriculture. Permentan Nomor 11 Tahun 2019. Jakarta: Ministry of Agriculture; 2019.
Ministry of Agriculture. Peraturan Menteri Pertanian Nomor 27 Tahun 2023 Tentang Penguatan Fungsi Penyuluhan Pertanian. Jakarta: Ministry of Agriculture; 2023. Available from: www.peraturan.go.id
Mitchell RK, Agle BR, Wood DJ. Toward a theory of stakeholder identification and salience: Defining the principle of who and what really counts. Acad Manag Rev. 1997;22(4).
Nasikh, Kamaludin M, Narmaditya BS, Wibowo A, Febrianto I. Agricultural land resource allocation to develop food crop commodities: Lesson from Indonesia. Heliyon. 2021;7(7) https://doi.org/10.1016/j.heliyon.2021.e07520
Nyamweru JC, Ndayitwayeko WM, Kessler A, Biemans H. Fostering sustainable agriculture in Burundi: Which competencies for change-agents should vocational agriculture education prioritize? J Agric Educ Ext. 2023. https://doi.org/10.1080/1389224X.2023.2205395
O'Daniel JM, Ackerman S, Desrosiers LR, Rego S, Knight SJ, Mollison L, et al. Integration of stakeholder engagement from development to dissemination in genomic medicine research: Approaches and outcomes from the CSER Consortium. Genet Med. 2022;24(5):1108–19. https://doi.org/10.1016/j.gim.2022.01.008
Owolabi AO, Yekinni OT. Utilisation of information and communication technologies for agricultural extension service delivery in public and non-public organisations in southwestern Nigeria. Heliyon. 2022;8(9). https://doi.org/10.1016/j.heliyon.2022.e10676
Paginian E, Kurniati D, Yusro AH. Strategi peningkatan kinerja penyuluh pertanian di Kabupaten Landak. SEPA: Jurnal Sosial Ekonomi Pertanian dan Agribisnis. 2021;17(2):135. https://doi.org/10.20961/sepa.v17i2.42734
Ranga M, Etzkowitz H. Triple helix systems: An analytical framework for innovation policy and practice in the knowledge society. Ind High Educ. 2013;27(4):237–62. https://doi.org/10.5367/ihe.2013.0165
Rees GH, Macdonell S. Data gathering for actor analyses: A research note on the collection and aggregation of individual respondent data for MACTOR. Future Studies Research Journal. 2017;9(1):115–37.
Salehi M, Abbasi E, Bijani M, Shahpasand MR. Evaluation of agricultural extension model sites approach in Iran. J Saudi Soc Agric Sci. 2021;20(8):506–18. https://doi.org/10.1016/j.jssas.2021.06.002
Shakman K, Rodriguez SM. Logic models for program design, implementation, and evaluation: Workshop toolkit. 2015. http://ies.ed.gov/
Sipayung BP, Joka U, Maulana AS, Onuigbon DM. Fiscal decentralization and farmer empowerment in Indonesia-Timor Leste border: A case study of village fund. Caraka Tani. 2023;38(2):273–83. https://doi.org/10.20961/carakatani.v38i2.67578
Smith HL, Bagchi-Sen S. Triple helix and regional development: A perspective from Oxfordshire in the UK. Technol Anal Strateg Manag. 2010;22(7):805–18. https://doi.org/10.1080/09537325.2010.511143
Strand Ø, Ivanova I, Leydesdorff L. Decomposing the Triple-Helix synergy into the regional innovation systems of Norway: firm data and patent networks. Qual Quant. 2017;51(3):963-88. https://doi.org/10.1007/s11135-016-0344-z.
Sundaro H. Positivisme dan Post Positivisme: Refleksi atas Perkembangan Ilmu Pengetahuan dan Perencanaan Kota dalam Tinjauan Filsafat Ilmu dan Metodologi Penelitian. Modul. 2022;22(1):21-30. https://doi.org/10.14710/mdl.22.1.2022.21-30.
Suparwata DO, Rukmana D, Tenriawaru AN, Neswati R. Actualization of local community participation in critical land management in Gorontalo. IOP Conf Ser Earth Environ Sci. 2021;755(1):012056. https://doi.org/10.1088/1755-1315/755/1/012056.
Suranti D, Latipa Sari H. Penerapan Metode MPE dalam Penilaian Kinerja Penyuluh Pertanian UPT BPP Sukaraja. Jurnal Media Infotama. 2018;14(2).
Tarekegne C, Wesselink R, Biemans HJA, Mulder M. Developing and validating a competence framework for improving the productivity of smallholder farmers: a case study from Ethiopia. J Agric Educ Ext. 2021;27(4):481-502. https://doi.org/10.1080/1389224X.2021.1880452.
Tarigan H. Pengembangan Sumber Daya Manusia Pertanian Pada Era Disrupsi: Upaya Mendukung Agribisnis Inklusif. Forum Penelit Agro Ekon. 2021;38(2):89-101. https://doi.org/10.21082/fae.v38n2.2020.89-101.

Taylor M, Bhasme S. Model farmers, extension networks and the politics of agricultural knowledge transfer. J Rural Stud. 2018;64:1-10. https://doi.org/10.1016/j.jrurstud.2018.09.015.

Turner VK. Obstacles to developing sustainable cities: The real estate rigidity trap. Ecology and Society. 2017;22(2). Available from: https://doi.org/10.5751/ES-09166-220201

Wardani OA. Peran penyuluh terhadap penguatan kelompok tani dan regenerasi petani di Kabupaten Bogor Jawa Barat. Journal TABARO. 2018;2(1).

Zhuang T, Zhou Z, Li Q. University-industry-government triple helix relationship and regional innovation efficiency in China. Growth and Change. 2021;52(1):349–70. Available from: https://doi.org/10.1111/grow.12461